
Establishing a Baseline and Assessing Spatial and Socioeconomic Change in the California Central Coast Commercial and CPFV Fisheries

Technical Report to the MPA Monitoring Enterprise, California Ocean Science Trust

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TABLE OF CONTENTS

1. INTRODUCTION	1
2. CENTRAL COAST REGION: TARGET FISHERIES AND PORTS AND COUNTIES OF INTEREST	2
2.1. Central Coast Region and Associated Counties Demographic Profile	5
2.1.1. Santa Cruz County	5
2.1.2. Monterey County	6
2.1.3. San Luis Obispo County.....	8
2.2. Target Fisheries and Fishing Ports of Interest	10
2.2.1. Target Commercial Fisheries and Commercial Fishing Ports of Interest.....	10
2.2.2. Primary CPFV Fisheries and Ports of Interest	11
3. SURVEY AND ANALYSIS METHODS.....	12
3.1. CDFG Landings Data Analysis Methods	12
3.2. Survey Data Collection and Analysis Methods	13
3.2.1. Sampling Method	14
3.2.2. Interview Protocol.....	16
3.2.3. Data Review and Verification	17
3.2.4. Spatial Data Analysis Methods.....	19
3.2.5. Non-spatial Data Analysis Methodology	20
4. CENTRAL COAST REGIONAL PROFILES	21
4.1. Central Coast Region Commercial Fishing Initial Changes.....	21
4.2. Central Coast Region Commercial Fishing Baseline Characterization.....	31
4.3. Central Coast Region MPAs and Commercial Fishing.....	46
4.4. Regional Commercial Fishery Profiles.....	60
4.4.1. California Halibut–Hook & Line: Initial Changes and Baseline Characterization	60
4.4.2. Coastal Pelagic Species–Seine/Net: Initial Changes and Baseline Characterization.....	74
4.4.3. Dungeness Crab–Trap: Initial Changes and Baseline Characterization.....	87
4.4.4. Market Squid–Seine: Initial Changes and Baseline Characterization.....	99
4.4.5. Nearshore Finfish–Dead Historical Profile	110
4.4.6. Nearshore Finfish–Live: Initial Changes and Baseline Characterization	117
4.4.7. Salmon–Troll: Initial Changes and Baseline Characterization.....	141
4.4.8. Spot Prawn–Trap Initial Changes and Baseline Characterization	151
4.5. Central Coast Region CPFV Initial Changes	160
4.5.1. Introduction/Methods.....	160

4.5.2.	CPFV Initial Changes	161
4.6.	Central Coast Region CPFV Baseline Characterization	168
4.7.	Central Coast Region MPAs and CPFV Operations	180
5.	CENTRAL COAST PORT PROFILES.....	190
5.1.	Santa Cruz	192
5.1.1.	Santa Cruz Commercial Fisheries Initial Change	192
5.1.2.	Santa Cruz Commercial Fisheries Baseline Characterization.....	202
5.1.3.	Santa Cruz CPFV Fisheries Initial Changes	211
5.1.4.	Santa Cruz CPFV Fisheries Baseline Characterization	215
5.2.	Moss Landing/Monterey	221
5.2.1.	Moss Landing/Monterey Commercial Fisheries Initial Changes.....	222
5.2.2.	Moss Landing/Monterey Commercial Fisheries Baseline Characterization	244
5.2.3.	Moss Landing/Monterey CPFV Fisheries Initial Changes	255
5.2.4.	Moss Landing/Monterey CPFV Fisheries Baseline Characterization	263
5.3.	Morro Bay	269
5.3.1.	Morro Bay Commercial Fisheries Initial Changes	269
5.3.2.	Morro Bay Commercial Fisheries Baseline Characterization	280
5.3.3.	Morro Bay CPFV Fisheries Initial Changes	289
5.3.4.	Morro Bay CPFV Fisheries Baseline Characterization.....	293
5.4.	Avila/Port San Luis	299
5.4.1.	Avila/Port San Luis Commercial Fisheries Initial Changes.....	299
5.4.2.	Avila/Port San Luis Commercial Fisheries Baseline Characterization.....	310
5.4.3.	Avila/Port San Luis CPFV Fisheries Initial Changes	318
6.	Central Coast Port Level Rocky Habitat Analysis.....	322
7.	Central Coast Region and Port Level Spatial Change Analyses	329
7.1.1.	Sum of Squares: Measuring spatial coincidence	330
7.1.2.	Raster Math Maps: Identifying spatial change in value	331
7.1.3.	Percent Volume Contour: Measuring changes in value concentration	341
7.1.4.	Euclidean Distance: Measuring change in fishing distances.....	343
8.	LESSONS LEARNED AND FUTURE RECOMMENDATIONS.....	345
8.1.	Lessons Learned.....	345
8.2.	Recommendations on Key Monitoring Metrics.....	345
8.2.1.	Commercial Fishing Sector	346
8.2.2.	CPFV Sector	347
9.	CONCLUSION.....	348

REFERENCES	348
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LIST OF MAPS

Map 1. Central Coast Region (north)	3
Map 2. Central Coast Region (south).....	4
Map 3. California halibut—hook & line 2011 commercial fishing value map, Central Coast Region	72
Map 4. California halibut—hook & line 2011 commercial fishing value map, Morro Bay	73
Map 5. Coastal pelagic species-seine/net 2011 commercial fishing value map, Central Coast Region	85
Map 6. Coastal pelagic species-seine/net 2011 commercial fishing value map, Moss Landing/Monterey	86
Map 7. Dungeness crab-trap 2011 commercial fishing value map, Central Coast Region	98
Map 8. Market squid-seine 2011 commercial fishing value map, Central Coast Region.....	108
Map 9. Market squid-seine 2011 commercial fishing value map, Monterey	109
Map 10. Nearshore finfish-live-hook & line 2011 commercial fishing value map, Central Coast Region	136
Map 11. Nearshore finfish-live-hook & line 2011 commercial fishing value map, Morro Bay	137
Map 12. Nearshore finfish-live-hook & line 2011 commercial fishing value map, Avila/Port San Luis	138
Map 13. Nearshore finfish-live-trap 2011 commercial fishing value map, Central Coast Region.....	139
Map 14. Nearshore finfish-live-trap 2011 commercial fishing value map, Central Coast Region.....	140
Map 15. California halibut 2011 CPFV fishing value map, Central Coast Region	175
Map 16. Rockfish/Lingcod 2011 CPFV fishing value value map, Central Coast Region.....	176
Map 17. Salmon 2011 CPFV fishing value map, Central Coast Region.....	177
Map 18. Rockfish/Lingcod 2011 CPFV fishing value map, Santa Cruz	178
Map 19. Rockfish/Lingcod 2011 CPFV fishing value map, Moss Landing/Monterey	179
Map 20. Central Coast Region rocky habitat analysis search radii, Santa Cruz	327
Map 21. Central Coast region rocky habitat analysis, RCA and MPA boundaries	328
Map 22. California halibut—hook & line spatial change map, Central Coast Region	332
Map 23. Dungeness crab—trap spatial change map, Central Coast Region	333
Map 24. Market squid—seine spatial change map, Monterey	334
Map 25. Market squid—seine spatial change map, Central Coast Region.....	335
Map 26. Nearshore finfish—live—trap spatial change map, Morro Bay	336
Map 27. Nearshore finfish—live—trap spatial change map, Central Coast Region	337
Map 28. Nearshore finfish—live—hook & line spatial change map, Morro Bay	338
Map 29. Nearshore finfish—live—hook & line spatial change map, Avila/Port San Luis.....	339
Map 30. Nearshore finfish—live—hook & line spatial change map, Central Coast Region.....	340

LIST OF TABLES

Table 1. Select 2010 demographic statistics, Santa Cruz County	5
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Table 2. Select 2010 demographic statistics, Monterey County	7
Table 3. Select 2010 demographic statistics, San Luis Obispo County.....	9
Table 4. Number of fishermen interviewed as a percent of each quartile revenue strata for each fishery, Central Coast Region	15
Table 5. Number of CPFV captains interviewed compared to the number of vessel in CDFG logbook data, Central Coast Region	18
Table 6. Comparison between study results and CDFG logbook data on average number of anglers per trip and number of trips per vessel, Central Coast Region	18
Table 7. Commercial fisheries of interest	24
Table 8. Average percent contribution of fishery ex-vessel revenue to Central Coast Region total ex-vessel revenues, commercial fishing.....	27
Table 9. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Central Coast Region	31
Table 10. Average age and years experience commercial fishing, Central Coast Region.....	32
Table 11. Percent change in income from overall commercial fishing from 2006–2011, Central Coast Region	33
Table 12. Cause of change in percent income from commercial fishing from 2006–2011, Central Coast Region.	33
Table 13. Other sources of income other than commercial fishing in 2011, Central Coast Region	34
Table 14. Percent change in overall commercial fishing operating costs from 2006–2011, Central Coast Region	34
Table 15 . Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Central Coast Region	35
Table 16. Additional commercial fishery specific data, Central Coast Region.....	35
Table 17. Commercial fisheries added/dropped since 2006 or not fished in 2011, Central Coast Region	36
Table 18. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Central Coast Region.....	37
Table 19. Overall success in specific commercial fishery compared to previous five years, Central Coast Region	38
Table 20 . Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region	39
Table 21. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region	40
Table 22. Economic changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region	41
Table 23. Other changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region	42
Table 24. Commercial fishing permits not used in 2011, Central Coast Region	43
Table 25. Reason for not fishing a commercial fishery permit, Central Coast Region	43
Table 26. Number of commercial fishermen interviews conducted and ex-vessel landings value represented, spatial survey, Central Coast Region.....	44
Table 27. Number of commercial fishermen interviews conducted and ex-vessel landings value represented in maps available to public, Central Coast Region	44

Table 28. Spatial data sets available for the commercial fishing sector, pre and post MPA	45
Table 29. Percent of individuals indicating specific direct impact from MPAs for each fishery, commercial fishermen, Central Coast Region	46
Table 30. Other ways MPAs have impacted specific commercial fisheries, Central Coast Region	47
Table 31. Percent of respondents indicating specific MPA impacting commercial fishery, Central Coast Region	49
Table 32. Percent of individuals indicating specific direct impact from MPAs for each fishery, Santa Cruz	50
Table 33. Other ways MPAs have impacted specific commercial fisheries, Santa Cruz.....	51
Table 34. Percent of respondents indicating specific MPA impacting commercial fishery, Santa Cruz	51
Table 35. Percent of individuals indicating specific direct impact from MPAs for each fishery, Moss Landing/Monterey	52
Table 36. Other ways MPAs have impacted specific commercial fisheries, Moss Landing/Monterey	53
Table 37. Percent of respondents indicating specific MPA impacting commercial fishery, Moss Landing/Monterey	54
Table 38. Percent of individuals indicating specific direct impact from MPAs for each fishery, Morro Bay	55
Table 39. Other ways MPAs have impacted specific commercial fisheries, Morro Bay	56
Table 40. Percent of respondents indicating specific MPA impacting commercial fishery, Morro Bay	57
Table 41. Percent of individuals indicating specific direct impact from MPAs for each fishery, Avila/Port San Luis	58
Table 42. Other ways MPAs have impacted specific commercial fisheries, Avila/Port San Luis	59
Table 43. Percent of respondents indicating specific MPA impacting commercial fishery, Avila/Port San Luis	59
Table 44: California halibut-hook & line: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	63
Table 45. Average age and years experience commercial fishing, California halibut–hook & line	64
Table 46. Percent change in income from overall commercial fishing from 2006–2011, California halibut–hook & line.....	64
Table 47. Cause of change in percent income from commercial fishing from 2006–2011, California halibut–hook & line	65
Table 48. Other sources of income other than commercial fishing in 2011, California halibut–hook & line	65
Table 49. Percent change in overall commercial fishing operating costs from 2006–2011, California halibut–hook & line	65
Table 50. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, California halibut–hook & line	66
Table 51. Additional commercial fishery specific data, California halibut–hook & line	66
Table 52. California halibut, added/dropped since 2006 or not fished in 2011	67
Table 53. California halibut, reason for adding/dropping since 2006 or not fishing a fishery in 2011	67
Table 54. Overall success in specific commercial fishery compared to previous five years, California halibut–hook & line	68
Table 55. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, California halibut–hook & line	69

Table 56. Environmental changes/factors influencing success in specific commercial fishery in	70
Table 57. Economic changes/factors influencing success in specific commercial fishery in previous five years, California halibut–hook & line	70
Table 58. Other changes/factors influencing success in specific commercial fishery in previous five years, California halibut–hook & line	71
Table 59. Coastal pelagic species–seine/net: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	77
Table 60. Average age and years experience commercial fishing, Coastal pelagic species–seine/net.....	78
Table 61. Percent change in income from overall commercial fishing from 2006–2011, Coastal pelagic species–seine/net.....	78
Table 62. Other sources of income other than commercial fishing in 2011, Coastal pelagic species–seine/net	78
Table 63. Percent change in overall commercial fishing operating costs from 2006–2011, Coastal pelagic species–seine/net.....	79
Table 64. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Coastal pelagic species–seine/net.....	79
Table 65. Additional commercial fishery specific data, Coastal pelagic species–seine/net.....	80
Table 66. Coastal pelagic species–seine/net, added/dropped since 2006 or not fished in 2011	80
Table 67. Overall success in specific commercial fishery compared to previous five years, Coastal pelagic species–seine/net.....	81
Table 68. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Coastal pelagic species–seine/net	82
Table 69. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Coastal pelagic species–seine/net	83
Table 70. Economic changes/factors influencing success in specific commercial fishery in previous five years, Coastal pelagic species–seine/net	83
Table 71. Other changes/factors influencing success in specific commercial fishery in previous five years, Coastal pelagic species–seine/net	84
Table 72. Dungeness crab-trap landings: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	90
Table 73. Average age and years experience commercial fishing, Dungeness crab–trap.....	91
Table 74. Percent change in income from overall commercial fishing from 2006–2011, Dungeness crab–trap	91
Table 75. Cause of change in percent income from commercial fishing from 2006–2011, Dungeness crab–trap	92
Table 76. Percent change in overall commercial fishing operating costs from 2006–2011, Dungeness crab–trap.	92
Table 77. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Dungeness crab–trap	93
Table 78. Additional commercial fishery specific data, Dungeness crab–trap.....	93
Table 79. Dungeness crab–trap, added/dropped since 2006 or not fished in 2011	94
Table 80. Dungeness crab–trap, reason for adding/dropping since 2006 or not fishing a fishery in 2011	94

Table 81. Overall success in specific commercial fishery compared to previous five years, Dungeness crab-trap	95
Table 82. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Dungeness crab-trap	95
Table 83. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Dungeness crab-trap	96
Table 84. Economic changes/factors influencing success in specific commercial fishery in previous five years, Dungeness crab-trap	96
Table 85. Other changes/factors influencing success in specific commercial fishery in previous five years, Dungeness crab-trap	97
Table 86. Market Squid-Seine: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	101
Table 87. Average age and years experience commercial fishing, Market squid-seine	102
Table 88. Percent change in income from overall commercial fishing from 2006–2011, Market squid-seine	103
Table 89. Other sources of income other than commercial fishing in 2011, Market squid-seine	103
Table 90. Percent change in overall commercial fishing operating costs from 2006–2011, Market squid-seine	103
Table 91. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Market squid-seine	104
Table 92. Additional commercial fishery specific data, Market squid-seine	104
Table 93. Market squid-seine, added/dropped since 2006 or not fished in 2011	104
Table 94. Overall success in specific commercial fishery compared to previous five years, Market squid-seine	105
Table 95. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Market squid-seine	106
Table 96. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Market squid-seine	107
Table 97. Economic changes/factors influencing success in specific commercial fishery in previous five years, Market squid-seine	107
Table 98. Nearshore finfish-dead-hook & line: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	113
Table 99. Nearshore finfish-dead-longline: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	116
Table 100. Nearshore finfish-live-hook & line: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	120
Table 101. Nearshore finfish-live-longline: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	123
Table 102. Nearshore finfish-live-trap: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	127
Table 103. Average age and years experience commercial fishing, Nearshore finfish-live	128
Table 104. Percent change in income from overall commercial fishing from 2006–2011, Nearshore finfish-live	128

Table 105. Cause of change in percent income from commercial fishing from 2006–2011, Nearshore finfish–live	129
Table 106. Other sources of income other than commercial fishing in 2011, Nearshore finfish–live	129
Table 107. Percent change in overall commercial fishing operating costs from 2006–2011, Nearshore finfish–live	129
Table 108. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Nearshore finfish–live	130
Table 109. Additional commercial fishery specific data, Nearshore finfish–live	130
Table 110. Nearshore finfish–live, added/dropped since 2006 or not fished in 2011	131
Table 111. Nearshore finfish–live, reason for adding/dropping since 2006 or not fishing a fishery in 2011...	131
Table 112. Overall success in specific commercial fishery compared to previous five years, Nearshore finfish–live	132
Table 113. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Nearshore finfish–live	133
Table 114. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Nearshore finfish–live	134
Table 115. Economic changes/factors influencing success in specific commercial fishery in previous five years, Nearshore finfish–live	134
Table 116. Other changes/factors influencing success in specific commercial fishery in previous five years, Nearshore finfish – live	135
Table 117. Salmon-troll: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	144
Table 118. Average age and years experience commercial fishing, Salmon–troll	145
Table 119. Percent change in income from overall commercial fishing from 2006–2011, Salmon–troll	145
Table 120. Cause of change in percent income from commercial fishing from 2006–2011, Salmon–troll	146
Table 121. Other sources of income other than commercial fishing in 2011, Salmon–troll	146
Table 122. Percent change in overall commercial fishing operating costs from 2006–2011, Salmon–troll	146
Table 123. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Salmon–troll	147
Table 124. Additional commercial fishery specific data, Salmon–troll	147
Table 125. Salmon–troll, added/dropped since 2006 or not fished in 2011	148
Table 126. Salmon–troll, reason for adding/dropping since 2006 or not fishing a fishery in 2011	148
Table 127. Overall success in specific commercial fishery compared to previous five years, Salmon–troll ..	149
Table 128. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Salmon–troll	149
Table 129. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Salmon–troll	150
Table 130. Economic changes/factors influencing success in specific commercial fishery in previous five years, Salmon–troll	151
Table 131. Spot prawn-trap: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011	154
Table 132. Average age and years experience commercial fishing, Spot prawn–trap	155

Table 133. Percent change in income from overall commercial fishing from 2006–2011, Spot prawn–trap..	156
Table 134. Percent change in overall commercial fishing operating costs from 2006–2011, Spot prawn–trap	156
Table 135. Additional commercial fishery specific data, Spot prawn–trap.....	157
Table 136. Spot prawn–trap, added/dropped since 2006 or not fished in 2011	157
Table 137. Overall success in specific commercial fishery compared to previous five years, Spot prawn – trap	158
Table 138. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Spot prawn–trap	158
Table 139. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Spot prawn–trap	159
Table 140. Other changes/factors influencing success in specific commercial fishery in previous five years, Spot prawn–trap	159
Table 141. Percent change in CPFV vessels, trips, and anglers per port and region wide, 2000-2011	167
Table 142. Number of CPFV interviews completed, Central Coast Region	168
Table 143. CPFV survey response statistics, Central Coast Region.....	168
Table 144. Cause of change in percent income from CPFV operations from 2006 - 2011, Central Coast Region	169
Table 145. Average CPFV gross economic revenue (GER) to operating costs, Central Coast Region	169
Table 146. Cause of change in CPFV gross economic revenue (GER) from 2006 to 2011, Central Coast Region	170
Table 147. CPFV trip statistics, Central Coast Region	170
Table 148. CPFV fishery/activity specific data, Central Coast Region	171
Table 149. Overall success of CPFV fishery/activity compared to past five years, Central Coast Region	172
Table 150. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region	173
Table 151. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region	173
Table 152. Economic changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region	174
Table 153. Spatial data sets available for the CPFV sector, post MPA.....	174
Table 154. Percent of individuals indicating direct impact from MPAs for each fishery, CPFV fishermen, Central Coast Region	181
Table 155. Other ways MPAs have impacted specific CPFV fisheries, Central Coast Region	181
Table 156. MPAs impacting specific CPFV fisheries/activities, Central Coast Region.....	183
Table 157. Percent of individuals indicating direct impact from MPAs for each fishery, CPFV fishermen, Santa Cruz	184
Table 158.MPAs impacting specific CPFV fisheries/activities, Santa Cruz	185
Table 159. Percent of individuals indicating direct impact from MPAs for each fishery, CPFV fishermen, Moss Landing/Monterey.....	186
Table 160. MPAs impacting specific CPFV fisheries/activities, Moss Landing/Monterey.....	187

Table 161. Percent of individuals indicating direct impact from MPAs for each fishery, CPFV fishermen, Morro Bay	188
Table 162. MPAs impacting specific CPFV fisheries/activities, Morro Bay.....	189
Table 163. Santa Cruz: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011	196
Table 164. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Santa Cruz.....	202
Table 165. Average age and years experience commercial fishing, Santa Cruz	202
Table 166. Percent change in income from overall commercial fishing, from 2006 – 2011, Santa Cruz	203
Table 167. Cause of change in percent income from commercial fishing from 2006–2011, Santa Cruz.....	203
Table 168. Other sources of income other than commercial fishing in 2011, Santa Cruz.....	204
Table 169. Percent change in overall commercial fishing operating costs from 2006–2011, Santa Cruz.....	204
Table 170. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Santa Cruz.....	205
Table 171. Additional commercial fishery specific data, Santa Cruz	205
Table 172. Commercial fisheries added/dropped since 2006 or not fished in 2011, Santa Cruz.....	206
Table 173. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Santa Cruz	206
Table 174. Overall success in specific commercial fishery compared to previous five years, Santa Cruz	207
Table 175. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz.....	208
Table 176. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz.....	209
Table 177. Economic changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz.....	210
Table 178. Other changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz.....	210
Table 179. CPFV survey response statistics, Santa Cruz	215
Table 180. Cause of change in percent income from CPFV operations from 2006 - 2011, Santa Cruz.....	216
Table 181. Average CPFV gross economic revenue (GER) to operating costs, Santa Cruz.....	216
Table 182. Cause of change in CPFV gross economic revenue (GER) from 2006 to 2011, Santa Cruz	217
Table 183. CPFV trip statistics, Santa Cruz.....	217
Table 184. CPFV fishery/activity specific data, Santa Cruz.....	218
Table 185. Overall success of CPFV fishery/activity compared to past five years, Santa Cruz.....	219
Table 186. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz.....	219
Table 187. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz.....	219
Table 188. Economic changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz.....	220

Table 189. Moss Landing: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011	226
Table 190. Monterey: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011	237
Table 191. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Moss Landing	245
Table 192. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Monterey	245
Table 193. Average age and years experience commercial fishing, Moss Landing/Monterey.....	246
Table 194. Percent change in income from overall commercial fishing from 2006-2011, Moss Landing/Monterey	246
Table 195. Cause of change in percent income from commercial fishing from 2006–2011, Moss Landing/Monterey	247
Table 196. Other sources of income other than commercial fishing in 2011, Moss Landing/Monterey.	247
Table 197. Percent change in overall commercial fishing operating costs from 2006–2011, Moss Landing/Monterey	248
Table 198. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Moss Landing/Monterey	248
Table 199. Additional commercial fishery specific data, Moss Landing/Monterey.....	249
Table 200. Commercial fisheries added/dropped since 2006 or not fished in 2011, Moss Landing/Monterey	250
Table 201. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Monterey/Moss Landing.....	250
Table 202. Overall success in specific commercial fishery compared to previous five years, Moss Landing/Monterey	251
Table 203. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey	252
Table 204. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey	253
Table 205. Economic changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey	254
Table 206. CPFV survey response statistics, Moss Landing/Monterey.....	263
Table 207. Cause of change in percent income from CPFV operations from 2006 - 2011, Moss Landing/Monterey	264
Table 208. Average CPFV gross economic revenue (GER) to operating costs, Moss Landing/Monterey	264
Table 209. Cause of change in CPFV gross economic revenue (GER) from 2006 to 2011, Moss Landing/Monterey	265
Table 210. CPFV trip statistics, Moss Landing/Monterey	265
Table 211. CPFV fishery/activity specific data, Moss Landing/Monterey	266
Table 212. Overall success of CPFV fishery/activity compared to past five years, Moss Landing/Monterey	266
Table 213. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey	267

Table 214. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Monterey/ Moss Landing	268
Table 215. Economic changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey	268
Table 216. Morro Bay: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011	274
Table 217. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Morro Bay.	281
Table 218. Average age and years experience commercial fishing, Morro Bay.....	281
Table 219. Percent change in income from overall commercial fishing from 2006–2011, Morro Bay	282
Table 220. Cause of change in percent income from commercial fishing from 2006–2011, Morro Bay	282
Table 221. Other sources of income other than commercial fishing in 2011, Morro Bay	283
Table 222. Percent change in overall commercial fishing operating costs from 2006–2011, Morro Bay	283
Table 223. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Morro Bay	284
Table 224. Additional commercial fishery specific data, Morro Bay.....	284
Table 225. Commercial fisheries added/dropped since 2006 or not fished in 2011, Morro Bay	285
Table 226. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Morro Bay	285
Table 227. Overall success in specific commercial fishery compared to previous five years, Morro Bay	286
Table 228. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay	286
Table 229. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay	287
Table 230. Economic changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay	288
Table 231. Other changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay	288
Table 232. CPFV survey response statistics, Morro Bay.....	293
Table 233. Cause of change in percent income from CPFV operations from 2006 - 2011, Morro Bay	294
Table 234. Average CPFV gross economic revenue (GER) to operating costs, Morro Bay	294
Table 235. Cause of change in CPFV gross economic revenue (GER) from 2006 to 2011, Morro Bay.....	295
Table 236. CPFV trip statistics, Morro Bay	295
Table 237. CPFV fishery/activity specific data, Morro Bay	296
Table 238. Overall success of CPFV fishery/activity compared to past five years, Morro Bay	297
Table 239. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay	298
Table 240. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay	298
Table 241. Avila/Port San Luis: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011	304

Table 242. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Avila/Port San Luis	310
Table 243. Average age and years experience commercial fishing, Avila/Port San Luis	310
Table 244. Percent change in income from overall commercial fishing from 2006-2011, Avila/Port San Luis	311
Table 245. Cause of change in percent income from commercial fishing from 2006 - 2011, Avila/Port San Luis	312
Table 246. Other sources of income other than commercial fishing in 2011, Avila/Port San Luis	312
Table 247. Percent change in overall commercial fishing operating costs from 2006 - 2011, Avila/Port San Luis	313
Table 248. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Avila/ Port San Luis	313
Table 249. Additional commercial fishery specific data, Avila/Port San Luis.....	314
Table 250. Commercial fisheries added/dropped since 2006 or not fished in 2011, Avila/Port San Luis	314
Table 251. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Avila/Port San Luis.....	315
Table 252. Overall success in specific commercial fishery compared to previous five years, Avila/Port San Luis	315
Table 253. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Avila/Port San Luis	316
Table 254. Economic changes/factors influencing success in specific commercial fishery in previous five years, Avila/Port San Luis	317
Table 255. Other changes/factors influencing success in specific commercial fishery in previous five years, Avila/Port San Luis	317
Table 256. Rocky habitat analysis results	323
Table 257. Count number of fishermen and percent of 2011 ex-vessel commercial fishing landings represented in interviews, spatial change analysis target fisheries, pre and post MPA	329
Table 258. Spatial change analysis results of top 25 percent value concentration, pre and post MPA	342
Table 259. Spatial change analysis results on total fishing area footprint, pre and post MPA	343
Table 260. Spatial change analysis results on distance to port, pre and post MPA	344
Table 261. Recommendations for key monitoring metrics in the commercial fishing sector	346
Table 262. Recommendations for key monitoring metrics in the CPFV sector	347

LIST OF FIGURES

Figure 1. Percent employment by industry in Santa Cruz County, California 2010	6
Figure 2. Percent employment by industry in Monterey County, California 2010	8
Figure 3. Percent employment by industry in San Luis Obispo County, California 2010	10
Figure 4. State of California total commercial landings, ex-vessel revenues, and number of fishermen, 1992–2011	22
Figure 5. Central Coast Region total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011	23

Figure 6. Average commercial landings and ex-vessel revenue per fisherman in the Central Coast Region, 1992–2011	23
Figure 7. Central Coast Region total commercial landings as a percentage of state commercial landings and ex-vessel revenues, 1992–2011	24
Figure 8. Central Coast Region commercial landings, ex-vessel revenues, and number of fishermen, fisheries of interest, 1992–2011	25
Figure 9. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in the Central Coast Region, 1992–2011	26
Figure 10. Central Coast Region commercial landings for fisheries of interest, 1992–2011	28
Figure 11. Central Coast Region commercial ex-vessel revenues for fisheries of interest, 1992–2011	29
Figure 12. Average percent of individual fishing income from commercial fisheries of interest, Central Coast Region, 1992–2011	30
Figure 13. California halibut–hook & line commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	61
Figure 14: California halibut–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	61
Figure 15. California halibut–hook & line commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011	62
Figure 16: California halibut–hook & line commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	63
Figure 17. Coastal pelagic species–seine/net commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	75
Figure 18. Coastal pelagic species–seine/net: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	75
Figure 19. Coastal pelagic species–seine/net commercial fishery average ex-vessel price per metric ton in the Central Coast Region, 1992–2011	76
Figure 20. Coastal pelagic species–seine/net commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	77
Figure 21. Dungeness crab–trap commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	88
Figure 22. Dungeness crab–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	88
Figure 23. Dungeness crab–trap commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011	89
Figure 24. Dungeness crab–trap commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	90
Figure 25. Market squid–seine commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	100
Figure 26. Market squid–seine: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	100
Figure 27. Market squid–seine commercial fishery average ex-vessel price per metric ton in the Central Coast Region, 1992–2011	101
Figure 28. Market squid–seine commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	102

Figure 29. Nearshore finfish–dead–hook & line commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	111
Figure 30. Nearshore finfish–dead–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	111
Figure 31. Nearshore finfish–dead–hook & line commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011	112
Figure 32. Nearshore finfish–dead–hook & line commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	113
Figure 33. Nearshore finfish–dead–longline commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	114
Figure 34. Nearshore finfish–dead–longline: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	115
Figure 35. Nearshore finfish–dead–longline commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011	115
Figure 36. Nearshore finfish–dead–longline commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	117
Figure 37. Nearshore finfish–live–hook & line commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	118
Figure 38. Nearshore finfish–live–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	119
Figure 39. Nearshore finfish–live–hook & line commercial fishery average ex-vessel price per pound in Central Coast Region ports, 1992–2011	119
Figure 40. Nearshore finfish–live–hook & line commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	121
Figure 41. Nearshore finfish–live–longline commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	122
Figure 42. Nearshore finfish–live–longline: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	122
Figure 43. Nearshore finfish–live–longline commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011	123
Figure 44. Nearshore finfish–live–longline commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	124
Figure 45. Nearshore finfish–live–trap commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	125
Figure 46. Nearshore finfish–live–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	125
Figure 47. Nearshore finfish–live–trap commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011	126
Figure 48. Nearshore finfish–live–trap commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	127
Figure 49. Salmon–troll commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	142
Figure 50. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	142

Figure 51. Salmon–troll commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011	143
Figure 52. Salmon–troll commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	144
Figure 53. Spot prawn–trap commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011	152
Figure 54. Spot prawn–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011	153
Figure 55. Spot prawn–trap commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011	153
Figure 56. Spot prawn–trap commercial ex-vessel revenues by Central Coast Region ports, 1992–2011 ...	155
Figure 57. Total number of CPFV vessels and average number of trips per vessel, Central Coast Region, 2000–2011	162
Figure 58. Total number of CPFV trips and average number of anglers per trip, Central Coast Region, 2000–2011	163
Figure 59. Total number of CPFV anglers and average number of anglers per vessel, Central Coast Region, 2000–2011	164
Figure 60. CPFV total number of fish caught for each fishery, Central Coast Region, 2000–2011	165
Figure 61. Total number of CPFV trips for each fishery, Central Coast Region, 2000–2011	166
Figure 62. Count of select multiple species CPFV trips, Central Coast Region, 2000–2011	166
Figure 63. Fisheries of interest commercial landings by Central Coast region ports, 1992–2011	191
Figure 64. Fisheries of interest commercial ex-vessel revenues by Central Coast region ports, 1992–2011	191
Figure 65. Santa Cruz total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011	194
Figure 66. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Santa Cruz, 1992–2011	194
Figure 67. Santa Cruz commercial landings for fisheries of interest, 1992–2011	195
Figure 68. Santa Cruz commercial ex-vessel revenues for fisheries of interest, 1992–2011	195
Figure 69. Average percent of individual fishing income from commercial fisheries of interest, Santa Cruz, 1992–2011	196
Figure 70. Average ex-vessel prices over time, target commercial fisheries, Santa Cruz, 1992–2011	198
Figure 71. California halibut–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Santa Cruz, 1992–2011	199
Figure 72. California halibut–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Santa Cruz, 1992–2011	199
Figure 73. Dungeness crab–trap: Commercial landings, ex-vessel revenues, and number of fishermen, Santa Cruz, 1992–2011	200
Figure 74. Dungeness crab–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Santa Cruz, 1992–2011	200
Figure 75. Salmon–troll: Commercial landings, ex-vessel revenues, and number of fishermen, Santa Cruz, 1992–2011	201
Figure 76. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Santa Cruz, 1992–2011	201

Figure 77. Total number of CPFV vessels and average number of trips per vessel, Santa Cruz, 2000-2011	12
Figure 78. Total number of CPFV trips and average number of anglers per trip, Santa Cruz, 2000-2011	212
Figure 79. Total number of CPFV anglers and average number of anglers per vessel, Santa Cruz, 2000-2011	213
Figure 80. CPFV total number of fish caught for each fishery, Santa Cruz, 2000-2011	214
Figure 81. Total number of CPFV trips for each fishery, Santa Cruz, 2000-2011	214
Figure 82. Count of select multiple species CPFV trips, Santa Cruz, 2000-2011	215
Figure 83. Moss Landing total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011	223
Figure 84. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Moss Landing, 1992–2011	223
Figure 85. Moss Landing commercial landings for fisheries of interest, 1992–2011	224
Figure 86. Moss Landing commercial ex-vessel revenues for fisheries of interest, 1992–2011	225
Figure 87. Average percent of individual fishing income from commercial fisheries of interest, Moss Landing, 1992–2011	225
Figure 88. Average ex-vessel prices over time, target commercial fisheries, Moss Landing, 1992–2011	228
Figure 89. Coastal pelagic species–seine/net: Commercial landings, ex-vessel revenues, and number of fishermen, Moss Landing, 1992–2011	229
Figure 90. Coastal pelagic species–seine/net: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Moss Landing, 1992–2011	229
Figure 91. Dungeness crab–trap: Commercial landings, ex-vessel revenues, and number of fishermen, Moss Landing, 1992–2011	230
Figure 92. Dungeness crab–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Moss Landing, 1992–2011	230
Figure 93. Market squid–seine: Commercial landings, ex-vessel revenues, and number of fishermen, Moss Landing, 1992–2011	231
Figure 94. Market squid–seine: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Moss Landing, 1992–2011	231
Figure 95. Salmon–troll: Commercial landings, ex-vessel revenues, and number of fishermen, Moss Landing, 1992–2011	232
Figure 96. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Moss Landing, 1992–2011	232
Figure 97. Monterey total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011	234
Figure 98. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Monterey, 1992–2011	234
Figure 99. Monterey commercial landings for fisheries of interest, 1992–2011	235
Figure 100. Monterey commercial ex-vessel revenues for fisheries of interest, 1992–2011	235
Figure 101. Average percent of individual fishing income from commercial fisheries of interest, Monterey, 1992–2011	236
Figure 102. Average ex-vessel prices over time, target commercial fisheries, Monterey, 1992–2011	239

Figure 103. Coastal pelagic species–seine/net: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011	239
Figure 104. Coastal pelagic species–seine/net: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011	240
Figure 105. Market squid–seine: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011	240
Figure 106. Market squid–seine: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011	241
Figure 107. Nearshore finfish–live–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011	241
Figure 108. Nearshore finfish–live–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011	242
Figure 109. Salmon–troll: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011	242
Figure 110. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011	243
Figure 111. Spot prawn–trap: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011	243
Figure 112. Spot prawn–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011	244
Figure 113. Total number of CPFV vessels and average number of trips per vessel, Moss Landing, 2000–2011	256
Figure 114. Total number of CPFV trips and average number of anglers per trip, Moss Landing, 2000–2011	256
Figure 115. Total number of CPFV anglers and average number of anglers per vessel, Moss Landing, 2000–2011	257
Figure 116. CPFV total number of fish caught for each fishery, Moss Landing, 2000–2011	258
Figure 117. Total number of CPFV trips for each fishery, Moss Landing, 2000–2011	258
Figure 118. Count of select multiple species CPFV trips, Moss Landing, 2000–2011	259
Figure 119. Total number of CPFV vessels and average number of trips per vessel, Monterey, 2000–2011	260
Figure 120. Total number of CPFV trips and average number of anglers per trip, Monterey, 2000–2011	260
Figure 121. Total number of CPFV anglers and average number of anglers per vessel, Monterey, 2000–2011	261
Figure 122. CPFV total number of fish caught for each fishery, Monterey, 2000–2011	262
Figure 123. Total number of CPFV trips for each fishery, Monterey, 2000–2011	262
Figure 124. Count of select multiple species CPFV trips, Monterey, 2000–2011	263
Figure 125. Morro Bay total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011	270
Figure 126. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Morro Bay, 1992–2011	271
Figure 127. Morro Bay commercial landings for fisheries of interest, 1992–2011	271
Figure 128. Morro Bay commercial ex-vessel revenues for fisheries of interest, 1992–2011	272

Figure 129. Average percent of individual fishing income from commercial fisheries of interest, Morro Bay, 1992–2011	272
Figure 130. Average ex-vessel prices over time, target commercial fisheries, Morro Bay, 1992–2011	276
Figure 131. California halibut–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Morro Bay, 1992–2011	276
Figure 132. California halibut–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Morro Bay, 1992–2011	277
Figure 133. Nearshore finfish–live–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Morro Bay, 1992–2011	277
Figure 134. Nearshore finfish–live–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Morro Bay, 1992–2011	278
Figure 135. Nearshore finfish–live–trap: Commercial landings, ex-vessel revenues, and number of fishermen, Morro Bay, 1992–2011	278
Figure 136. Nearshore finfish–live–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Morro Bay, 1992–2011	279
Figure 137. Salmon–troll: Commercial landings, ex-vessel revenues, and number of fishermen, Morro Bay, 1992–2011	279
Figure 138. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Morro Bay, 1992–2011	280
Figure 139. Total number of CPFV vessels and average number of trips per vessel, Morro Bay, 2000-2011	290
Figure 140. Total number of CPFV trips and average number of anglers per trip, Morro Bay, 2000-2011	290
Figure 141. Total number of CPFV anglers and average number of anglers per vessel, Morro Bay, 2000-2011	291
Figure 142. CPFV total number of fish caught for each fishery, Morro Bay, 2000-2011	292
Figure 143. Total number of CPFV trips for each fishery, Morro Bay, 2000-2011	292
Figure 144. Count of select multiple species CPFV trips, Morro Bay, 2000-2011	293
Figure 145. Avila/Port San Luis total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011	300
Figure 146. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Avila/Port San Luis, 1992–2011	301
Figure 147. Avila/Port San Luis commercial landings for fisheries of interest, 1992–2011	301
Figure 148. Avila/Port San Luis commercial ex-vessel revenues for fisheries of interest, 1992–2011	302
Figure 149. Average percent of individual fishing income from commercial fisheries of interest, Avila/Port San Luis, 1992–2011	302
Figure 150. Average ex-vessel prices over time, target commercial fisheries, Avila/Port San Luis, 1992–2011	306
Figure 151. California halibut–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Avila/Port San Luis, 1992–2011	306
Figure 152. California halibut–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Avila/Port San Luis, 1992–2011	307
Figure 153. Nearshore finfish–live–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Avila/Port San Luis, 1992–2011	307

Figure 154. Nearshore finfish—live—hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Avila/Port San Luis, 1992–2011	308
Figure 155. Salmon—troll: Commercial landings, ex-vessel revenues, and number of fishermen, Avila/Port San Luis, 1992–2011	308
Figure 156. Salmon—troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Avila/Port San Luis, 1992–2011	309
Figure 157. Total number of CPFV vessels and average number of trips per vessel, Avila/Port San Luis, 2000-2011	319
Figure 158. Total number of CPFV trips and average number of anglers per trip, Avila/Port San Luis, 2000-2011	319
Figure 159. Total number of CPFV anglers and average number of anglers per vessel, Avila/Port San Luis, 2000-2011	320
Figure 160. CPFV total number of fish caught for each fishery, Avila/Port San Luis, 2000-2011	321
Figure 161. Total number of CPFV trips for each fishery, Avila/Port San Luis, 2000-2011	321
Figure 162. Count of select multiple species CPFV trips, Avila/Port San Luis, 2000-2011	322
Figure 163. Nearshore finfish—dead (hook & line and longline combined) commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	326
Figure 164. Nearshore finfish—live (hook & line, longline, and trap combined) commercial ex-vessel revenues by Central Coast Region ports, 1992–2011	326
Figure 165. Spatial change analysis results of spatial coincidence, pre and post MPA	331
Figure 166. Spatial change in top 25 percent value concentration area between pre and post MPA	341
Figure 167. Spatial change in total fishing area footprint between pre and post MPA	342

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Conducting research in coastal communities is as challenging as it is rewarding. We have learned a tremendous amount from the commercial and CPFV fishermen who provided guidance and feedback during this study as well as the countless other community members, state agency staff, and observers of this project. We are deeply thankful to the commercial fishermen and CPFV operators/owners who participated in this project and for making time in their busy schedules, overcoming sometimes considerable reservations, and sharing their knowledge and experience with us.



1. INTRODUCTION

The waters off the Central Coast of California have long supported fishing activities that are integral to the cultural and economic history of the area. Fisheries exemplify the interdependencies between the natural environment and coastal communities that have characterized California since well before statehood. In September 22, 2007, as part of the Marine Life Protection Act (MLPA) Initiative, the California Fish and Game Commission (CFGC) designated 29 marine protected areas (MPAs) within the Central Coast state waters of California. The Central Coast Region of California stretches from Pigeon Point in the north to Point Conception in the south (see Map 1 and 2).

As part of the baseline marine protected area monitoring effort to characterize the ecological and socioeconomic conditions and changes within the Central Coast Region since MPA implementation, this report provides three sets of primary findings:

1. A spatial and socioeconomic baseline characterization of select commercial fisheries and the commercial passenger fishing vessel (CPFV) fleet in the California Central Coast Region;
2. An assessment of initial spatial and socioeconomic changes following MPA implementation; and
3. An investigation of the role of MPAs and other major driving factors in observed spatial and economic changes

Establishing a baseline characterization of the commercial fishing and CPFV fleets of the California Central Coast provides a better understanding of the current socioeconomic health of the Central Coast fishing communities and provides a benchmark of socioeconomic conditions and spatial fishing patterns against which future MPA impacts and benefits can be measured. Furthermore, assessing historical trends along with initial changes in socioeconomic conditions and spatial fishing patterns that followed MPA implementation will help inform how MPAs and other driving factors may interplay to influence observed changes.

This project will directly inform the 5-year management review of the Central Coast MPAs in which the California Department of Fish and Game (CDFG) will make management recommendation to the California Fish and Game Commission based on findings from the baseline MPA monitoring projects and other sources of information. This project was developed by the MPA Monitoring Enterprise (Monitoring Enterprise), a program of the California Ocean Science Trust, in partnership the California Department of Fish and Game, and supported by the California Ocean Protection Council (OPC).

The primary goal of this project was to collect up-to-date information on historical trends, current socioeconomic conditions, and the spatial distribution and relative economic value of key commercial fisheries and the commercial passenger fishing vessel ("party-boat") fleet in the Central Coast Region. This work documents the initial socioeconomic changes that may have followed MPA implementation and investigates the degree to which any changes are attributable to the MPAs themselves.

To accomplish this goal, the objectives of this project were to:

1. Collect detailed data on the a) demographic characteristics; b) spatial use patterns; and c) socioeconomic profile for key commercial fisheries and the CPFV fleet of the Central Coast;
2. Utilizing previous baseline data collected by Ecotrust, conduct an assessment of spatial and economic changes in key commercial fisheries since MPA implementation;
3. Utilizing existing data sets and reports, conduct a qualitative assessment of economic change over time within the Central Coast CPFV fleet; and
4. Provide contextual information on the direct and indirect effects of MPA establishment and other driving factors attributing to socioeconomic change (e.g., general economic decline, closure of fisheries, additional spatial fishing regulations, loss of port infrastructure, etc) within the commercial and CPFV fisheries in the Central Coast.

To complete these objectives our research team conducted extensive community outreach in the region and developed and deployed an interactive, web browser-based interview instrument called Open OceanMap that was customized to the Central Coast Region and project objectives. The survey

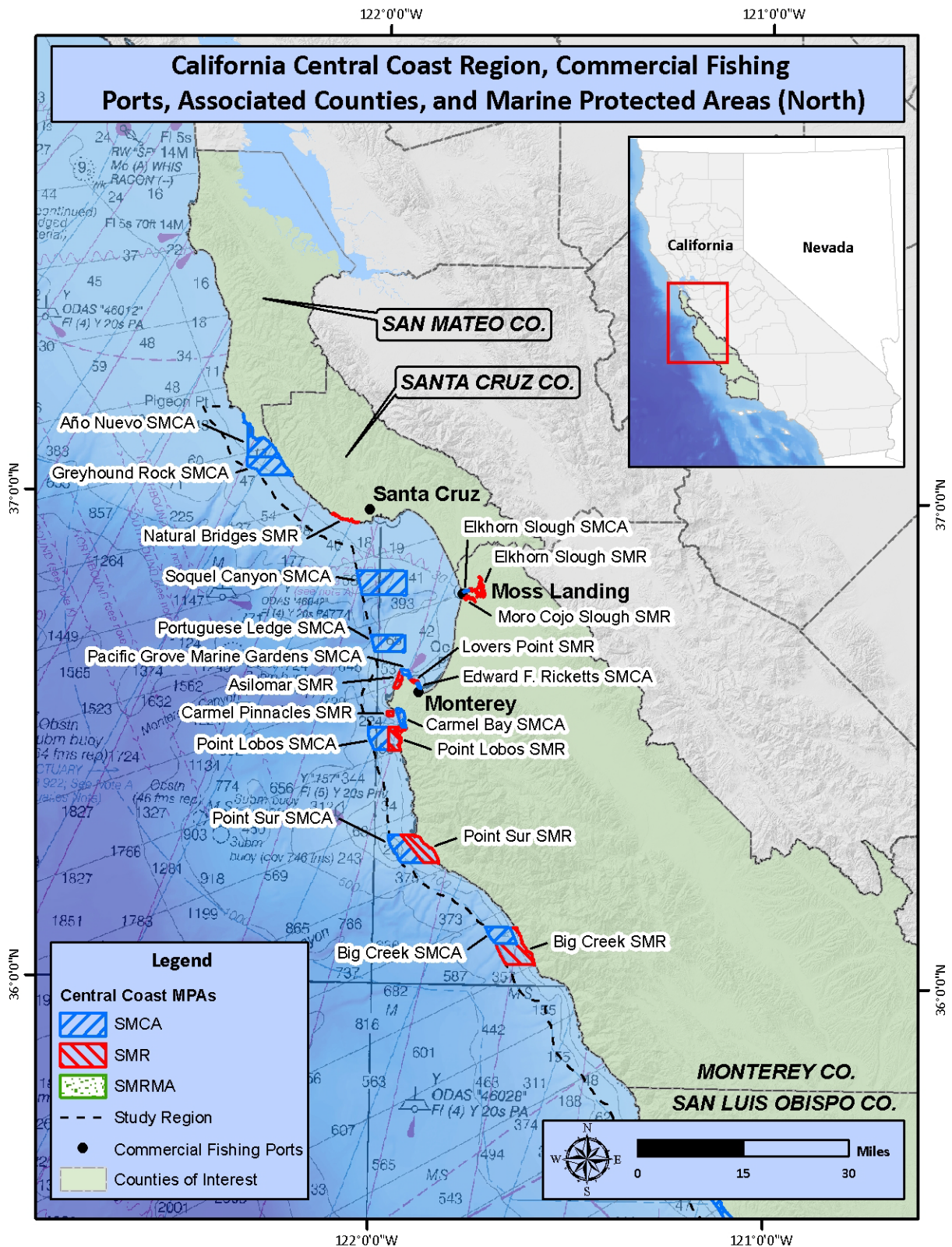
instrument was utilized by field staff on laptop computers to collect geo-referenced information from commercial and CPFV fishermen about the extent and relative importance of California Central Coast marine waters and related socioeconomic data. Data collection occurred during the months of January to April 2012. The data were then compiled into spatial datasets (e.g., raster data layers, kernel density layers, pdf maps) and various excel workbooks and delivered to the MPA Monitoring Enterprise in a format that protects the confidentiality of the participants. This report details the approach and methods we used to collect, analyze, verify, and interpret the various data sets utilized in this project.

The main body of this report consists of two main sections—1) region-wide profiles for the commercial fishing sector as a whole, for each commercial fishery of interest, and for the CPFV fleet (section 4) and 2) profiles for each port divided into sections for commercial fishing and CPFV operations (section 5). To help better facilitate the use of the data presented in this report in accordance with the Monitoring Enterprises' 'Framework to Guide Analyses of Central Coast MPA Baseline Data' each sub-section is further broken out into the MPA monitoring framework components of 'initial changes' and 'baseline characterization'.

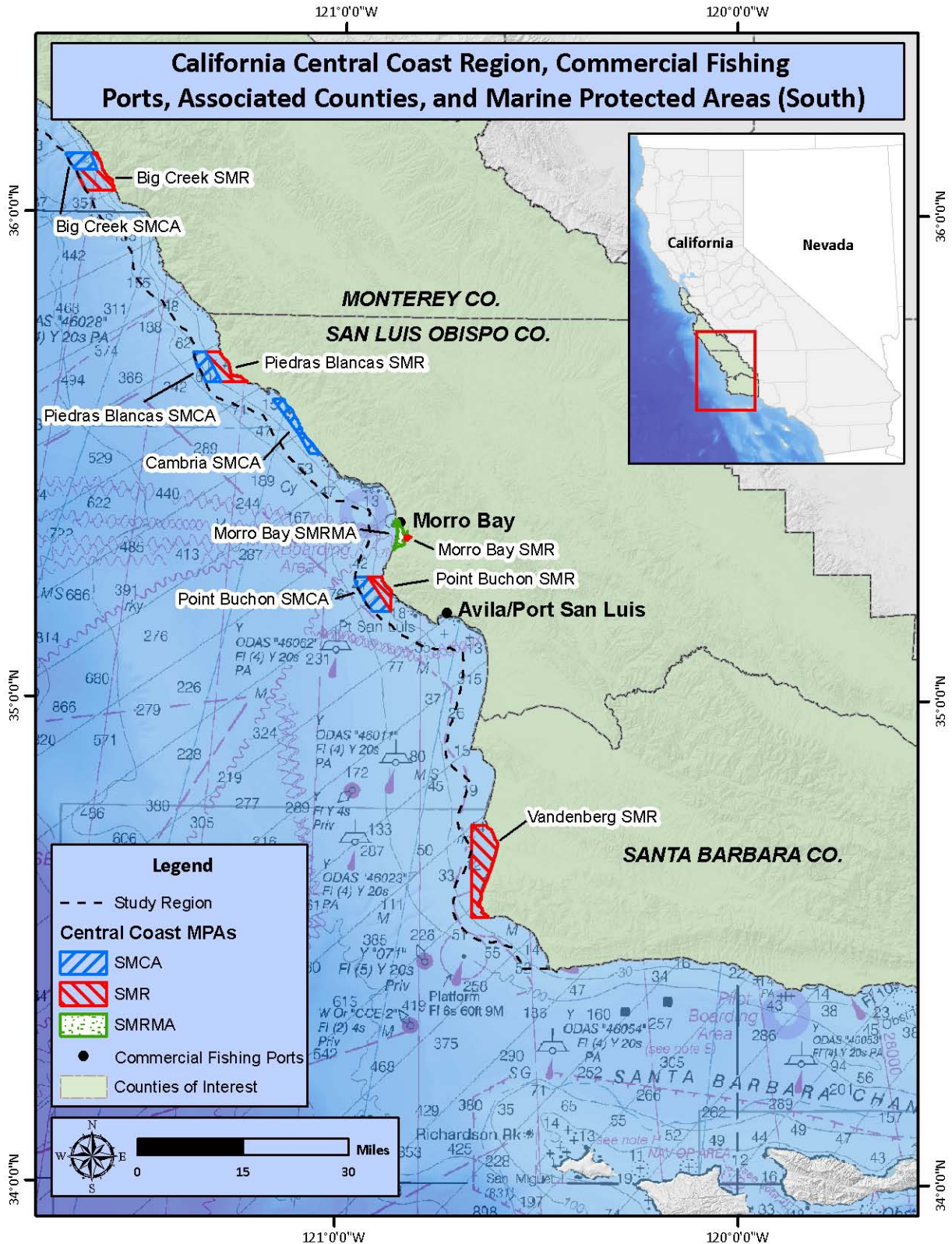
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2. CENTRAL COAST REGION: TARGET FISHERIES AND PORTS AND COUNTIES OF INTEREST

Map 1. Central Coast Region (north)



Map 2. Central Coast Region (south)



2.1. Central Coast Region and Associated Counties Demographic Profile

The Central Coast Region of California stretches from Pigeon Point in the north to Point Conception in the south and includes the counties of San Mateo, Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara. However, the commercial fishing and CPFV ports of the Central Coast Region are located within the counties of Santa Cruz, Monterey, and San Luis Obispo. Below are demographic profiles of each of these three counties using 2010 U.S. Census data to establish a baseline profile of population characteristics such as income, education, and employment levels which provide insight into the socioeconomic conditions these fishing communities work and live within.

2.1.1. Santa Cruz County

Population, age, and race demographics: In 2010, the population of Santa Cruz County was 262,382 people with 50 percent females and 50 percent males. The median age was 37.0 years and 21 percent of the population was under 18 years and 11 percent of the population was 65 years and older. For people reporting one race alone, 82 percent were White; 5 percent were Asian; 1 percent were Black or of African American descent; 1 percent were American Indian and Alaska Native; less than 0.5 percent were Native Hawaiian and Other Pacific Island; and 11 percent were some other race.

Household and housing characteristics: The median household income in Santa Cruz County in 2010 was \$65,253 and 13 percent of households had income below \$15,000 a year and 13 percent had income over \$150,000 or more. In 2010, Santa Cruz County had a total of 104,000 housing units, 52 percent were owner occupied, 36 percent were renter occupied, and 13 percent of which were vacant. Of the total housing units, 74 percent were in single-unit structures, 20 percent were in multi-unit structures, and 6 percent were mobile homes. 17 percent of the housing units were built since 1990.

Education and employment levels: In 2010, 16 percent of people 25 years and over had only a high school diploma, 34 percent had a bachelor's degree or higher and 16 percent of the population had not graduated from high school. In 2010, 55 percent of the population that were 16 and over were employed and 39 percent were not currently in the labor force. 71 percent of the people employed were private wage and salary workers; 17 percent were federal, state, or local government workers; and 12 percent were self-employed in their own (not incorporated) business.

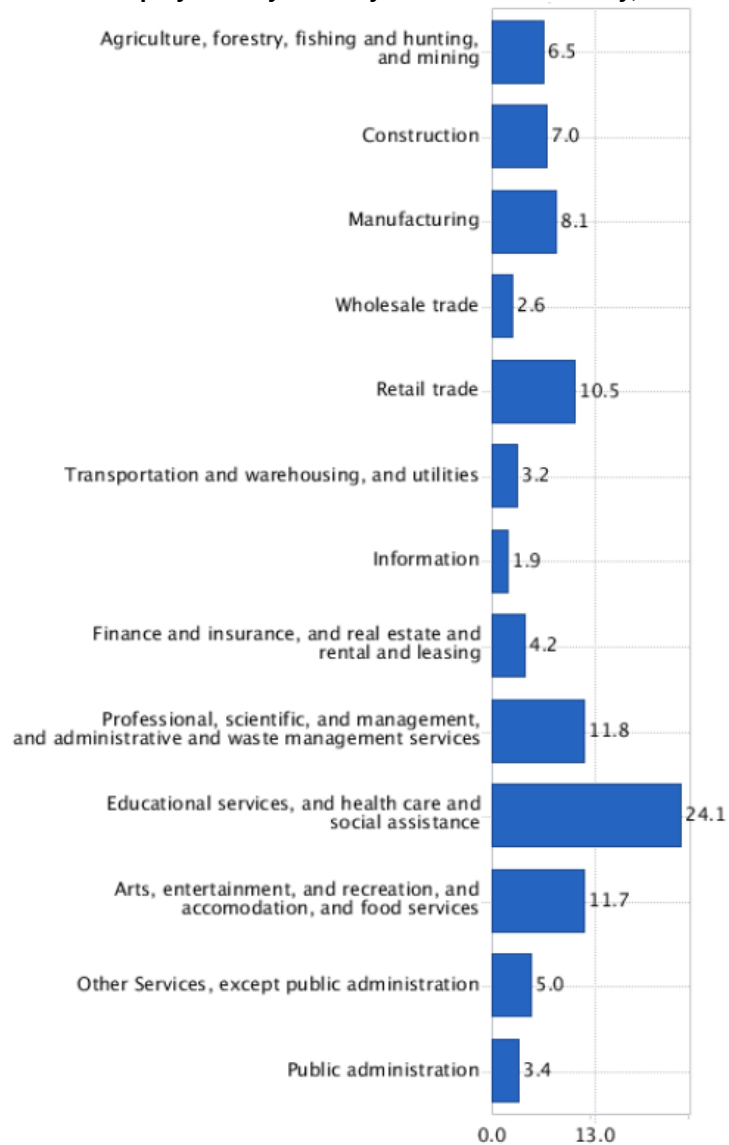
Employment industries: In 2010, the civilian employed population 16 years and older in Santa Cruz County primarily worked in educational services, health care, and social assistance industry (24.1 percent) and 6.5 percent of the population worked in agriculture, forestry, fishing, hunting, and mining. Please see Figure 1 below for the full range industry employment percentages.

Table 1. Select 2010 demographic statistics, Santa Cruz County

Statistic	Santa Cruz County	California
Population	262,382	37,253,956
Population growth (2000-2010)	2.7%	10.0%
Median household income	\$65,253	\$60,883
Per capita income	\$29,060	\$27,353
Unemployment	6.1%	8.2%
Change in unemployment (2000-2010)	32.8%	47.6%
Individuals below poverty level	12.7%	13.7%
Percentage high school graduate or greater	84.1%	80.7%
Percentage aged 18 or younger	21.1%	25.0%
Percentage aged 65 or greater	11.1%	11.4%

Source: U.S. Census Bureau

Figure 1. Percent employment by industry in Santa Cruz County, California 2010



Source: U.S. Census Data 2010

2.1.2. Monterey County

Population, age, and race demographics: In 2010, the population of Monterey County was 415,057 people with 49 percent females and 52 percent males. The median age was 32.8 years and 27 percent of the population was under 18 years and 11 percent of the population was 65 years and older. For people reporting one race alone, 81 percent were White; 6 percent were Asian; 3 percent were Black or of African American descent; 2 percent were American Indian and Alaska Native; 1 percent were Native Hawaiian and Other Pacific Island; and 8 percent were some other race.

Household and housing characteristics: The median household income in Monterey County in 2010 was \$54,534 and 9 percent of households had income below \$15,000 a year and 10 percent had income over \$150,000 or more. In 2010, Monterey County had a total of 139,000 housing units, 46 percent were owner occupied, 45 percent were renter occupied, and 10 percent of which were vacant. Of the total

housing units, 69 percent were in single-unit structures, 27 percent were in multi-unit structures, and 5 percent were mobile homes. 27 percent of the housing units were built since 1990.

Education and employment levels: In 2010, 21 percent of people 25 years and over had only a high school diploma, 23 percent had a bachelor's degree or higher and 29 percent of the population had not graduated from high school. In 2010, 56 percent of the population that were 16 and over were employed and 35 percent were not currently in the labor force. 74 percent of the people employed were private wage and salary workers; 17 percent were federal, state, or local government workers; and 9 percent were self-employed in their own (not incorporated) business.

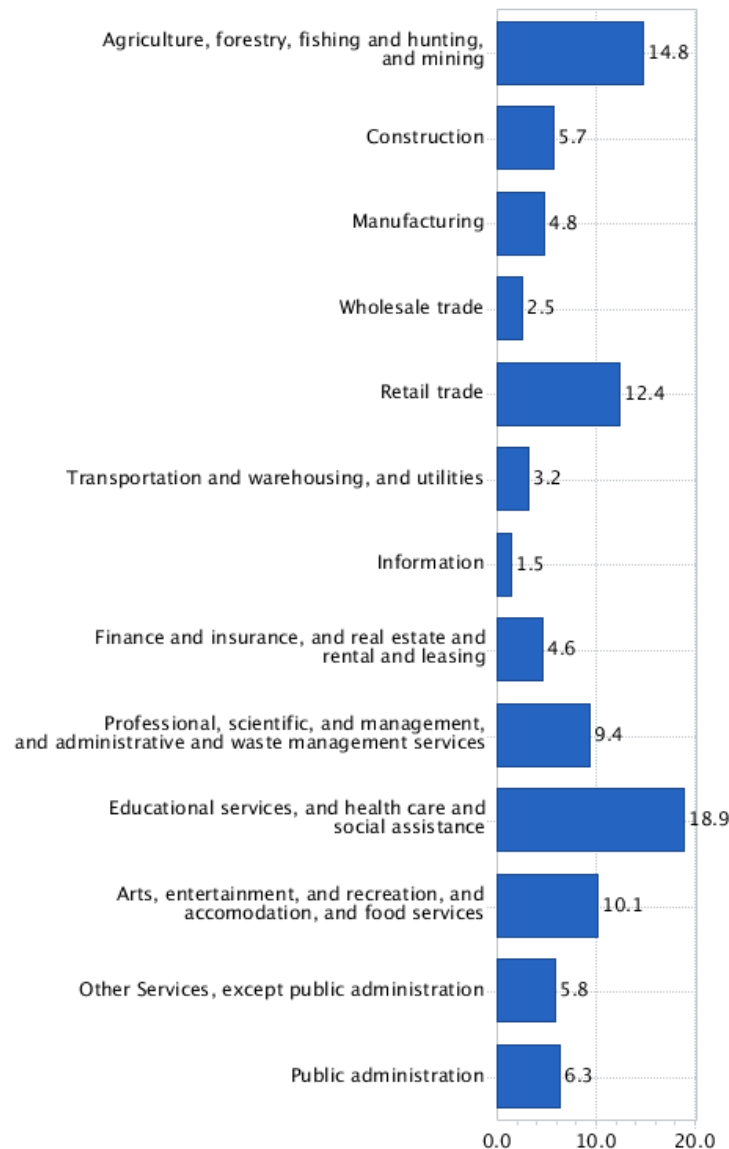
Employment industries: In 2010, the civilian employed population 16 years and older in Monterey County primarily worked in educational services, health care, and social assistance industry (18.9 percent) and 14.8 percent of the population worked in agriculture, forestry, fishing, hunting, and mining—far greater than Santa Cruz and San Luis Obispo counties. Please see Figure 2 below for the full range industry employment percentages.

Table 2. Select 2010 demographic statistics, Monterey County

Statistic	Monterey County	California
Population	415,057	37,253,956
Population growth (2000-2010)	3.3%	10.0%
Median household income	\$59,271	\$60,883
Per capita income	\$24,950	\$27,353
Unemployment	7.1%	8.2%
Change in unemployment (2000-2010)	26.8%	47.6%
Individuals below poverty level	13.9%	13.7%
Percentage high school graduate or greater	70.7%	80.7%
Percentage aged 18 or younger	26.7%	25.0%
Percentage aged 65 or greater	10.7%	11.4%

Source: U.S. Census Bureau

Figure 2. Percent employment by industry in Monterey County, California 2010



Source: U.S. Census Data 2010

2.1.3. San Luis Obispo County

Population, age, and race demographics: In 2010, the population of San Luis Obispo County was 262,382 people with 49 percent females and 51 percent males. The median age was 39.4 years and 19 percent of the population was under 18 years and 15 percent of the population was 65 years and older. For people reporting one race alone, 85 percent were White; 3 percent were Asian; 3 percent were Black or of African American descent; 1 percent were American Indian and Alaska Native; less than 0.5 percent were Native Hawaiian and Other Pacific Island; and 9 percent were some other race.

Household and housing characteristics: The median household income in San Luis Obispo County in 2010 was \$53,978 and 12 percent of households had income below \$15,000 a year and 9 percent had income over \$150,000 or more. In 2010, San Luis Obispo County had a total of 117,000 housing units, 51 percent were owner occupied, 34 percent were renter occupied, and 15 percent of which were vacant. Of

the total housing units, 74 percent were in single-unit structures, 17 percent were in multi-unit structures, and 9 percent were mobile homes. 30 percent of the housing units were built since 1990.

Education and employment levels: In 2010, 22 percent of people 25 years and over had only a high school diploma, 31 percent had a bachelor's degree or higher and 12 percent of the population had not graduated from high school. In 2010, 52 percent of the population that were 16 and over were employed and 41 percent were not currently in the labor force. 71 percent of the people employed were private wage and salary workers; 19 percent were federal, state, or local government workers; and 11 percent were self-employed in their own (not incorporated) business.

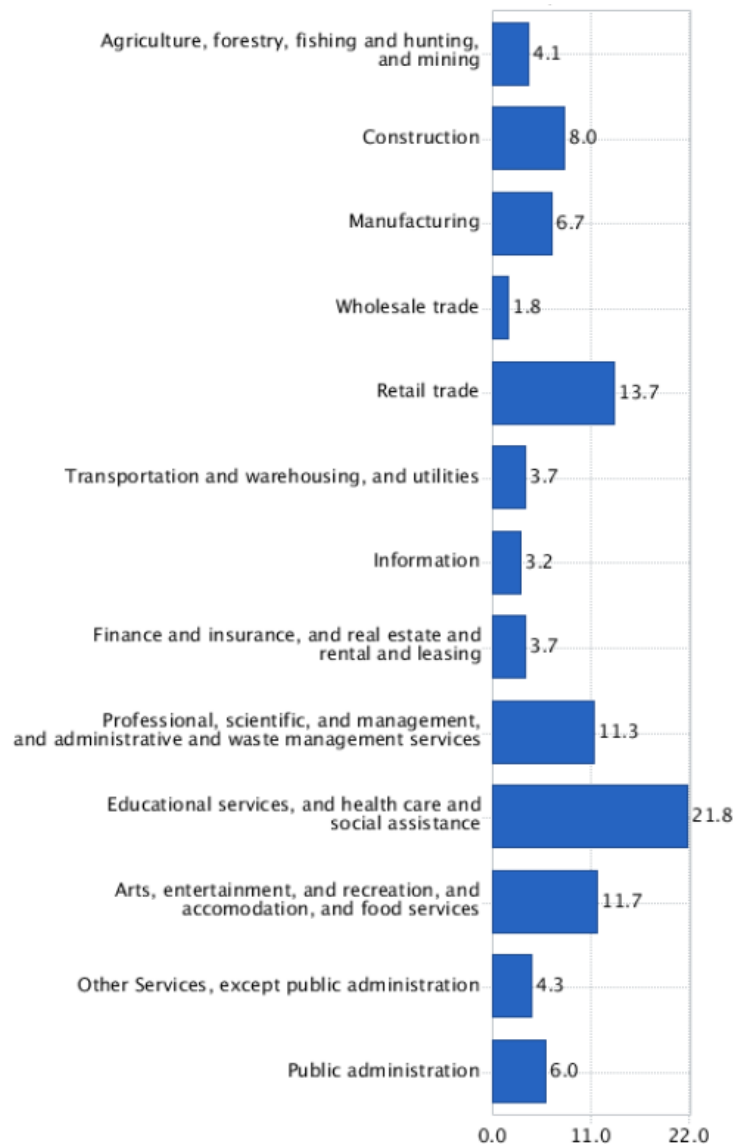
Employment industries: In 2010, the civilian employed population 16 years and older in San Luis Obispo County primarily worked in educational services, health care, and social assistance industry (21.8 percent) and 4.1 percent of the population worked in agriculture, forestry, fishing, hunting, and mining. Please see Figure 3 below for the full range industry employment percentages.

Table 3. Select 2010 demographic statistics, San Luis Obispo County

Statistic	San Luis Obispo County	California
Population	269,637	37,253,956
Population growth (2000-2010)	9.3%	10.0%
Median household income	\$57,365	\$60,883
Per capita income	\$28,231	\$27,353
Unemployment	7.0%	8.2%
Change in unemployment (2000-2010)	51.4%	47.6%
Individuals below poverty level	12.9%	13.7%
Percentage high school graduate or greater	88.2%	80.7%
Percentage aged 18 or younger	18.9%	25.0%
Percentage aged 65 or greater	15.2%	11.4%

Source: U.S. Census Bureau

Figure 3. Percent employment by industry in San Luis Obispo County, California 2010



Source: U.S. Census Data 2010

2.2. Target Fisheries and Fishing Ports of Interest

To focus efforts upon information which may be most useful and cost effective in informing a 5-year management review of the Central Coast MPAs, this project identified key consumptive user groups and associated fisheries in which to target our data collection and analysis efforts. These user groups and key fisheries have been identified as occurring mostly in state waters and are most likely to experience both short-term spatial and economic changes associated with MPA implementation and are of high economic importance to the Central Coast Region.

2.2.1. Target Commercial Fisheries and Commercial Fishing Ports of Interest

The following is the list of key commercial fisheries targeted for this project. We focused on these target fisheries for data collection. This list below was developed in collaboration with the California Department of Fish and Game, the MPA Monitoring Enterprise, and the Central Coast fishing community to define

when applicable the species groupings that compose a fishery. These fisheries below will be referenced as 'target fisheries' throughout this report. These 'target fisheries' should not be confused with 'fisheries of interest' which are fisheries we investigate in CDFG landings data (for more information on 'fisheries of interest' please see section 4). The target fisheries for the data collection component of this project are:

1. California halibut—hook & line
2. Coastal pelagic species—seine/net
3. Dungeness crab—trap
4. Market squid—seine
5. Nearshore finfish—live—hook & line
6. Nearshore finfish—live—longline
7. Nearshore finfish—live—trap
8. Salmon—troll
9. Spot prawn—trap

The nearshore finfish fishery is a state fishery grouping managed through the California Nearshore Fishery Management Plan which consists of the following 19 species: Rockfish, gopher (*Sebastes carnatus*); Rockfish, black (*S. melanops*); Rockfish, black-and-yellow (*S. chrysomelas*); Rockfish, blue (*S. mystinus*); Rockfish, kelp (*S. atrovirens*); Rockfish, copper (*S. caurinus*); Rockfish, grass (*S. rastrelliger*); Rockfish, brown (*S. auriculatus*); Rockfish, quillback (*S. maliger*); Rockfish, china (*S. nebulosus*); Rockfish, calico (*S. dallii*); Treefish (*S. serriceps*); Rockfish, olive (*S. serranoides*); Cabezon (*Scorpaenichthys marmoratus*); California sheephead (*Semicossyphus pulcher*); California scorpionfish (*Scorpaena guttata*); Kelp greenling (*Hexagrammos decagrammus*); Rock greenling (*Hexagrammos lagocephalus*); and Monkeyface prickleback (*Cebidichthys violaceus*). It should be noted that even though California sheephead, California scorpionfish, and Monkeyface prickleback species are included in the nearshore finfish grouping they are largely found outside of the Central Coast Region.

The coastal pelagic species-seine/net fishery consists of Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), and northern anchovy (*Engraulis mordax*).

Lastly, the salmon-troll fishery was initially not a target fishery. However, during interviews data were collected for this fishery (along with other data on fisheries within the full commercial fishing portfolio of fishermen) but fishermen were not asked to map this fishery. As this fishery is an important fishery in California state waters we have included the salmon—troll fishery as a target fishery and present the data collected for this fishery in this report, however, no spatial data are presented.

Based on California Department of Fish and Game landings data the commercial fishing ports of interest for this project are defined as:

1. Santa Cruz
2. Moss Landing
3. Monterey
4. Morro Bay
5. Avila/Port San Luis

Smaller commercial fishing ports such as Willow Creek, Mill Creek, and Big Creek were grouped with the port of Monterey and the smaller ports of San Simeon and Oceano were grouped with the port of Morro Bay.

2.2.2. Primary CPFV Fisheries and Ports of Interest

For the CPFV sector, data were collected for the entire portfolio of activities conducted by CPFV operations. Across all CPFV operators/owner interviewed the following are the primary fisheries and non-consumptive activities conducted in the Central Coast Region:

1. Albacore tuna – fishery
2. California halibut – fishery
3. Dungeness crab – fishery
4. Humboldt squid – fishery
5. Rockfish/Lingcod – fishery
6. Salmon – fishery
7. Sanddab – fishery
8. White sea bass – fishery
9. Whale watching – activity

The CPFV ports of interest for this project are defined as:

1. Santa Cruz
2. Moss Landing
3. Monterey
4. Morro Bay
5. Avila/Port San Luis

Due to confidentiality constraints much of the primary data collected for Moss Landing could not be published on its own. However, similarities in fishing grounds and fisheries pursued across the commercial and CPFV sector led us to combine the ports of Moss Landing and Monterey when presenting non-spatial and spatial data collected. Landings data and CPFV logbook data provided by CDFG are still presented separately for each port.

3. SURVEY AND ANALYSIS METHODS

3.1. CDFG Landings Data Analysis Methods

Under a non-disclosure agreement with the California Department of Fish and Game (CDFG), the commercial fisheries landings data presented throughout this report was developed in collaboration with CDFG staff using ex-vessel landings receipt data contained in the CDFG's Commercial Fisheries Information System (CFIS) database. As the CFIS database is continually updated it is important to document the date the CFIS database was queried so that the status of the data sets used are known. For 1992–2009 landings data the CFIS database was queried on March 9th, 2011 and for 2010–2011 landings data the CFIS database was queried on April 18th, 2012. The data were sent to Ecotrust by CDFG staff. Under the same non-disclosure agreement with the CDFG, Ecotrust worked with CDFG staff to analyze CPFV logbook data from 2000–2011 which was transmitted to Ecotrust in a summarized form in May 2012. CPFV logbook data is submitted by each CPFV vessel operator each year which documents the number of passenger, the number of fish caught, and other characteristics of each fishing trip they operate.

All dollar values presented in this report are corrected for inflation, and are reported in 2010 dollars using the Implicit Price Deflators for Gross Domestic Product from the U.S. Bureau of Economic Analysis. It is important to note that ex-vessel revenues are merely suggestive of differences in economic value, as they do not account for differences in operating costs, and thus profitability, across fisheries. Likewise, they are only first order approximations of the value of fisheries to local economies; a comprehensive assessment of fishery operating costs, multiplier effects, and the full value of fishing activities to local economies are important to assess but are beyond the scope of this study.

Finally, we present only a subset of the landings data available—following CDFG protocol we suppressed all landings data with fewer than 3 commercial fisherman or CPFV operators. We strived to summarize the landings data in the most compelling and visual formats. We have consistently color-coded fisheries throughout the report and presented data in consistently formatted and scaled graphs in order to facilitate quick reference of specific fisheries and comparison across fisheries or ports. We avoid repetition

whenever possible and recognize there are many more ways to query and analyze the data, however, throughout this report we aimed to present the most relevant and informative analyses possible.

3.2. Survey Data Collection and Analysis Methods

While the use of GIS technology and analysis in marine and fisheries management has expanded steadily over the past decade (Kruse et al. 2001; Breman 2002; Valavanis 2002; Fisher and Rahel 2004; Meaden 2009), its use for socioeconomic research is still somewhat limited. Nevertheless, a growing body of literature has examined GIS-enabled approaches to community-based MPA design and assessment (Aswani and Lauer 2006; Hall and Close 2006; St. Martin et al. 2007; Ban et al. 2009; Gleason et al. 2010) and there are several good examples to build on for improving the spatial specificity of the West Coast knowledge base and data landscape.

Some of the most pertinent applications of GIS technology to socioeconomic questions in marine fisheries concern the spatial extent and intensity of fishing effort (Caddy and Carocci 1999; Green and King 2003; Parnell et. al 2010; Lee et. al 2010) and the use of participatory methods similar to the ones employed here (Wedell et al. 2005; St. Martin 2004; 2005; 2006; Scholz et al. 2011a). We built on these approaches and adapted them for the California Central Coast context, following best practices for the use of participatory GIS in natural resource management (Quan et al. 2001), as described in the remainder of this section.

Our project approach builds on methods developed in previous projects on the West Coast of the United States (Steinback et al. 2010; Scholz et al. 2004; 2005; 2006a; 2006b; 2008; 2010; 2011a; 2011b), which demonstrated novel approaches for collecting, compiling, and analyzing spatial fishing patterns and associated socioeconomic information at various geographic resolutions to aid the design and assessment of various marine spatial planning efforts (e.g., marine protected areas and wave energy siting). The successes and lessons learned in these projects were directly applied to the methods and tools deployed in this project. As Ecotrust continues to conduct socioeconomic MPA monitoring work in other regions in California we aim to help close existing coastal and marine use information gaps and provide a tested, consistent, and cost-effective method for long-term monitoring across California.

Specifically, Ecotrust's approach involved several steps that are designed to engage the fishing community throughout the project from project/survey design to the development of final products. These steps are generally categorized below:

1. Fishing community outreach/engagement;
2. Survey questions and survey tool design;
3. Data collection;
4. Data analysis;
5. Review and validation of data analysis results; and
6. Final reporting.

Ecotrust conducted a series of outreach meetings throughout the data collection period with key fishing community members and fishing organizations/associations prior to beginning interviews in the region and in each port. The objectives of these meetings were to provide a project overview, answer questions, develop relationships, gain insights into the current fishery issues/challenges, raise general awareness, and solicit potential interview participants. Under the guidance of these key community members, Ecotrust developed several pieces of outreach materials including a letter to the fishing community from Ecotrust's Director of Marine Planning describing the projects intentions, a description of the types of data that were proposed to be collected/compiled for the final report, and a general description of the overall project and its goals and objectives. These materials were disseminated to the fishing community by mail and email through several members of the fishing community who served as community liaisons—communicating the project to other fishermen and providing Ecotrust with additional contacts. During these initial meetings Ecotrust also gathered feedback on its proposed project and survey design, such as on what types of information the fishing community felt were important to capture, and when possible the feedback received was incorporated into the data collection tool and data analysis plan.

3.2.1. Sampling Method

To determine a sample method for the commercial fishing sector, Ecotrust examined CDFG commercial fishing landings and ex-vessel revenue data for the year 2010 (2011 landings data was not yet available at the time) for target fisheries and organized the landings data to identify commercial fishermen¹ to interview in each target fishery in each port in the region. Based on the number of fishermen in the landings data and the knowledge that fishermen may be reticent to participate in interviews, Ecotrust set out to contact every commercial fisherman in the landings database to participate in an interview. For the purpose of this project, Ecotrust defines a commercial fisherman as an individual who has commercial fishery landings data (pounds and ex-vessel revenue) associated with his/her commercial license number (L number). To investigate how our sample was spread across the various ex-vessel revenue ranges for each fishery we stratified each fishery into four revenue strata. Please see Table 4 for the number of commercial fishermen interviewed in each target fishery compared to the number of fishermen in the landing database separated by the four revenue stratification levels. We indicated the approximate revenue range when possible for each stratification to demonstrate the multitude of relatively small dollar values that are landed by individuals in each fishery. This may be due to several reasons which could include amongst others: fish caught as bycatch in a different fishery but were still landed/sold; fishermen who were trying out a new fishery or new gear type for a fishery and thus landed a relatively small amount; families of fishermen who fish together and land their catch on various L numbers of family members—sometimes just once or twice for an individual; fishermen from outside the region who landed only once or a few times in the region; or fishermen who must land some amount of catch to maintain a permit but do not actively fish the permit as a major income source. As 2010 landings data was only available at the time to guide our interview efforts, some fishermen in the California halibut (3 individuals) and Dungeness crab (2 individuals) fisheries participated in interviews but did not have landings in the Central Coast Region in 2011. However, for the survey questions that did not relate directly to the 2011 calendar year their responses were included in the survey data summarized in this report. We chose to include these fishermen to capture information from individuals who may still rely upon the fishery, but perhaps not participate in the fishery every year.

¹ The term 'fishermen' is used to denote people who fish. In the California fishing community this is the preferred term regardless of gender.

Table 4. Number of fishermen interviewed as a percent of each quartile revenue strata for each fishery, Central Coast Region

Fishery	Revenue strata (quartiles)	Number of individuals interviewed with 2011 landings	Number of individuals in 2011 landings	Percent of individual in landings strata interviewed	Approximate 2011 revenue strata range (2010\$)
California halibut - hook & line	Total	7	101	7%	\$130,577
	1	1	4	25%	\$6,500 - \$12,000
	2	1	7	14%	\$4,000 - \$6,500
	3	2	13	15%	\$1,500 - \$3,500
	4	3	77	4%	\$0 - \$1,500
Coastal pelagics species - seine/net	Total	4	31	13%	\$2,241,160
	1	1	2	50%	*
	2	1	3	33%	\$180,000 - \$240,000
	3	2	3	67%	\$100,000 - \$180,000
	4	0	22	0%	\$0 - \$100,000
Dungeness crab - trap	Total	5	32	16%	\$1,260,304
	1	1	2	50%	*
	2	2	3	67%	\$100,000 - \$120,000
	3	1	4	25%	\$60,000 - \$100,000
	4	1	23	4%	\$0 - \$55,000
Market squid - seine	Total	4	40	10%	\$7,478,294
	1	1	3	33%	\$600,000 - \$650,000
	2	1	4	25%	\$400,000 - \$550,000
	3	0	6	0%	\$250,000 - \$400,000
	4	2	27	7%	\$0 - \$200,000
Nearshore finfish - live - hook & line	Total	9	62	15%	\$1,077,290
	1	0	5	0%	\$50,000 - \$70,000
	2	1	6	17%	\$40,000 - \$50,000
	3	2	8	25%	\$30,000 - \$40,000
	4	6	43	14%	\$0 - \$25,000
Nearshore finfish - live - trap	Total	4	12	33%	\$101,018
	1	0	1	0%	*
	2	1	1	100%	*
	3	0	1	0%	*
	4	3	9	33%	\$0 - \$8,000
Salmon - troll	Total	9	173	5%	\$558,358
	1	1	13	8%	\$9,000 - \$13,000
	2	3	19	16%	\$5,500 - \$9,000
	3	3	33	9%	\$3,000 - \$5,500
	4	2	108	2%	\$0 - \$3,000
Spot prawn - trap	Total	3	7	43%	\$1,940,848
	1	1	1	100%	*
	2	1	1	100%	*
	3	1	1	100%	*
	4	0	4	0%	\$2,500 - \$15,000

Source: California Department of Fish and Game, Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

For the CPFV fleet, a comprehensive list of CPFV owner/captains was not available to Ecotrust and thus Ecotrust staff identified CPFV operators by networking in each port. Because of the need to advertise their services, CPFV operations are often highly visible in a harbor and widely known. Using this method, Ecotrust field staff compiled a list of CPFV operations in each port, and later confirmed and added to this list as it was reviewed with each CPFV operator interviewed. Ecotrust interviewed both CPFV operation owners and CPFV captains of each vessel in a port as often owners were more knowledgeable of revenue and operating cost information and also to gain a broader perspective. Please see Table 5 for the number of CPFV captains interviewed compared the number of CPFV vessels who submitted logbooks to CDFG in 2011. Given our methodology of vetting lists of CPFV operators within a port community, it is likely that the discrepancy between the number of vessels interviewed and the number of vessels which submitted logbook data in 2011 are from smaller operations such as part-time six-pack operators.

3.2.2. Interview Protocol

The data collection methods in this project were designed to complement existing data previously acquired from commercial fishing operations in the Central Coast Region (see Scholz et al. 2006b) before the MPA network was established. Interviews in this project were conducted in person using a one-on-one interview format. All interview data were entered directly into a spatially enabled, Open Source GIS survey tool developed by Ecotrust called Open OceanMap². Field staff used Open OceanMap to collect non-spatial survey data (e.g., demographics, basic operating information, descriptive fishing characteristics, impacts from MPAs and other factors, and associated qualitative questions) and to map areas representing a participant's fishing grounds. Open OceanMap's mapping component utilizes NOAA nautical charts which can be zoomed in and out to reveal more detailed nautical charts and moved directionally (similar to Google Maps) to allow fishermen to draw fishing areas in their natural sizes (polygons) rather than confining responses to a statistical grid or to political boundaries.

All interviews followed a shared protocol:

1. Interviews begin with an explanation of the project goals/objectives, the types of data collected, how data will be analyzed, and any other project information the fisherman would like to discuss.
2. The fisherman is presented a consent form agreement which allows Ecotrust to utilize interview data, however, the agreement legally binds Ecotrust to present data only in the aggregate form and to never release individual data or the identities of those interviewed.
3. Non-spatial survey data is collected on questions pertaining to individual fisherman characteristics and overall commercial fishing or CPFV operations.
4. Non-spatial survey data is collected on each fishery within a commercial fisherman's full fishing portfolio and for each fishery/activity within a CPFV operator's portfolio.
5. Fishing grounds are mapped following these steps. These steps are repeated to map each fishery separately:
 - a. Maximum extent: Using the electronic nautical charts embedded in Open OceanMap, fishermen were asked to identify the maximum extent north, south, east, and west they would target a fishery for the catch that was landed within the ports in the Central Coast Region.
 - b. Map fishing grounds: Within this maximum extent, fishermen were then asked to delineate the area(s) they fish for a particular species/fishery in the calendar year of 2011. For the Dungeness crab fishery, individual were asked to map for the 2010-2011 season. Under the guidance of the fisherman, field staff drew these fishing areas in the Open OceanMap survey tool and recorded associated boundary information for each area such as depth limits and geographic landmarks.
 - c. Scaling: Fishermen are then asked to rank these fishing areas using a weighted percentage — in which they split and distribute 100 points or '100 pennies' over the various fishing areas based on their relative importance.

Throughout the project we established strict protocols to protect the access to and confidentiality of the information provided by fishermen. Interviews were conducted under individual non-disclosure consent

² For more information on Open OceanMap please see <http://www.ecotrust.org/marineplanning/>

forms and all data were collected on password protected laptop computers. Furthermore, data collection and analysis protocols were utilized which masks all names and identifying characteristics of an individual's fishing grounds. In line with this effort, data for ports or fisheries with fewer than three respondents have been withheld from publication to protect the confidentiality of the survey respondents.

3.2.3. Data Review and Verification

There are several data review and verifications steps throughout this project. Firstly, standard quality assurance and quality control (QAQC) steps were conducted:

1. Editing of spatial data by Ecotrust staff based on notes from interviews and when required to standardize the data (e.g. clipping a shape to the shoreline or specific depth);
2. Review by each participant of his/her individual maps and information; and
3. Review by fishing community, though group and individual meetings, to verify aggregated results.

The collection of spatial data has an inherent higher margin of error and thus several QAQC steps were implemented in our project to ensure the spatial data collected were of the highest quality possible. First, notes were taken on the boundaries of each fishing area drawn during an interview with a fisherman. Once spatial data are collected and transmitted to Ecotrust staff for analysis, each spatial dataset is checked against spatial data notes to ensure fishing areas are drawn to the indicated depth limits and spatial extent. Furthermore, if any spatial outliers are identified within a given fishery, individual fishermen are contacted to verify their spatial dataset is accurate. Second, each individual fisherman is mailed maps of his/her fishing grounds for each fishery they provided spatial information on to review/verify its accuracy. These individual maps are printed on security paper that cannot be photocopied and are mailed with a return addressed and stamped envelope and contact information so fisherman may easily communicate any changes to their spatial data. Third, once all spatial fishing data are aggregated, these maps are reviewed by the fishing community with Ecotrust staff.

These review meetings with the fishing community are complimentary to the individual interviews and take a synergistic approach that is important in several ways. Review meetings are an opportunity to review and verify map products as well as share other data analysis results such as having the fishing community assist in interpreting landings data analysis results, review drafts of the project report, discuss project next steps, build trust within the fishing community, and continue established relationships.

For review meetings, each individual who participated in the project were contacted to participate in the community review. During these review meetings, map products were reviewed for errors. It should be emphasized that spatial data sets are not augmented based on the where an individual who reviews the map(s) thinks areas of importance should be. Instead, the purpose of reviewing the map products are to ensure there are no large errors in the data sets made during the collecting, editing, and compiling of the data. Example of errors include fishing areas that extend beyond regulatory depth limits or geographic areas in which the fishery occurs (e.g., nearshore finfish grounds extending into rockfish conservation area boundaries) or areas in which no-fishing is allowed (e.g., 1 nautical mile no fishing zone around Diablo Canyon nuclear power plant). Based on our experience, having the community review these map products helps ground-truth the data sets, produce data sets that are of higher quality, and help establish transparency and trust between researchers and the fishing community.

To the extent possible, Ecotrust validated data collected during this project with independent data sets provided by CDFG. Data validation with independent data sets is an important step in providing rigorous research methods as data collected in any survey are liable to the inconsistencies of memory, subjective judgment, and possible deliberate falsification. However, much of the data Ecotrust collected in this project are novel and thus similar data sets to our knowledge do not exist or are not readily accessible to compare survey results. To verify the spatial fishing data sets, commercial and CPFV logbook data could have been used, however this data is confidential at the individual level and would take considerable resources to compile and analyze at the aggregate level. Furthermore, the spatial scale in which data are collected with logbooks are at a much larger scale than Ecotrust's data, making it difficult to compare data sets.

To verify non-spatial data collected, again, there are limited data sets readily available on the characteristics of commercial fishermen and CPFV operators. However, for CPFV operators we were able to use summarized CPFV logbook data provided by CDFG to compare with data collected in our survey (see Table 6) and the number of vessels reporting trips departing from a particular port (see Table 5). As noted in the sampling method section, we networked through port communities to identify and interview CPFV operators. Using this method we sampled often larger more visible operations in each port. Upon reviewing the tables below with CPFV operators in the region, the remaining vessels we did not interview may have been smaller six-pack operations that operate on a part-time basis and/or operate out of multiple ports. Furthermore, some of the CPFV operators we interviewed do operate out of more than one port; however, we categorized these operators based on their indicated homeport.

The potential that we did not sample some smaller CPFV operators is supported by the comparison of data on average number of trips per vessel reported by interview respondents compared to CDFG CPFV logbook data (Table 6). Most likely, the vessel captains we interviewed operate more trips per year than the vessel captains we did not interview. Lastly, interview respondents on average reported 10.5 number of anglers per trip while CDFG CPFV logbook data reported on average 19.0 anglers per trip in the Central Coast Region. Upon reviewing this data comparison with CPFV operators, several indicated that the number of passenger they report in logbooks include the captain and crew members but could not offer any further reasons to explain the discrepancy.

Table 5. Number of CPFV captains interviewed compared to the number of vessel in CDFG logbook data, Central Coast Region

Port	Number of CPFV captains interviewed	Number of vessels in CDFG logbook data (2011)
Santa Cruz	4	7
Monterey	4	6
Moss Landing	1	4
Morro Bay	3	6
Avila/Port San Luis	—	5
Central Coast Region	12	28

Source: Current study and CDFG CPFV logbook data

— indicates that the port/fishery was not sampled or a zero value data point

Table 6. Comparison between study results and CDFG logbook data on average number of anglers per trip and number of trips per vessel, Central Coast Region

	Average	
	Ecotrust study	CDFG CPFV
Number of anglers/passengers per trip	10.5	19.0
Number of trips per vessel	97.3	68.0

Source: Current study and CDFG CPFV logbook data

For the commercial fishing sector, the landings database provided by CDFG did not contain data on individual fishermen that were comparable to our survey results and we were unable to identify any other data sources to utilize for validation. In light of the difficulties in obtaining and analyzing existing data sets to compare our results, Ecotrust thoroughly reviewed all data sets with the fishing community to ensure all data products submitted were verified and accepted by the fishing community and are of the best quality possible.

3.2.4. Spatial Data Analysis Methods

In this section we further detail how spatial data were analyzed in this project. Ecotrust's methodology to analyze spatial fishing data collected was developed and refined through collaboration with fishing communities across California during the MLPA process (Scholz et al. 2011a). The analysis of the fishing grounds information is broadly comprised of two components: determination of the fishing grounds and determination of relative (economic) importance. Below we present a detailed methodology for how spatial data were weighted, analyzed, and aggregated for both the commercial and CPFV sector's spatial fishing data.

As stated above all fishermen were asked to map fishing grounds for each fishery separately for the calendar year 2011, except for the commercial Dungeness crab fishery in which fishermen were asked to map for the 2010-2011 season. For the commercial fishing sector, the fishing grounds of individual respondents were weighted by CDFG reported 2011 ex-vessel revenue. For the Dungeness crab fishery, spatial data were weighted using CDFG landings and ex-vessel revenue data from the 2010-2011 season.

For CPFV operators, spatial fishing data were weighted based on self-report gross economic revenue for 2011 from each specific fishery/activity. To calculate gross economic revenue from each fishery/activity, CPFV operators/owners were first asked to approximate his/her gross economic revenue from CPFV operation in 2011 and were then asked what percent of his/her gross revenue was from each vessel (if the owner operated multiple vessels) and then from each specific fishery/activity.

Spatial Analysis Detailed Methodology

During the interview process, each fisherman was presented a navigable nautical chart (e.g., interviewer could zoom in/out and move the map around) contained within the mapping portion of the Open OceanMap survey tool. Fishermen were then asked to direct field staff to draw polygons or areas that could be of any shape or size. Each fisherman (m) identified his or her particular fishing grounds (G_m) for a particular fishery as one or more set of polygon/areas (S_i), comprising his or her total fishing grounds for a particular fishery:

$$G_m = \sum_{i=1}^n S_i \quad (1)$$

To determine the relative economic importance of fishing grounds for each fishery, we used the relative weightings elicited in the interviews. This was done by having each fisherman allocate some portion of points, (P_i), to each polygon/fishing area, (S_i), of his or her fishing grounds, (G_m), such that the sum of points allocated across his or her overall fishing ground for a particular fishery equaled 100:

$$\sum_{i=1}^S P_i = 100 \quad (2)$$

To determine relative economic importance by port, we converted each fisherman's fishing ground data layer for a particular fishery into a grid of 100 x 100 meter cells. We then calculated the weight of each cell, (W_{mj}), in a fisherman's fishing ground by multiplying his or her CDFG ex-vessel landing revenue (for commercial fisheries) or self-reported gross economic revenue (for CPFV operators) for that fishery-port combination (in each port-specific analysis), or fishery-region combination, (in the Central Coast Region analysis), multiplied by the number of points the fisherman allocated to the polygon (P), where (R_{mp}) is the ex-vessel or gross revenue associated with each fisherman for a given fishery.

$$W_{mj} = P_i * R_{mp}, \quad (3)$$

Additionally, to obtain a more accurate spatial representation of revenue we derived the total value of each cell for each fisherman, (V_{mj}), by multiplying the cell weight, (W_{mj}) by 1 minus the total area of the fishing grounds of each fisherman, relative to the area of the entire fishery in the region (G_j):

$$V_{mj} = W_{mj} * (1 - G_m / G_f). \quad (4)$$

Thus, fisherman specific grounds that represented a significant proportion of the fishery specific grounds do not obfuscate the value of the grounds of other fishermen. Equation 4 was not implemented to correct for any reporting bias, however, the equation represents a scalable correction, where, as any given fisherman specific grounds (G_m) grew relative to the fishery specific grounds (G_f), a larger discount was attributed to the value of associated polygons.

Lastly, to derive the relative value for any given location for each fishery-port combination, we added all values for each cell location (V_j) for all fishermen and divided by the sum of all values for all cells for all fishermen.

$$V_{pj} = \sum_{m=1}^m V_j / \sum_{m=1}^m \sum_{j=1}^J V_j \quad (5)$$

The resulting value surface illustrates the extent and relative importance of the fishing grounds for a given fishery.

3.2.5. Non-spatial Data Analysis Methodology

All non-spatial survey data were exported from Open OceanMap to an MS Access database and then imported into MS Excel files which were then summarized into tabular format primarily using pivot table queries. As emphasized above all data for ports or fisheries with fewer than three respondents have been withheld from publication to protect the confidentiality of the survey respondents. An asterisk, '*', can be found in the data tables in which data has been suppressed. A dash, '-', in the data tables indicates data was not collected for a given port-fishery combination. Often if data were not collected in a given port-fishery combination the fishery does not occur or is not a significant fishery in a port (e.g., some fisheries have small dollar amounts landed). For more information, please see our tables on the number of fishermen interviewed and landing revenue for each target fishery in the region-wide profiles and port profiles.

The design of survey questions within this project were largely modeled from survey questions developed through the survey work Ecotrust conducted during the MLPA planning process (2005-20011) and in the North Central Coast socioeconomic MPA monitoring project Ecotrust began in 2010. The survey was further refined through review with key informants within the Central Coast fishing community to tailor the questions and select target fisheries specific to the Central Coast Region. The survey questions were designed so that fishermen could easily provide answers/estimates from readily available knowledge commonly known by fishermen. For the instances in which fishermen were unable to provide answers using on-hand information, Ecotrust field staff later followed up with the individual to collect the information.

In the report, there are several survey summary tables which report out on characteristics of fishing activities/income from the year 2006. As limited non-spatial survey data was collected during the 2005 study by Ecotrust, we included these questions in our survey to provide some estimates as to possible socioeconomic change. Furthermore, asking questions about activities in 2006 as well as 2011 together allowed us to gather important qualitative information on the major factors driving any reported/perceived changes between the two years. We chose the year 2006 to serve as a pre-MPA year in which to gauge subsequent change as it was the last full year before the Central Coast MPA network was implemented.

4. CENTRAL COAST REGIONAL PROFILES

4.1. Central Coast Region Commercial Fishing Initial Changes

This section provides an analysis of CDFG commercial landings data from 1992-2011 to provide historical trends and initial changes in commercial fisheries on interest since MPA implementation. The following types of information listed below are generally the analyses presented in the initial change sections found at the region and port level throughout the report. It should be noted that some information may be not found at the general region level as these are later report at the region-fishery level to avoid redundancy.

1. Landings (pounds) and ex-vessel revenue levels and counts of commercial fishermen;
2. Average landings (pounds) and ex-vessel revenue levels per fisherman;
3. Percent contribution of fisheries of interest to total ex-vessel revenue in the region and in a port;
4. Percent contribution of each port to total ex-vessel revenue of each fishery of interest;
5. Relative percent contribution of specific fisheries of interest to commercial fishing income; and
6. Percent change in ex-vessel revenue levels during pre and post MPA periods in comparison to state or region changes

Figure 4 displays statewide commercial landings in California from 1992–2011. Landings fluctuated over the study period; they were lowest in 2003 at 275.3 million pounds and highest in 2000 at nearly 554 million pounds. At the end of 2011, landings were at 407.4 million pounds. The ex-vessel revenues over the study period increased from \$151.5 million in 1992 to a high of \$210.6 million in 1996, and were at approximately \$200 million at the end of 2011. It is interesting to note that the highest and lowest years of ex-vessel revenues do not correspond with the highest and lowest years for volume or pounds landed, this is likely due to changing composition of landings and ex-vessel price paid in particular fisheries each year. Overall, landings and ex-vessel revenues for the state of California increased by 36.0 and 32.1 percent respectively from 1992 to 2011. The number of fishermen consistently declined over the study period, 67.1 percent total, from 5,920 in 1992 to 1,948 in 2011.

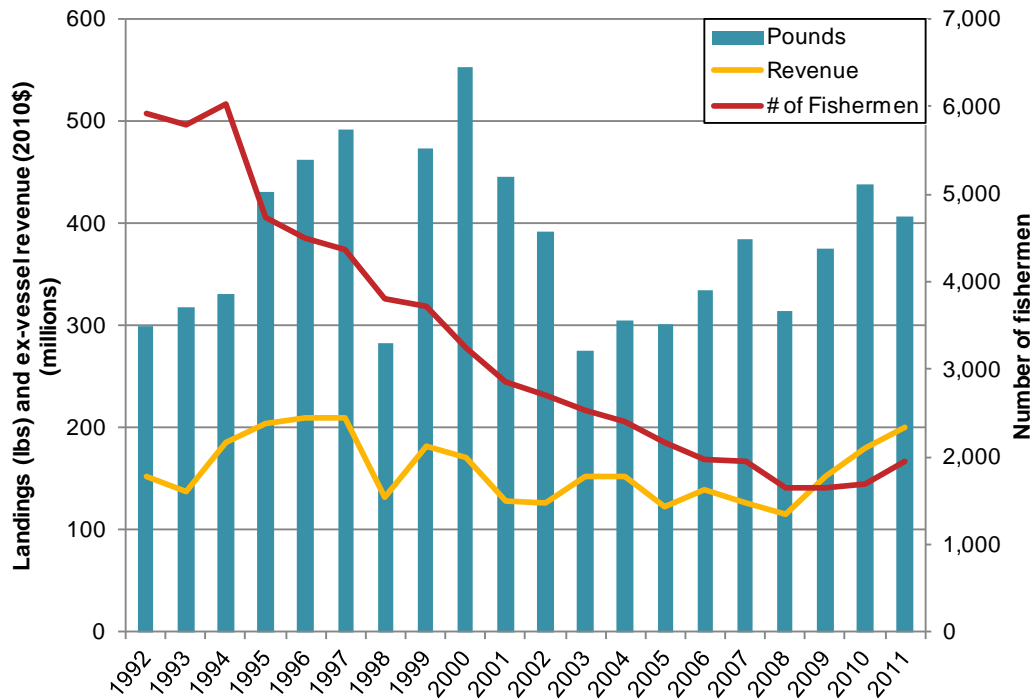
Figure 5 displays commercial landings made in the Central Coast Region from 1992–2011. Overall trends in the region were similar to those found for the state of California, yet varied. Landings in 1992 were 41.8 million pounds, peaking in 2002 at 101 million pounds, and at the end of 2011 were at 62.8 million pounds. Ex-vessel revenues over the study period increased from \$15.9 million in 1992 to a high of \$27.6 million in 2010. Overall, the ratio of ex-vessel revenues to pounds landed in the Central Coast Region was slightly lower to that of the state of California during the same study period. However, landings and ex-vessel revenues for the Central Coast Region increased more from 1992 to 2011 than observed for the state of California--50.2 percent increase for landings and 47.9 percent increase for ex-vessel revenues. However, during this same period, the number of fishermen declined 69.4 percent.

As illustrated in Figure 5 the number of fishermen making landings in the Central Coast Region declined dramatically during the study period, close to 70 percent overall. However, the average landings and ex-vessel revenues per vessel steadily increased over time (see Figure 6). The average rise in landings and ex-vessel revenues per fisherman suggests an increase in the scale of fishing operations overall, shifts to higher value fisheries, or an increase in ex-vessel price in select fisheries in the Central Coast Region. These and other possible explanations for observed changed are explored at the region-fishery and port-fishery level throughout this report. It should be highlighted that presenting a Central Coast Region average does not reveal trends at the individual fishery or port level which may be experiencing average per vessel decreases in landings and ex-vessel revenues.

As displayed in Figure 7, the significance of the Central Coast Region relative to California state fisheries as a whole has varied over time. In 1992, 14.0 percent of all California landings and ex-vessel revenues were made in ports within the Central Coast Region. The percentage of Central Coast Region ex-vessel revenues to state ex-vessel revenues peaked in 2002 at nearly 17.0 percent; the percentage of Central Coast Region landings to state landings peaked in 2008 at 28.1 percent, in that same year the percentage of Central Coast Region to California state ex-vessel revenues was lower at 9.4 percent. By

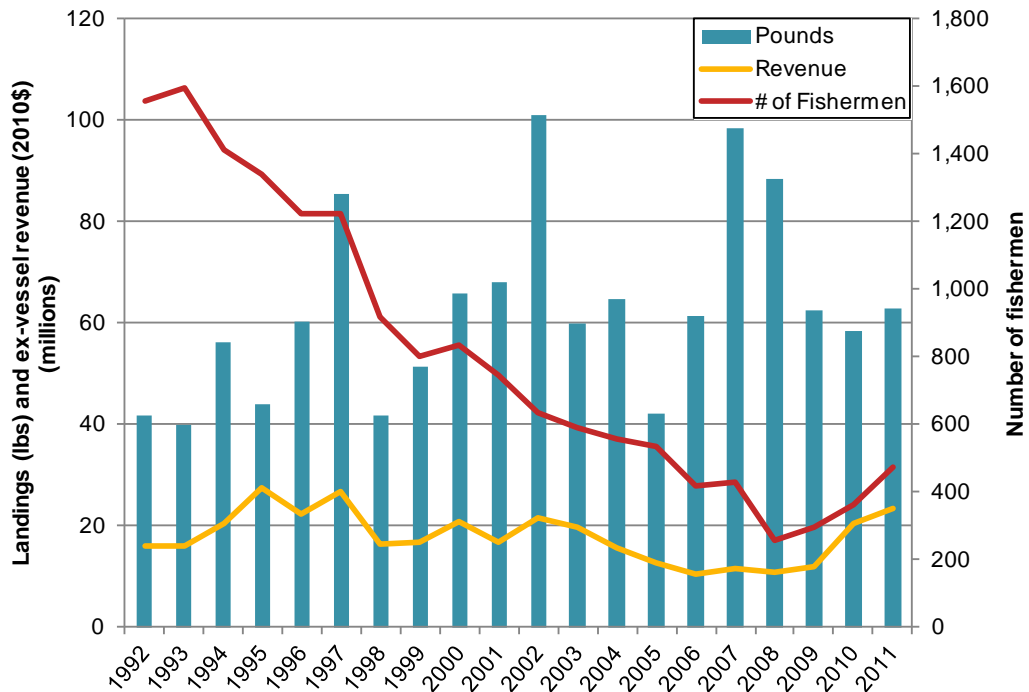
the end of 2011, the percentage of landings and ex-vessel revenues from the Central Coast Region to the state was at 15.4 percent and 11.7 percent respectively. Fishermen in the Central Coast Region represented nearly 24 percent of fishermen in the state of California on average over the study period, declining overall from 1992 to 2008, and increasing again from 2009 to 2011.

Figure 4. State of California total commercial landings, ex-vessel revenues, and number of fishermen, 1992–2011



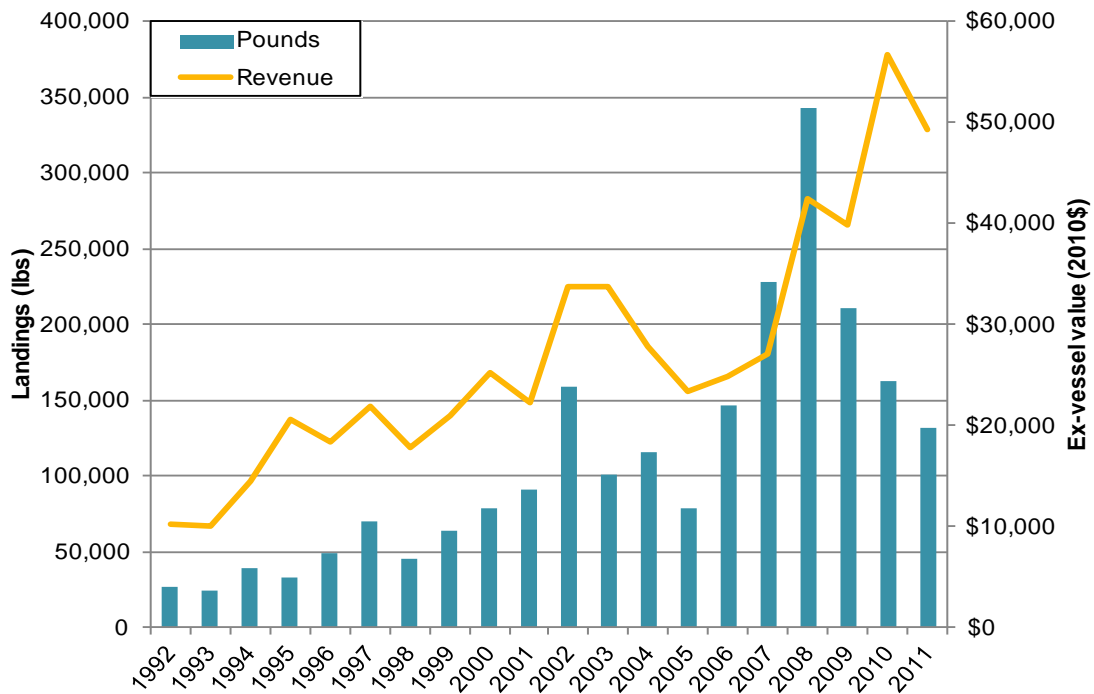
Source: Landings data from CDFG

Figure 5. Central Coast Region total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011



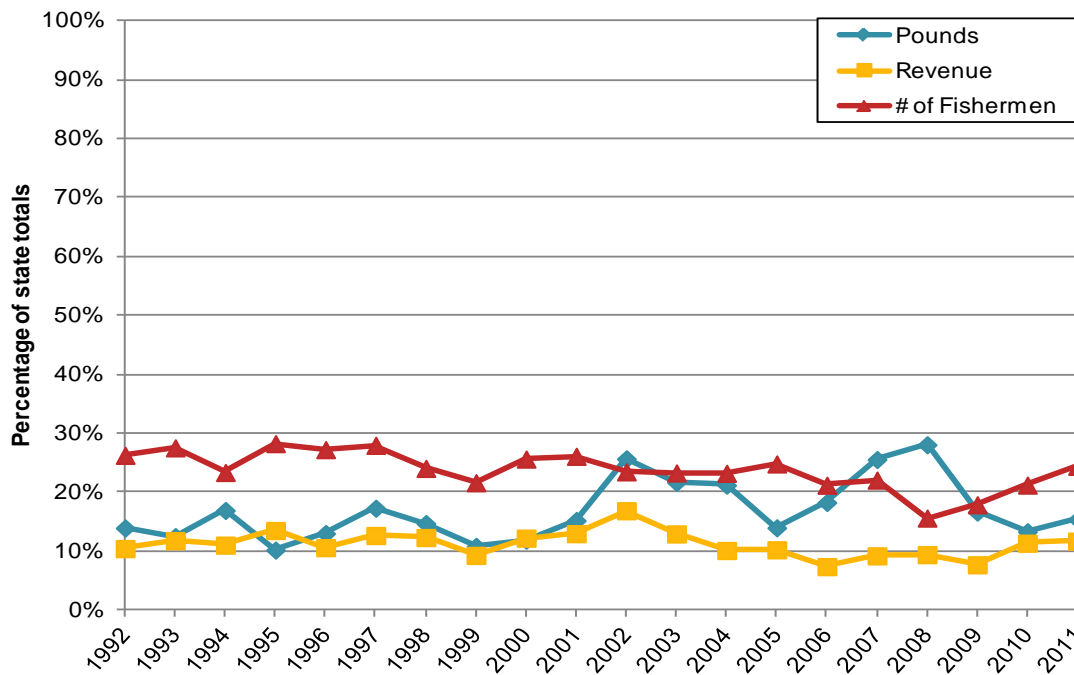
Source: Landings data from CDFG

Figure 6. Average commercial landings and ex-vessel revenue per fisherman in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Figure 7. Central Coast Region total commercial landings as a percentage of state commercial landings and ex-vessel revenues, 1992–2011



Source: Landings data from CDFG

The initial changes sections of this report examine the commercial landings data for eleven fisheries of interest in the Central Coast Region. This grouping of eleven fisheries which we refer to as ‘fisheries of interest’ should not be confused with the eight fisheries we refer to as ‘target fisheries’ that were targeted for data collection. In examining historical landings data we expanded the number of fisheries to analyze beyond our target fisheries are the nearshore finfish-dead fishery was a significant fishery in the region and helps illustrate the shift to the nearshore finfish-live fishery. Additionally, we included the salmon-troll fishery as many fishermen in the Central Coast Region rely on this fishery for a significant portion of their income. As stated earlier in the methods section these fisheries were selected for further analysis as they occur mostly in state waters and are most likely to experience both short-term spatial and economic changes associated with MPA implementation and are of high economic importance to the Central Coast Region. The eleven fisheries of interest are presented in Table 7.

Table 7. Commercial fisheries of interest

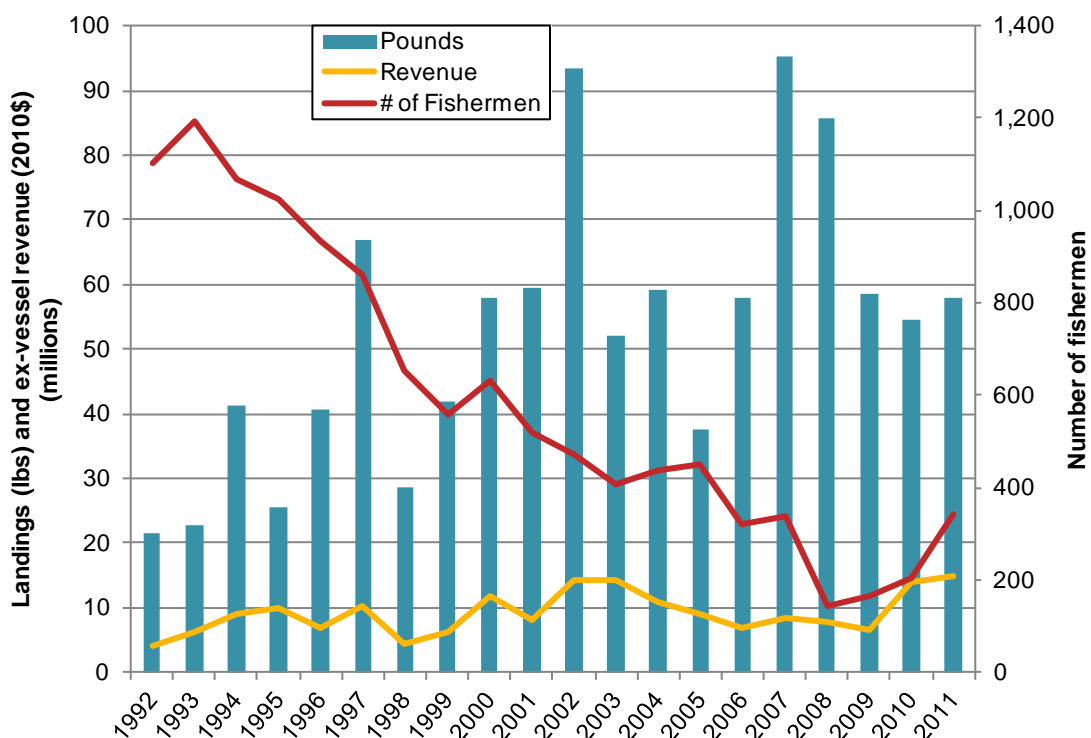
California halibut–hook & line
Coastal pelagic species–seine/net
Dungeness crab–trap
Market squid–seine
Nearshore finfish–dead–hook & line
Nearshore finfish–dead–longline
Nearshore finfish–live–hook & line
Nearshore finfish–live–longline
Nearshore finfish–live–trap
Salmon–troll
Spot prawn–trap

Source: Landings data from CDFG

It is important to note that unless marked 'all fisheries', most figures in this report are examining the commercial landings and ex-vessel revenue trends specific to these eleven fisheries of interest. Of course, these eleven fisheries of interest are not the only fisheries that occur in the Central Coast Region, and additional landings and ex-vessel revenues from other fisheries are mentioned in the narrative for each Central Coast Region port.

Total landings in the Central Coast Region for all fisheries averaged 62.7 million pounds annually and \$18 million in ex-vessel revenues from 1992–2011. Total landings in the Central Coast Region for the eleven selected fisheries of interest averaged 53 million pounds annually and \$9.2 million in ex-vessel revenues from 1992–2011, see Figure 8.

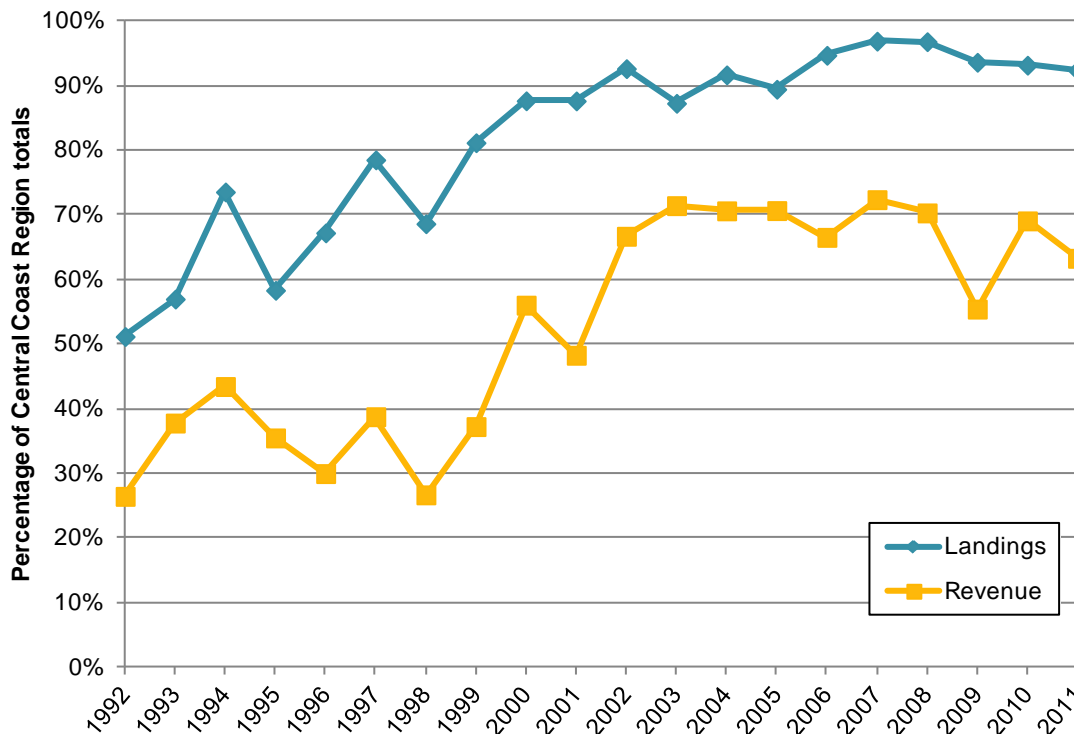
Figure 8. Central Coast Region commercial landings, ex-vessel revenues, and number of fishermen, fisheries of interest, 1992–2011



Source: Landings data from CDFG

Figure 9 displays the percentage of total landings and ex-vessel revenues the eleven fisheries of interest represented of total landings and ex-vessel revenues from all fisheries in the Central Coast Region over the study period. In 1992, fishery of interest landings and ex-vessel revenues comprised only 51.2 percent and 26.5 percent of total landings and ex-vessel revenues respectively. By 2011, these percentages increased to 92.4 percent and 63.3 percent overall as the fisheries became more significant in the Central Coast Region overall.

Figure 9. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Additional fisheries in the Central Coast Region contributing to landings and ex-vessel revenues across the study period include groundfish–bottom trawl (8.6 percent), sablefish–longline (0.9 percent), and Albacore tuna–troll (0.8 percent) among others. The groundfish bottom-trawl fishery contributed significantly to ex-vessel revenues in the Central Coast Region over the study period, particularly early on when that fishery's percentage of total ex-vessel revenues averaged 21.6 percent, or \$4.3 million, annually from 1992-1999. The Albacore tuna–troll fishery peaked in the Central Coast Region in 1997 with ex-vessel revenues of \$2.8 million, while averaging \$549,021 annually over 1992–2001. The spot prawn–bottom trawl fishery contributed to ex-vessel revenues early in the study period. In 1998 alone the spot prawn–bottom trawl fishery constituted 13.4 percent of total ex-vessel revenues at \$2.2 million. In 2003 ex-vessel revenues fell to zero for the remainder of the study period due to a ban on the use of bottom trawl gear type in the spot prawn fishery. Sablefish–longline on the other hand, increasingly contributed to ex-vessel revenues in the Central Coast Region over the study period. This fishery averaged 3.4 percent of total ex-vessel revenues (\$655,784) annually before 2007, increasing to 12.6 percent (\$2.1 million) annually from 2008–2011. Although we did not query the CDFG database for swordfish and rock crab, these fisheries also contributed significantly at times to total landings and ex-vessel revenues in the Central Coast Region over the study period.

Table 8 displays the average annual landings and ex-vessel revenues of the eleven fisheries of interest over the study period. The percentage of each fishery's ex-vessel revenues to total ex-vessel revenues in the Central Coast Region are displayed over various time segments of the study period to enable comparisons both pre and post MPA implementation. The coastal pelagic species–seine/net fishery averaged 11.8 percent of total ex-vessel revenues over 2000–2011, increasing from 9.6 and 19.8 percent pre MPA (2000–2003 and 2004–2007 respectively) to 23.8 percent post MPA (2008–2011). The significance of some fisheries, such as the coastal pelagic species–seine/net, nearshore finfish–live–hook & line, and spot prawn–trap fisheries for example, is observable as is the decline of others, such as the nearshore finfish–live–longline and the salmon–troll fisheries for example. These trends are likely due to a

combination of several factors including changes in regulations, status of fish stocks, market forces, and oceanographic conditions.

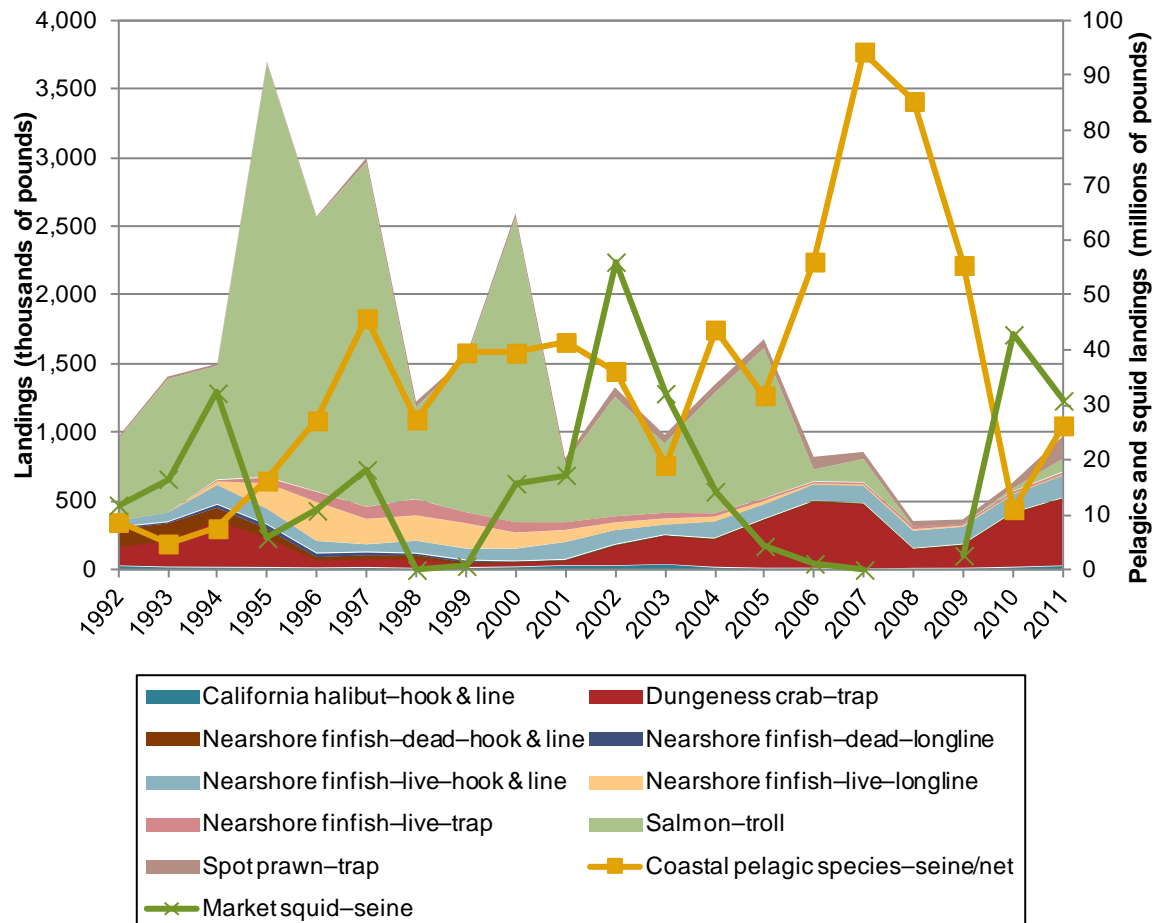
Figure 10 and Figure 11 illustrate these shifts in the composition of total landings and ex-vessel revenues in the Central Coast Region graphically. We would like to highlight that for ex-vessel revenue and landings composition figures shown throughout this report at the port level not all eleven fisheries of interest are displayed each time. In many cases certain fisheries would not be visible in the figures due to relatively low values and thus to keep the figures and figure legends clean and readable we display the fisheries which on average compose approximately 95 percent of the landings and ex-vessel revenues in a particular port or in the case of Figure 10 and Figure 11 in the Central Coast region.

Table 8. Average percent contribution of fishery ex-vessel revenue to Central Coast Region total ex-vessel revenues, commercial fishing

Fishery	Annual averages 1992– 2011		Average percent of revenue to total revenues			
	Landings	Ex-vessel revenues	Pre MPA (2000- 2003)	Pre MPA (2004- 2007)	Post MPA (2008- 2011)	2000- 2011
California halibut–hook & line	17,127	\$62,492	0.5%	0.3%	0.4%	0.4%
Coastal pelagic species–seine/net	35,844,355	\$1,694,536	9.6%	19.8%	23.8%	11.8%
Dungeness crab–trap	209,626	\$576,282	1.6%	8.5%	4.5%	3.7%
Market squid–seine	15,657,520	\$2,913,192	28.0%	9.0%	23.0%	14.8%
Nearshore finfish–dead–hook & line	32,106	\$47,361	0.1%	0.1%	0.1%	0.3%
Nearshore finfish–dead–longline	7,868	\$10,147	0.0%	0.0%	0.0%	0.0%
Nearshore finfish–live–hook & line	102,666	\$616,205	3.0%	7.1%	6.1%	4.0%
Nearshore finfish–live–longline	74,723	\$388,677	2.4%	1.2%	0.4%	2.0%
Nearshore finfish–live–trap	38,698	\$216,153	1.8%	0.9%	0.8%	1.2%
Salmon–troll	901,034	\$2,114,986	10.7%	16.0%	0.7%	11.3%
Spot prawn–trap	45,778	\$533,599	3.1%	7.2%	4.7%	3.4%

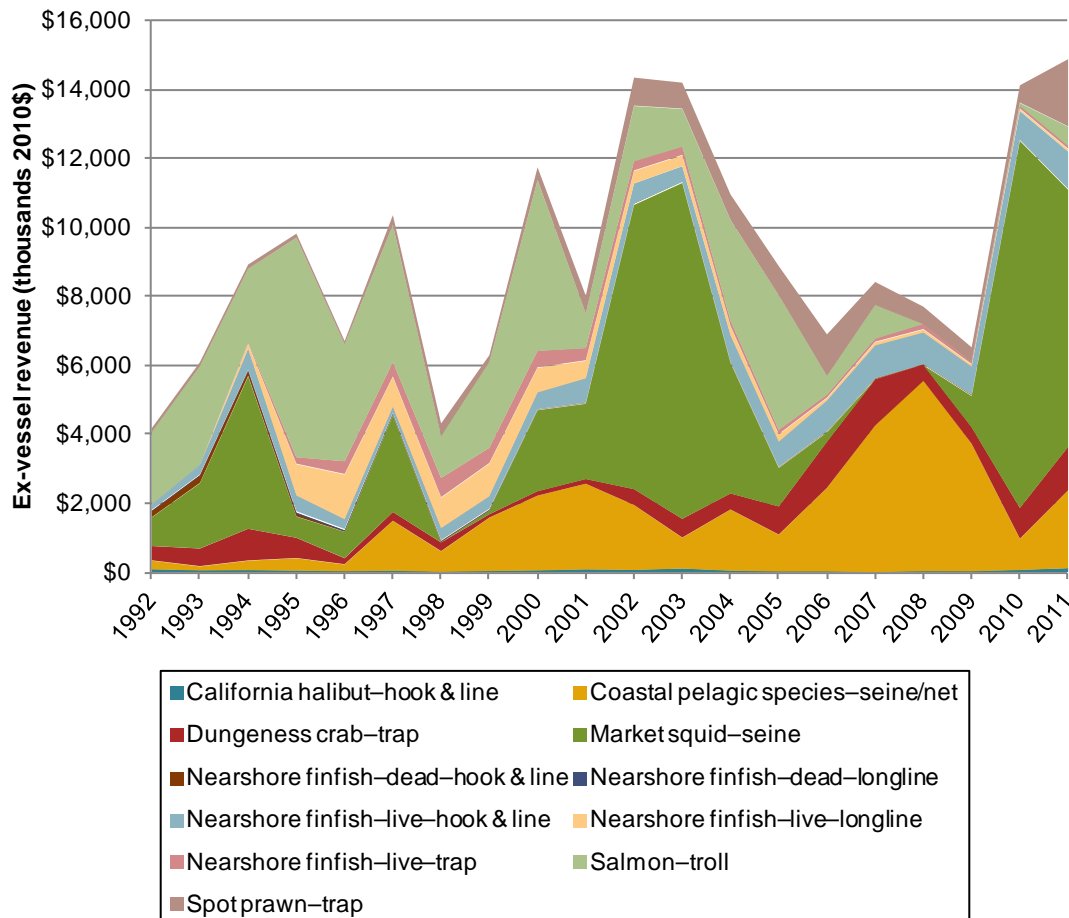
Source: Landings data from CDFG

Figure 10. Central Coast Region commercial landings for fisheries of interest, 1992–2011



Source: Landings data from CDFG

Figure 11. Central Coast Region commercial ex-vessel revenues for fisheries of interest, 1992–2011



Source: Landings data from CDFG

Figure 12 displays the average relative percent fishing income from the eleven commercial fisheries of interest from 1992–2011 and was created using CDFG landings data. Similar figures are presented for each Central Coast Region port later in the report. These figures were developed to explore changes in how much fishermen rely upon specific fisheries of interest relative to other fisheries of interest. It should be noted that these percentages do not reflect upon a fisherman's full fishing portfolio, we examined revenue from only the eleven fisheries of interest within the Central Coast Region.

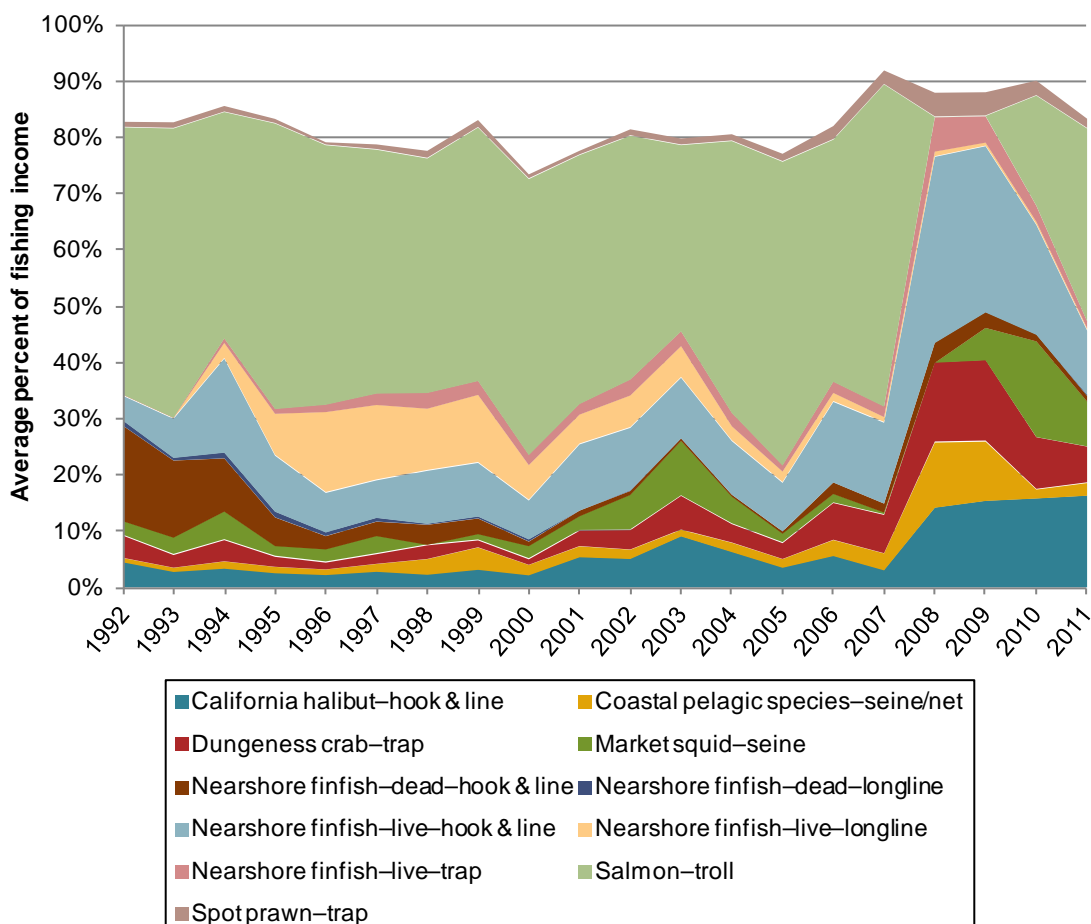
To create this figure, ex-vessel revenues from the eleven fisheries of interest for each individual fisherman making landings in the region or a specific port were summed by year to estimate a 'total fishing income'. Using this 'total fishing income', the percentage of fishing revenue from each fishery of interest was calculated for an individual. These individual percentages were then averaged across all fishermen at either the region or port level. The resulting percentages indicate the relative importance of specific fisheries to the other eleven fisheries of interests. Total averages do not add up to 100 percent as these are averages calculated across separate fisheries.

The figures are not intended to portray an individual fisherman as most fishermen tend to fish between only one to three fisheries in a given year on average. Instead, the figures display how important the revenue from a specific fishery was relative to the other fisheries of interest for the average fisherman.

Figure 12 displays the average percent fishing income from the eleven fisheries of interest within the Central Coast Region over time. This figure reveals how dependent fishermen are on average to a particular fishery. Most striking is the reliance fishermen in the region had on the salmon–troll fishery relative to other fisheries of interest—contributing on average approximately 40.0 percent of revenue from all fisheries of interest over the study period. In years that the salmon–troll fishery was closed, 2008 and 2009, many fishermen relied more heavily upon other fisheries, most notably the California halibut–hook & line, Dungeness crab–trap, and nearshore finfish fisheries. During the years 2008 and 2009 the nearshore finfish–live–hook & line fishery contributed approximately three times more than it had in years previous to revenues an average fishermen made from fisheries of interest.

While some of these fisheries, such as the California halibut–hook & line fishery continued to provide increased contributions to fishing revenues with the reopening of the salmon–troll fishery, others tapered off again. The rising reliance of fishermen on the California halibut–hook & line fishery is a trend that is not as observable when examining just ex-vessel revenues for that fishery over time. Ex-vessel revenues from the California halibut–hook & line fishery averaged 16.5 percent of the average Central Coast Region fisherman’s revenue from fisheries of interest in 2011.

Figure 12. Average percent of individual fishing income from commercial fisheries of interest, Central Coast Region, 1992–2011



Source: Landings data from CDFG

4.2. Central Coast Region Commercial Fishing Baseline Characterization

In the commercial fishing baseline characterization sections found throughout this report we summarized the primary data collected from fisherman interviews carried out in this project. Establishing a baseline characterization of the Central Coast Region commercial fishing fleet for the nine target fisheries provides a benchmark of socioeconomic conditions and spatial fishing patterns in which future MPA impacts and benefits can be measured.

As a part of providing a baseline characterization of the commercial fishing we solicited information during interviews and report out on characteristics of fishing activities/income from the year 2006. As limited non-spatial survey data was collected during the 2005 study by Ecotrust, we included these questions in our survey to provide some estimates as to possible socioeconomic change. Furthermore, asking questions about activities in 2006 as well as 2011 together allowed us to gather important qualitative information on the major factors driving any reported/perceived changes between the two years. We chose the year 2006 to serve as a baseline year in which to gauge subsequent change as it was the last full year before the Central Coast MPA network was implemented.

In the Central Coast Region the target fisheries (listed below in Table 9) for data collection generated over \$14.8 million in 2011. Almost half of the total revenue from the region came from the market squid–seine fishery (\$7.5 million). The next largest producer was coastal pelagic species–seine/net (\$2.2 million), followed by spot prawn–trap (\$1.9 million). We interviewed 29 commercial fishermen with most fishermen participating in more than one fishery, producing 57 data sets. Nearshore finfish–live includes the following three gear types; hook & line, trap, and longline. These fisheries are grouped together due to their similarities and in order to present data that would have been suppressed if presented separately. We interviewed 12 unique nearshore finfish–live fishermen producing 16 data sets, 10 of which are fishermen using hook & line gear, 5 are from fishermen using trap gear, and 1 is from a fisherman using longline gear.

Table 9. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Central Coast Region

Fishery	2011 Landings revenue (2010\$)	Total number of individuals in 2011 landings revenue	Number interviewed
California halibut–hook & line	\$130,577	101	10
Coastal pelagic species–seine/net	\$2,241,160	31	4
Dungeness crab–trap	\$1,260,304	32	7
Market squid–seine	\$7,478,293	40	4
Nearshore finfish–live–hook & line	\$1,077,290	62	10
Nearshore finfish–live – longline	\$60,374	7	1
Nearshore finfish–live–trap	\$101,018	12	5
Nearshore finfish–live	\$1,238,682	66	12
Salmon – troll	\$558,358	173	13
Spot prawn–trap	\$1,940,848	7	3
All target fisheries	\$14,848,223	338	29

Source: CDFG landings data, Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

As shown in Table 10, the average fisherman across all target fisheries is 51.2 years old and has 26.0 years of commercial fishing experience. This average, for all target fisheries, includes each individual only once, regardless of how many fisheries they participated in. Fishermen in the market squid–seine, coastal pelagic species–seine/net, and salmon–troll fisheries were slightly older and had more years of experience commercial fishing than the average fisherman. Spot prawn–trap and California halibut–hook & line fishermen were on average 40.7 and 43.4 years old respectively, the youngest in the region. Throughout the region, the least experienced fishermen we spoke to had three years of commercial fishing experience and the most had 54 years of experience.

Table 10. Average age and years experience commercial fishing, Central Coast Region.

Fisheries	Age		Years experience	
	Average	Standard deviation	Average	Standard deviation
California halibut–hook & line	43.4	12.5	18.8	14.2
Coastal pelagic species–seine/net	56.3	12.0	35.0	17.5
Dungeness crab–trap	51.3	21.1	23.6	14.6
Market squid–seine	56.3	12.0	35.0	17.5
Nearshore finfish–live	47.8	16.9	21.1	14.7
Salmon – troll	53.1	16.7	26.7	13.4
Spot prawn–trap	40.7	15.6	22.0	16.1
All target fisheries (unique individuals)	51.2	14.7	26.0	14.3

Source: Current study

Fishermen were asked to estimate the percent of their personal income that came from commercial fishing for the years 2006 and 2011 (Table 11). In the table below, percent change was calculated after the interview was completed. On average fishermen in all target fisheries, except in the Dungeness crab–trap and nearshore finfish–live, experienced a decrease in the percent of their total income that was derived from commercial fishing. Most fishermen who participated in the Dungeness crab–trap fishery cited that 2011 was a good year for Dungeness crab, noting it was in a peak abundance phase of its natural cycle. One nearshore finfish–live fisherman reported a large increase in percent income from fishing due to obtaining a nearshore rockfish permit and focusing full time on commercial fishing. The drastic difference from this response to all responses is indicated by the large standard deviation associated with the average percent change from 2006 to 2011.

With this outlier removed, those that participated in the nearshore finfish–live fishery made an average of 80.8 percent of their income from commercial fishing in 2006 (with a standard deviation of 28.3 percent) and 79.1 percent of their income in 2011 (with a standard deviation of 30.5), resulting in a change of -3.33 percent (with a 24.0 percent standard deviation) from 2006 to 2011. When considering all target fisheries together without the outlier, the 2006 average is 76.1 percent (with a standard deviation of 26.4 percent) and 2011 is 75.4 percent (with a standard deviation of 31.7 percent). This results in an overall change of -0.60 percent change from 2006 to 2011 (with a standard deviation of 31.1 percent). No one participating in either the coastal pelagic species–seine/net fishery, the market squid–seine fishery, or the spot prawn–trap fishery reported any change in percent of total income from commercial fishing over the study time frame.

Table 11. Percent change in income from overall commercial fishing from 2006–2011, Central Coast Region

Fisheries	2006		2011		Percent change	
	Average	Standard	Average	Standard	Average	Standard
California halibut–hook & line	60.6%	31.9%	52.2%	34.2%	-9.5%	43.8%
Coastal pelagic species–seine/net	97.5%	5.0%	97.5%	5.0%	—	—
Dungeness crab–trap	92.9%	12.2%	96.4%	9.4%	4.8%	12.6%
Market squid–seine	97.5%	5.0%	97.5%	5.0%	—	—
Nearshore finfish–live	75.4%	33.9%	80.4%	29.9%	132.6%	509.2%
Salmon – troll	78.5%	24.4%	70.4%	37.4%	-15.2%	34.3%
Spot prawn–trap	100.0%	—	100.0%	—	—	—
All target fisheries (unique individuals)	77.0%	31.1%	76.3%	33.2%	63.2%	368.2%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

After reporting the percent of their income from commercial fishing for 2006 and 2011, fishermen who reported a change were asked to describe factors to which they attributed this change. This was posed as an open-ended question and respondents were encouraged to speak freely as the interviewer took notes on key aspects that were mentioned. After the interview, the notes were coded and summarized into the categories which are shown below in Table 12. Responses are summarized by fishery to characterize the fishermen who participate in each target fishery. However, reasons cited for change in percent of total income from commercial fishing are not fishery specific—for example a fisherman who participated in the California halibut—hook & line fishery may have cited change in fish abundance, but the change in fish abundance may be referring to another fishery.

Table 12. Cause of change in percent income from commercial fishing from 2006–2011, Central Coast Region.

Response	Number responding			
	California halibut–hook & line	Dungeness crab–trap	Nearshore finfish–live	Salmon – troll
Increased regulation	1	—	3	1
Intensified fishing efforts	1	—	—	1
Had additional job or source of income	1	1	2	1
Found additional job or source of income	1	—	2	1
Change in fish abundance	2	—	—	2
Total number responding	6	1	7	5

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were then asked what other sources of income they had other than commercial fishing. Again, respondents' answers were coded into categories which are shown below in Table 13.

Table 13. Other sources of income other than commercial fishing in 2011, Central Coast Region

Response	Number responding				
	California halibut—hook & line	Coastal pelagic species—seine/net	Market squid—seine	Nearshore finfish—live	Salmon – troll
Skilled labor	5	—	—	5	3
Investments/retirement/social security	1	1	1	1	1
Business/office work	5	—	—	2	3
Other maritime occupation	2	—	—	—	1
Total number responding	8	1	1	6	5

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were asked what percent of their total gross economic revenue (GER) from commercial fishing was spent on their overall operating costs across all his/her fisheries. Percent change between 2006 and 2011 was calculated after the interview. Individuals in all fisheries, with the exception of spot prawn—trap, experienced an increase in overall operating costs, with the highest increase report by fishermen who participate in the California halibut—hook & line fishery (Table 14). The most commonly cited reason for increased operating costs was an increase in fishing expense in which the rising cost of fuel was the most commonly mentioned, followed by gear expenses, boat slip costs, and insurance (Table 15). Furthermore, fishermen who indicated large capital investments were often fishermen who purchased new boats, engines, or gear. This question was asked in an open ended manner and responses were coded into the categories shown below.

Table 14. Percent change in overall commercial fishing operating costs from 2006–2011, Central Coast Region

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut – hook & line	34.1%	27.0%	47.0%	31.7%	23.8%	30.7%
Coastal pelagic species – seine/net	70.0%	13.2%	73.5%	5.1%	7.1%	10.1%
Dungeness crab – trap	47.9%	25.1%	51.4%	19.7%	13.3%	22.3%
Market squid – seine	70.0%	13.2%	73.5%	5.1%	7.1%	10.1%
Nearshore finfish – live	35.6%	20.5%	40.8%	18.6%	19.4%	23.5%
Salmon – troll	45.8%	26.5%	54.6%	28.2%	16.8%	26.7%
Spot prawn – trap	50.0%	—	50.0%	—	—	—
All target fisheries (unique individuals)	41.7%	26.3%	50.3%	25.0%	22.3%	27.2%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 15 . Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Central Coast Region

Response	Number responding					
	California halibut—hook & line	Coastal pelagic species—seine/net	Dungeness crab—trap	Market squid—seine	Nearshore finfish—live	Salmon – troll
Large capital investment	2	1	1	1	3	1
Decrease in fishing income	2	—	1	—	1	2
Decrease in fishing grounds	—	—	—	—	1	—
Increase in fishing expenses	3	4	2	4	5	4
Fishing less in 2006	—	—	—	—	1	—
Fishing less in 2011	1	—	—	—	—	1
Total number responding	6	4	4	4	9	6

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

In addition to how many years each individual has been a commercial fisherman (see Table 10) individuals were also asked how many years they had been participating in each individual fishery. Overall, individuals have the most experience in coastal pelagic species—seine/net, market squid—seine, and salmon—troll. Fishermen in the nearshore finfish—live fishery had the least amount of experience and this fishery had more recently transitioned from the nearshore finfish—dead fishery. The California halibut—hook & line, nearshore finfish—live, and salmon—troll fisheries all have on average less than 1 crew member. Coastal pelagic species—seine/net and market squid—seine reported the largest amount of crew with an average of 5.3 people while California halibut—hook & line fishermen reported the smallest amount of crew with an average of 0.5 people. Fishermen were also asked what percent of their gross economic revenue (GER) goes towards paying their crew. Both coastal pelagic species—seine/net and market squid—seine reported spending an average 46.3 percent of their GER on their crew as compared to salmon—troll fishermen who reported spending the least amount of the GER on crew (5.5 percent). Dungeness crab—trap fishing was reported as the most fuel intensive, with nearly a quarter of GER going towards fuel.

Table 16. Additional commercial fishery specific data, Central Coast Region

Fisheries	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut—hook & line	19.2	15.3	0.5	0.5	11.0%	12.6%	12.4%	5.8%
Coastal pelagic species—seine/net	27.8	5.9	5.3	1.0	46.3%	8.5%	10.0%	—
Dungeness crab—trap	16.0	16.6	1.4	0.8	20.7%	15.9%	23.6%	15.2%
Market squid—seine	31.8	1.7	5.3	1.0	46.3%	8.5%	10.0%	—
Nearshore finfish—live	14.9	8.1	0.9	0.3	14.1%	9.4%	14.6%	4.9%
Salmon—troll	26.7	13.2	0.6	0.7	5.5%	8.7%	18.6%	14.4%
Spot prawn—trap	20.3	13.4	1.7	0.6	23.0%	2.6%	12.0%	7.1%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Additionally, for each fishery they participated in fishermen were asked if they had added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. If they had answered yes to any of these

questions, they were additionally asked an open-ended question as to why added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. These questions were asked to investigate if fishermen have entered fisheries to diversify their fishing portfolio or if they had left fisheries and the factors driving those decisions. Furthermore, some fishermen may not drop a fishery entirely and participate in the fishery on and off across the years. If this was the case we also sought to investigate the reasoning behind this situation such as fishery closures or regulatory complications.

Most fishermen fell into the 'none of the above' category, which is not shown in Table 17 below, but makes up the remainder of the reported percentages. Nobody reported completely dropping a fishery from their portfolio although many added new fisheries since 2006. California halibut–hook & line and nearshore finfish–live were added by 30.0 percent and 31.3 percent of fishermen interviewed in the fisheries, respectively. Fishermen noted the relative ease to add California halibut–hook & line due to its status as an open access fishery and difficulty entering the nearshore finfish–live fishery due to the difficulties in obtaining a permit. The system for obtaining a nearshore finfish–live permit requires a fisherman to buy two permits held by existing fishermen within their management region and retire one of them. Additionally, a trap endorsement is required for nearshore finfish–live –trap fishery. None of the coastal pelagic species–seine/net or market squid–seine fishermen reported entering or leaving the fishery, making it the most consistent of the target fisheries. The reasons for adding, dropping, or not fishing a fishery in 2011 were sorted into the categories listed below in Table 18. Often fishermen who indicated they added a fishery since 2006 were new to commercial fishing overall.

Table 17. Commercial fisheries added/dropped since 2006 or not fished in 2011, Central Coast Region

Fisheries	Number responding	Percent responding		
		Added	Dropped	Not fished in 2011
California halibut – hook & line	10	30.0%	—	—
Coastal pelagic species – seine/net	4	—	—	—
Dungeness crab – trap	7	28.6%	—	42.9%
Market squid – seine	4	—	—	—
Nearshore finfish – live	16	31.3%	—	—
Salmon – troll	13	7.7%	—	15.4%
Spot prawn – trap	3	33.3%	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 18. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Central Coast Region

Responses	Number responding			
	California halibut-hook & line	Nearshore finfish-live	Salmon-troll	Dungeness crab-trap
Started commercial fishing	2	2	—	1
Change in fish population	—	—	—	1
Diversify fisheries	—	—	—	1
Was able to obtain permit	—	1	—	—
High costs	—	—	1	—
Total number responding	2	3	1	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked for each fishery separately to compare the success of his/her fishery in 2011 to the success of his/her fishery in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse. Market squid-seine and Dungeness crab-trap had the largest percentage of respondents indicating 2011 was better than the previous five years.

Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

Table 19. Overall success in specific commercial fishery compared to previous five years, Central Coast Region

Fisheries	Number responding	Percent response					
		Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
California halibut–hook & line	10	—	10.0%	30.0%	30.0%	30.0%	—
Coastal pelagic species–seine/net	4	—	25.0%	—	25.0%	25.0%	25.0%
Dungeness crab–trap	7	28.6%	71.4%	—	—	—	—
Market squid–seine	4	—	75.0%	25.0%	—	—	—
Nearshore finfish–live	14	—	21.4%	14.3%	28.6%	21.4%	14.3%
Salmon–troll	11	9.1%	9.1%	9.1%	9.1%	36.4%	27.3%
Spot prawn–trap	3	—	66.7%	—	33.3%	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Regulatory issues or issues resulting from regulatory action were the most commonly cited reasons for change in the success of a particular fishery. Impacts from MPAs were the most cited regulatory factor and will be discussed further in the subsequent section. Respondents also reported that often fishery regulations were inconsistent or inefficient. Examples of responses in this category included that regulation often forces a large number of fishermen to fish in small areas, which increases fishing pressure both spatially and temporally. Size and quota limits were noted to increase bycatch and competition. Fishermen also reported they felt MPA regulations were insufficiently communicated, monitored, and enforced. Many fishermen mentioned impending trap limits in the Dungeness crab–trap fishery; some were in favor and some were against these limits. Additionally, many fishermen noted that the reduction of the trawl fleet has helped the hook and line fisheries.

Environmental factors mentioned included natural fluctuation in fish populations (especially bait fish), good weather, and habitat changes due to a variety of reasons. Fishermen also noted that the ocean is an ever changing environment and natural changes in fish populations, temperature regimes, and weather are always impacting the success of their catch. Economic factors included changes in price, market fluctuation, and increased expenses such as fuel as factors that influenced their success. Lastly, other factors included loss of traditional knowledge and culture and gaining more fishing experience as factors impacting their success. Often fishermen included some overall reflections on their fishery or commercial fishing as a whole and some of these are included in Table 23.

Table 20 . Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region

Response	Number responding						
	California halibut – hook & line	Coastal pelagic species – seine/net	Dungeness crab – trap	Market squid – seine	Nearshore finfish – live	Salmon – troll	Spot prawn – trap
MPA impacts	1	1	2	4	6	—	3
Insufficient monitoring/enforcement/ communication of MPAs	—	1	2	—	1	—	1
Trawlers impacting nearshore fleet	2	—	—	—	—	—	—
Quota limit issues	1	4	—	1	2	1	—
Concentration of fishing effort into smaller areas/over-crowding	—	—	—	—	1	—	—
Regulations have resulted in less competition	—	—	—	—	1	—	1
Inefficiencies in bycatch regulations	—	1	—	—	1	—	1
Inefficiencies/inconsistencies in fishery regulations	1	4	1	3	3	2	1
Inequities in fishery regulations	—	1	3	2	4	1	1
Inadequate research for policy	—	—	—	1	2	—	1
Inequities in obtaining fishery permits	—	—	—	—	2	—	—
Insufficient regulation on land-based impacts to fisheries	—	—	—	—	—	1	—
Lack of influence on policy/regulation development	—	—	1	—	1	—	1
Insufficient communication of fishery regulations	—	—	1	—	—	1	—
Populations recovering from fishing gear ban	3	—	—	—	—	—	1
Distress around unintended infractions	—	1	—	3	—	—	—
Increased number of fishermen participating in the fishery	—	—	—	—	—	—	—
Increased personal fishing effort	—	—	—	—	1	—	1
Rockfish conservation area (RCA)	1	—	—	—	2	1	—
Total number responding	5	4	3	4	8	6	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 21. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region

Response	California halibut–hook & line	Coastal pelagic species– seine/net	Dungeness crab–trap	Market squid– seine	Nearshore finfish–live	Salmon–troll	Spot prawn– trap
Increase in bait fish	2	—	—	—	—	—	—
Increase in fish abundance	—	1	3	1	—	—	1
Stable fish abundance	3	—	1	1	1	—	—
Increase in catch	2	—	3	1	—	—	—
Decrease in catch	1	—	—	—	—	3	1
Increase in predators	—	—	—	1	—	—	1
Good weather	—	1	1	—	—	—	—
Biomass of fish largely in MPAs	—	—	—	1	—	—	—
PG&E seismic testing impacts	1	—	—	—	2	—	—
Decrease in habitat or water quality	—	—	—	—	—	5	—
Decrease in fish abundance	—	—	—	—	—	3	—
Change in normal water temp	—	—	1	—	—	1	—
Fish population moved further offshore	—	—	—	—	—	1	—
Decrease in fish size	—	—	—	—	—	2	—
Farmed fish spreading disease	—	—	—	—	—	1	—
Protected species overpopulated	—	—	—	1	1	—	—
Total number responding	6	1	4	3	4	7	2

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Table 22. Economic changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region

Response	Number responding						
	California halibut—hook & line	Coastal pelagic species—seine/net	Dungeness crab—trap	Market squid—seine	Nearshore finfish—live	Salmon—troll	Spot prawn—trap
Increased number of fishermen participating in the fishery	1	—	—	—	—	—	—
Increase in operating costs	1	—	—	—	1	1	—
Increase in fish price	—	1	—	1	—	1	—
Decrease in fish price	—	1	—	—	1	—	1
Market flooded	—	1	—	—	—	1	—
Longer season allowed increase in catch	—	—	1	—	—	1	—
Increased demand for fish	—	—	1	1	—	1	—
Decrease in demand for fish	—	—	—	—	1	—	—
Increased personal fishing effort	—	—	—	—	2	—	—
Increased number of outside vessels fishing in local grounds	—	1	—	—	—	—	—
Lack of port infrastructure	—	—	—	—	1	—	—
Increase in travel distance	—	—	1	—	—	—	—
Total number responding	1	2	3	2	5	5	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 23. Other changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region

Response	Number responding				
	California halibut – hook & line	Coastal pelagic species – seine/net	Dungeness crab – trap	Nearshore finfish – live	Spot prawn – trap
Increase in fishing experience	—	1	—	1	—
Loss of historical fishing knowledge	1	1	1	—	—
Fisherman's knowledge not valued	—	—	—	1	1
Lack of outreach to fishing community	—	—	—	1	—
Loss of cultural fishing heritage	1	1	—	1	—
Total number responding	1	2	1	2	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Lastly, fishermen were asked if they own a fishing permit that they did not use in 2011. This question was asked to investigate why fishermen may not be utilizing particular fishing permits. The most commonly mentioned permit that was not fished in 2011 was a salmon fishery permit. Additional permits are listed below in Table 24.

Table 24. Commercial fishing permits not used in 2011, Central Coast Region

Response	Number responding
Salmon	5
Highly Migratory Species (HMS)	2
Crab	2
Deeper Nearshore Rockfish	2
Herring	1
Trawl	1
Gillnet	1
Trap	1
Lobster	1
Dive	—
Total number responding	12

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The most commonly cited reason for not using a permit was that regulations such as season lengths or fishery closures either restricted or made it not profitable for them to utilize their permit. A lack of time to pursue the fishery was also a common answer. Some of those that reported not having enough time to use a permit mentioned that it made sense for them to spend more time in other fisheries that were more productive.

Table 25. Reason for not fishing a commercial fishery permit, Central Coast Region

Response	Number responding
Regulations	5
Not equipped	2
Lack of time	5
Fish population changes	2
Total number responding	12

Source: Current study

Participants were allowed to give multiples responses

The number of fishermen who participated in the mapping portion of the interview and the percent of 2011 ex-vessel revenue they represent are presented below in Table 26 and Table 27. Not all fishermen who participated in interviews chose to participate in the fisheries mapping portion. Frequently fishermen cited a general distrust towards how spatial fisheries data might be used to further restrict their fishing. The table below also indicates the percentage of 2011 ex-vessel revenue that is represented in each map from the fishermen we interviewed.

Table 26. Number of commercial fishermen interviews conducted and ex-vessel landings value represented, spatial survey, Central Coast Region

Fishery	2011 Landings revenue (2010\$)	Percent of ex-vessel revenue represented by interviews	Total number of individuals in 2011 landings revenue	Number of fishermen who mapped with 2011 landings
California halibut–hook & line	\$130,577	13.4%	101	4
Coastal pelagic species–seine/net	\$2,241,160	32.4%	31	4
Dungeness crab–trap	\$1,260,304	27.6%	32	3
Market squid–seine	\$7,478,294	22.0%	40	4
Nearshore finfish–live–hook & line	\$1,077,290	13.4%	62	8
Nearshore finfish–live – longline	\$60,374	92.7%	7	1
Nearshore finfish–live–trap	\$101,018	35.3%	12	4
Spot prawn–trap	\$1,940,848	98.3%	7	3
All target fisheries	\$14,289,865		229	23

Source: California Department of Fish and Game, Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Table 27. Number of commercial fishermen interviews conducted and ex-vessel landings value represented in maps available to public, Central Coast Region

Port	Fishery	2011 Landings revenue (2010\$)	Percent of ex-vessel revenue represented by interviews	Total number of individuals in 2011 landings revenue	Number interviewed
Monterey	Market squid–seine	\$4,145,325	22.0%	33	4
Morro Bay	California halibut–hook & line	\$69,192	17.7%	29	3
Morro Bay	Nearshore finfish–live–hook & line	\$400,854	13.5%	20	4
Morro Bay	Nearshore finfish–live–trap	\$75,090	46.5%	7	3
Moss Landing/Monterey	Coastal pelagic species–seine/net	\$2,239,543	16.3%	28	3
Avila/Port San Luis	Nearshore finfish–live–hook & line	\$650,598	13.9%	29	4

Source: California Department of Fish and Game, Current study

Table 28 indicates the spatial data sets or maps were developed for both the pre (2005) and post (2011) MPA survey efforts. The pre MPA maps may be found in Appendix A and the post MPA maps can be found throughout the region fishery profiles in section 4. Table 26 indicates the percentage of the landing value represented in the port-fishery maps developed.

Table 28. Spatial data sets available for the commercial fishing sector, pre and post MPA

Fishery/Port	Survey	Santa Cruz	Moss Landing	Moss Landing/ Monterey	Monterey	Morro Bay	Avila/Port San Luis	Central Coast Region
California halibut- hook & line	Pre MPA	Yes	Yes	-	Yes	Conf	Yes	Yes
	Post MPA	Conf	-	-	-	Yes	Conf	Yes
Coastal pelagic species - seine/net	Pre MPA	-	-	-	-	-	-	-
	Post MPA	-	Conf	Yes	Conf	-	-	Yes
Dungeness crab - trap	Pre MPA	Yes	Conf	-	Yes	Conf	Conf	Yes
	Post MPA	Conf	Conf	-	-	-	-	Yes
Market squid - seine	Pre MPA	-	Yes	-	Yes	Conf	Conf	Yes
	Post MPA	-	Conf	-	Yes	Conf	-	Yes
Nearshore finfish live - hook & line	Pre MPA	-	Yes	-	Yes	Yes	Yes	Yes
	Post MPA	-	-	-	-	Yes	Yes	Yes
Nearshore finfish live - trap	Pre MPA	-	-	-	-	Yes	Conf	Yes
	Post MPA	-	Conf	-	-	Yes	-	Yes
Salmon - troll	Pre MPA	-	-	-	-	-	-	-
	Post MPA	-	-	-	-	-	Conf	Conf
Spot prawn - trap	Pre MPA	Conf	-	-	Conf	Conf	Conf	Conf
	Post MPA	-	-	-	Conf	Conf	-	Conf

Source: Current study

The ports of Moss Landing and Monterey were combined for the coastal pelagic species-seine/net fishery only

Data was collected only post MPA for the coastal pelagic species-seine/net fishery

Data was collected only post MPA for the salmon-troll fishery

'Conf' indicates data were collected but are not available due to confidentiality constraints

Spot prawn spatial data sets were suppressed to protect the location of individual fishing grounds even though 3 or more fishermen contributed to the data set

4.3. Central Coast Region MPAs and Commercial Fishing

Determining and measuring the impact of MPAs upon commercial fishermen is challenging to quantify and unravel from the multitude of environmental, regulatory, and economic factors influencing systems of fishing. Despite this, we sought to capture information from fishermen as to how they perceive they have been impacted by MPAs and the specific MPAs which are impacting their fisheries.

This section provides information at the region and port levels and summarizes the response from the following three questions which were asked during interviews for each fishery:

- 1) Has your fishery been directly impacted by the recently established MPAs?;
- 2) If so, how have you been impacted?; and
- 3) What MPAs have impacted your specific fishery?

Question one was posed as a simple yes or no response and questions two and three were open-ended questions in which responses were later coded and categorized into the tables below.

Across the entire Central Coast Region, 61.4 percent of responses indicated that his/her fishing had been impacted in some way by MPAs. The fishery with the fewest number of fishermen reporting impacts from MPAs was salmon-troll (15.4 percent) and the most was nearshore finfish-live (81.3 percent). All of the nearshore finfish-live fishermen who reported they were impacted also indicated they had lost traditional fishing areas to MPAs. Additionally, 43.8 percent of the nearshore finfish-live fishermen interviewed reported having to travel longer distances at times (often past MPAs) in order to fish. Most nearshore finfish-live fishermen expressed that the MPAs on top of pre-existing regulations, such as the Rockfish Conservation Area (RCA) has resulted in a large portion of traditional fishing grounds being lost.

Table 29. Percent of individuals indicating specific direct impact from MPAs for each fishery, commercial fishermen, Central Coast Region

Fisheries	Number responding	Percent of respondents indicating direct impacts by MPAs	Type of impact			
			Fishing at borders	Traveling longer distances	Shifted efforts to areas with less predictable/worse weather	Loss of traditional fishing grounds
California halibut – hook & line	10	60.0%	40.0%	20.0%	20.0%	60.0%
Coastal pelagic species – seine/net	4	75.0%	25.0%	25.0%	—	50.0%
Dungeness crab – trap	7	85.7%	71.4%	57.1%	42.9%	71.4%
Market squid – seine	4	75.0%	50.0%	25.0%	25.0%	50.0%
Nearshore finfish – live	16	81.3%	31.3%	43.8%	37.5%	81.3%
Salmon-troll	13	15.4%	—	7.7%	7.7%	7.7%
Spot prawn – trap	3	66.7%	33.3%	66.7%	33.3%	66.7%
All target fisheries	57	61.4%	31.6%	31.6%	24.6%	54.4%

Source: Current study

Participants were allowed to select multiple types of impacts

— indicates that the port/fishery was not sampled or a zero value data point

In addition to the commonly mentioned impacts from MPAs displayed in the table above, Table 30 provides additional perceived impacts from MPAs that fishermen discussed during interviews. Many fishermen cited that the loss of fishing area further concentrates fishing effort into smaller areas—causing over-fishing and the catch of smaller sized fish in some remaining open areas. Furthermore, some fishermen with smaller vessels also indicated that MPAs have decreased the overall area of available fishing grounds as their vessels may only travel safely a certain distance from port and with both MPAs and the RCA—they are forced to fish harder in remaining open areas or expend more effort/increase operating costs/increase the number of trips than in the past to fish less productive grounds. Several fishermen also expressed distress over unintended infractions such as traps or nets swept into MPAs and confusion around regulations or MPA boundaries. Lastly, fishermen also noted that MPAs have disrupted traditional fishing patterns such as in the salmon fishery in which they cannot follow schools of salmon through MPAs. Furthermore, fishermen indicated they often have a portfolio of fishing grounds they fish in rotation to let areas rest and that there are particular sequences in the fishing grounds they fish or efficient routes they used to take on a given trip. This type of knowledge of fishing grounds is built over years of experience and several fishermen indicated that MPAs have disrupted these long-standing patterns of use.

Table 30. Other ways MPAs have impacted specific commercial fisheries, Central Coast Region

Responses	Number responding					
	California halibut – hook & line	Dungeness crab – trap	Market squid – seine	Nearshore finfish – live	Salmon– troll	Spot prawn – trap
Concentration of fishing effort into smaller areas/over-crowding	1	1	—	3	—	2
Decrease in available fishing grounds	1	1	—	4	2	2
Fishery less profitable	1	—	—	—	—	—
Less time at home	1	—	—	—	—	—
Fishing less productive areas	1	—	—	2	—	—
Loss of fishing opportunities	1	—	—	1	1	—
Distress around unintended infractions	1	1	1	—	—	—
Disrupts traditional fishing pattern	1	—	—	4	2	2
Increase in the number of trips	—	—	—	2	—	—
Increased operating costs	—	—	—	3	—	—
Total number responding	5	2	1	11	2	2

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to include multiples responses

The 25 MPAs listed in Table 31 were reported to have impacted at least one person in a specific port-fishery combination. There are an additional four MPAs that were not noted as having an impact on any of the interview participants; these MPAs were Edward F Ricketts SMCA, Elkhorn Slough SMCA, Elkhorn Slough SMR, and Moro Cojo Slough SMR. The largest number of fisheries that a single MPA impacted was five fisheries. The MPAs which impacted five fisheries are Año Nuevo SMCA, Greyhound Rock SMCA, and Soquel Canyon SMCA. Across the region, California halibut–hook & line and Nearshore finfish–live fishermen reported being impacted by the largest number of MPAs (20 MPAs). The last column in the table sums the number of responses across each fishery and divides by the number of responses across all fisheries (57 responses) to show

which MPAs were most commonly reported as having the most impact on fishermen. Across the region and across all fisheries, Año Nuevo SMCA impacted the largest number of fishermen interviewed. It should be noted that coastal pelagic species-seine/net fishermen indicated that they are impacted by the Portuguese Ledge SMCA and Soquel Canyon SMCA, however, upon review of the MPA regulations these MPAs allow the take of 'pelagic finfish'. Fishermen may have responded that these MPAs have impacted them as they are unclear as to the current regulations of those MPAs.

Table 31. Percent of respondents indicating specific MPA impacting commercial fishery, Central Coast Region

MPAs	California halibut – hook & line	Coastal pelagic species – seine/net	Dungeness crab – trap	Market squid – seine	Nearshore finfish – live	Salmon– troll	Spot prawn – trap	All target fisheries
Number responding	10	4	7	4	16	13	3	57
Año Nuevo SMCA	20.0%	50.0%	71.4%	50.0%	12.5%	—	—	22.8%
Asilomar SMR	—	—	—	—	12.5%	—	—	3.5%
Big Creek SMCA	10.0%	—	—	—	6.3%	7.7%	—	5.3%
Big Creek SMR	10.0%	—	—	—	18.8%	7.7%	33.3%	10.5%
Cambria SMCA	30.0%	—	—	25.0%	25.0%	7.7%	—	15.8%
Carmel Bay SMCA	10.0%	—	—	25.0%	6.3%	—	—	5.3%
Carmel Pinnacles SMR	—	—	—	—	6.3%	—	—	1.8%
Greyhound Rock SMCA	10.0%	50.0%	71.4%	50.0%	12.5%	—	—	21.1%
Lovers Point SMR	10.0%	—	—	—	—	—	—	1.8%
Morro Bay SMR	10.0%	—	—	—	—	—	—	1.8%
Morro Bay SMRMA	20.0%	—	—	—	—	—	—	3.5%
Natural Bridges SMR	20.0%	—	—	—	—	—	—	3.5%
Pacific Grove Marine Gardens SMCA	—	—	—	—	6.3%	—	—	1.8%
Piedras Blancas SMCA	20.0%	—	—	—	18.8%	7.7%	—	10.5%
Piedras Blancas SMR	20.0%	—	—	—	31.3%	7.7%	—	14.0%
Point Buchon SMCA	30.0%	—	—	—	31.3%	7.7%	—	15.8%
Point Buchon SMR	20.0%	—	—	—	50.0%	7.7%	—	19.3%
Point Lobos SMCA	10.0%	—	—	—	12.5%	—	—	5.3%
Point Lobos SMR	10.0%	—	—	—	12.5%	—	—	5.3%
Point Sur SMCA	20.0%	—	—	—	37.5%	—	—	14.0%
Point Sur SMR	20.0%	—	—	—	50.0%	—	—	17.5%
Portuguese Ledge SMCA	—	25.0%	57.1%	25.0%	—	—	33.3%	12.3%
Soquel Canyon SMCA	—	25.0%	85.7%	25.0%	6.3%	—	33.3%	17.5%
Vandenberg SMR	20.0%	—	—	—	37.5%	7.7%	—	15.8%
White Rock-Cambria SMCA	30.0%	—	—	25.0%	25.0%	7.7%	—	15.8%
Total number of MPAs impacting fishery/region	20	4	4	7	20	9	3	25

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to select multiple MPAs

In the port of Santa Cruz, all of the Dungeness crab – trap fishermen reported having been impacted by MPAs and the loss of traditional fishing grounds. Conversely, none of the salmon–troll fishermen reported any impacts. Only the Dungeness crab – trap fishermen reported having to fish at the borders of MPAs, traveling longer distances to get to alternative fishing areas, or shifting their fishing areas where weather was worse or less predictable. Of the 13 responses from fishermen, 46.2 percent of them indicated experiencing direct impacts from MPAs and all of these individuals indicated loss of traditional fishing grounds.

Table 32. Percent of individuals indicating specific direct impact from MPAs for each fishery, Santa Cruz

Fisheries	Number responding	Percent of respondents indicating direct impacts by MPAs	Type of impact			
			Fishing at borders	Traveling longer distances	Shifted efforts to areas with less predictable/worse weather	Loss of traditional fishing grounds
California halibut – hook & line	3	66.7%	—	—	—	66.7%
Coastal pelagic species – seine/net	—	—	—	—	—	—
Dungeness crab – trap	3	100.0%	66.7%	66.7%	66.7%	100.0%
Market squid – seine	—	—	—	—	—	—
Nearshore finfish – live	1	*	*	*	*	*
Salmon–troll	6	—	—	—	—	—
Spot prawn – trap	—	—	—	—	—	—
All target fisheries	13	46.2%	23.1%	23.1%	23.1%	46.2%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to select multiple types of impacts

In addition to the commonly mentioned impacts from MPAs displayed in the table above, Table 33 provides additional perceived impacts from MPAs that fishermen discussed during interviews. The majority of fishermen responding expressed distress over unintended infractions such as traps swept into MPAs and confusion around regulations or MPA boundaries.

Table 33. Other ways MPAs have impacted specific commercial fisheries, Santa Cruz

Responses	Number responding	
	California halibut – hook & line	Dungeness crab – trap
Concentration of fishing effort into smaller areas/over-crowding	—	1
Decrease in available fishing grounds	—	1
Fishery less profitable	—	—
Less time at home	—	—
Fishing less productive areas	—	—
Loss of fishing opportunities	—	—
Distress around unintended infractions	1	1
Disrupts traditional fishing pattern	—	—
Increase in the number of trips	—	—
Increased operating costs	—	—
Total number responding	1	2

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to include multiples responses

The 9 MPAs listed in Table 31 were reported to have impacted at least one person in a specific port-fishery combination. The largest number of fisheries that a single MPA impacted was at least two fisheries - these MPAs are Año Nuevo SMCA and Greyhound Rock SMCA. Within the port, California halibut – hook & line fishermen reported being impacted by the largest number of MPAs (7 MPAs). The last column in the table sums the number of responses across each fishery and divides by the number of responses across all fisheries (13 responses) to show which MPAs were most commonly reported as having the most impact on fishermen in the port. Across the port and across the fisheries, Año Nuevo SMCA impacted the largest number of fishermen interviewed.

Table 34. Percent of respondents indicating specific MPA impacting commercial fishery, Santa Cruz

MPAs	California halibut – hook & line	Dungeness crab – trap	Nearshore finfish – live	Salmon–troll	All target fisheries
Number responding	3	3	1	6	13
Año Nuevo SMCA	66.7%	100.0%	*	—	46.2%
Greyhound Rock SMCA	33.3%	100.0%	*	—	38.5%
Natural Bridges SMR	66.7%	—	*	—	15.4%
Point Lobos SMCA	33.3%	—	*	—	7.7%
Point Lobos SMR	33.3%	—	*	—	7.7%
Point Sur SMCA	33.3%	—	*	—	15.4%
Point Sur SMR	33.3%	—	*	—	15.4%
Portuguese Ledge SMCA	—	33.3%	*	—	7.7%
Soquel Canyon SMCA	—	100.0%	*	—	30.8%
Total number of MPAs impacting port/fishery combination	7	4	*	—	9

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to select multiple MPAs

As reiterated throughout the report, the ports of Moss Landing and Monterey were combined so that data collected could be shown as much of the data if presented separately would need to be suppressed for confidentiality purposes.

In the ports of Moss Landing and Monterey, 75 percent of fishermen in the coastal pelagic species-seine/net, Dungeness crab-trap, and market squid-seine fisheries indicated they were directly impacted by MPAs. Conversely, none of the salmon-troll fishermen reported any direct impacts from MPAs. The nearshore finfish-live fishery reported the greatest percent of fishermen (66.7 percent) who have lost traditional fishing grounds from MPAs. Of the 24 responses from fishermen, 50.0 percent of them indicated experiencing direct impacts from MPAs and 41.7 percent of individuals indicated loss of traditional fishing grounds. Again, the all target fisheries row includes individuals more than once if they participated in multiple fisheries.

Table 35. Percent of individuals indicating specific direct impact from MPAs for each fishery, Moss Landing/Monterey

Fisheries	Number responding	Percent of respondents indicating direct impacts by MPAs	Type of impact			
			Fishing at borders	Traveling longer distances	Shifted efforts to areas with less predictable/worse weather	Loss of traditional fishing grounds
California halibut – hook & line	2	*	*	*	*	*
Coastal pelagic species – seine/net	4	75.0%	25.0%	25.0%	—	50.0%
Dungeness crab – trap	4	75.0%	75.0%	50.0%	25.0%	50.0%
Market squid – seine	4	75.0%	50.0%	25.0%	25.0%	50.0%
Nearshore finfish – live	3	66.7%	33.3%	66.7%	66.7%	66.7%
Salmon-troll	5	—	—	—	—	—
Spot prawn – trap	2	*	*	*	*	*
All target fisheries	24	50.0%	37.5%	29.2%	20.8%	41.7%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to select multiple types of impacts

In addition to the commonly mentioned impacts from MPAs displayed in the table above, Table 36 provides additional perceived impacts from MPAs that fishermen discussed during interviews. The majority of fishermen responding expressed distress over unintended infractions such as traps swept into MPAs or confusion around regulations or MPA boundaries.

Table 36. Other ways MPAs have impacted specific commercial fisheries, Moss Landing/Monterey

Responses	Number responding		
	Coastal pelagic species – seine/net	Market squid – seine	Spot prawn – trap
Concentration of fishing effort into smaller areas/over-crowding	—	—	*
Decrease in available fishing grounds	1	—	*
Fishery less profitable	—	—	*
Less time at home	—	—	*
Fishing less productive areas	—	—	*
Loss of fishing opportunities	—	—	*
Distress around unintended infractions	1	1	*
Disrupts traditional fishing pattern	—	—	*
Increase in the number of trips	—	—	*
Increased operating costs	—	—	*
Total number responding	2	1	*

Source: Current study

Participants were allowed to include multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

The 17 MPAs listed in Table 37 were reported to have impacted at least one person in a specific port-fishery combination. The largest number of fisheries that a single MPA impacted was at least three fisheries - these MPAs are Año Nuevo SMCA and Greyhound Rock SMCA, Portuguese Ledge SMCA, and Soquel Canyon SMCA. Within the port, market squid-seine fishermen reported being impacted by the largest number of MPAs (7 MPAs). The last column in the table sums the number of responses across each fishery and divides by the number of responses across all fisheries (17 responses) to show which MPAs were most commonly reported as having the most impact on fishermen in the port. Across the port and across the fisheries, Año Nuevo SMCA and Greyhound Rock SMCA impacted the largest number of fishermen interviewed.

Table 37. Percent of respondents indicating specific MPA impacting commercial fishery, Moss Landing/Monterey

MPAs	California halibut – hook & line	Coastal pelagic species – seine/net	Dungeness crab – trap	Market squid – seine	Nearshore finfish – live	Salmon– troll	Spot prawn – trap	All target fisheries
Number responding	2	4	4	4	3	5	2	24
Año Nuevo SMCA	*	50.0%	50.0%	50.0%	*	—	*	29.2%
Asilomar SMR	*	—	—	—	*	—	*	8.3%
Big Creek SMCA	*	—	—	—	*	—	*	4.2%
Big Creek SMR	*	—	—	—	*	—	*	4.2%
Cambria SMCA	*	—	—	25.0%	*	—	*	4.2%
Carmel Bay SMCA	*	—	—	25.0%	*	—	*	12.5%
Carmel Pinnacles SMR	*	—	—	—	*	—	*	4.2%
Greyhound Rock SMCA	*	50.0%	50.0%	50.0%	*	—	*	29.2%
Lovers Point SMR	*	—	—	—	*	—	*	4.2%
Pacific Grove Marine Gardens SMCA	*	—	—	—	*	—	*	4.2%
Point Lobos SMCA	*	—	—	—	*	—	*	8.3%
Point Lobos SMR	*	—	—	—	*	—	*	8.3%
Point Sur SMCA	*	—	—	—	*	—	*	8.3%
Point Sur SMR	*	—	—	—	*	—	*	8.3%
Portuguese Ledge SMCA	*	25.0%	75.0%	25.0%	*	—	*	25.0%
Soquel Canyon SMCA	*	25.0%	75.0%	25.0%	*	—	*	25.0%
White Rock-Cambria SMCA	*	—	—	25.0%	*	—	*	4.2%
Total number of MPAs impacting port/fishery combination	*	4	4	7	*	—	*	17

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to select multiple MPAs

In the port of Morro Bay, all fishermen interviewed in the California halibut-hook & line and 87.5 percent of fishermen interviewed in the nearshore finfish-live fishery indicated they were directly impacted by MPAs. Seventy five percent of California halibut-hook & line and nearshore finfish-live fishermen reported the loss of traditional fishing grounds from MPAs. Of the 15 responses from fishermen across all fisheries, 93.3 percent of them indicated experiencing direct impacts from MPAs and 73.3 percent of responses indicated loss of traditional fishing grounds. Again, the all target fisheries row includes individuals more than once if they participated in multiple fisheries.

Table 38. Percent of individuals indicating specific direct impact from MPAs for each fishery, Morro Bay

Fisheries	Number responding	Percent of respondents indicating direct impacts by MPAs	Type of impact			
			Fishing at borders	Traveling longer distances	Shifted efforts to areas with less predictable/worse weather	Loss of traditional fishing grounds
California halibut – hook & line	4	100.0%	75.0%	50.0%	50.0%	75.0%
Coastal pelagic species – seine/net	—	—	—	—	—	—
Dungeness crab – trap	—	—	—	—	—	—
Market squid – seine	—	—	—	—	—	—
Nearshore finfish – live	8	87.5%	25.0%	25.0%	12.5%	75.0%
Salmon–troll	2	*	*	*	*	*
Spot prawn – trap	1	*	*	*	*	*
All target fisheries	15	93.3%	33.3%	40.0%	26.7%	73.3%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to select multiple types of impacts

In addition to the commonly mentioned impacts from MPAs displayed in the table above, Table 39 provides additional perceived impacts from MPAs that fishermen discussed during interviews. Several fishermen indicated that MPAs have concentrated fishing effort into the remaining open fishing areas causing over-crowding and forcing fishermen to fish in less productive areas or causing areas to become less productive. Furthermore, some fishermen with smaller vessels also indicated that MPAs have decreased the overall area of available fishing grounds as their vessels may only travel safely a certain distance from port and with both MPAs and the RCA—they are forced to fish harder in remaining open areas or expend more effort/increase operating costs/increase the number of trips than in the past to fish less productive grounds. Lastly, fishermen also noted that MPAs have disrupted traditional fishing patterns such as in the salmon fishery in which they cannot follow schools of salmon through MPAs. Furthermore, fishermen indicated they often have a portfolio of fishing grounds they fish in rotation to let areas rest and that there are particular sequences in the fishing grounds they might fish on a given trip. This type of knowledge of fishing grounds is built over years of experience and several fishermen indicated that MPAs have disrupted these long-standing patterns of use.

Table 39. Other ways MPAs have impacted specific commercial fisheries, Morro Bay

Responses	Number responding			
	California halibut – hook & line	Nearshore finfish – live	Salmon– troll	Spot prawn – trap
Concentration of fishing effort into smaller areas/over-crowding	1	3	*	*
Decrease in available fishing grounds	1	2	*	*
Fishery less profitable	1	—	*	*
Less time at home	1	—	*	*
Fishing less productive areas	1	2	*	*
Loss of fishing opportunities	1	1	*	*
Distress around unintended infractions	—	—	*	*
Disrupts traditional fishing pattern	1	2	*	*
Increase in the number of trips	—	1	*	*
Increased operating costs	—	1	*	*
Total number responding	4	7	*	*

Source: Current study

Participants were allowed to include multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

The 14 MPAs listed in Table 37 were reported to have impacted at least one person in a specific port-fishery combination. The largest number of fisheries that a single MPA impacted was at least two fisheries. Within the port, California halibut-hook & line fishermen reported being impacted by the largest number of MPAs (13 MPAs). The last column in the table sums the number of responses across each fishery and divides by the number of responses across all fisheries (15 responses) to show which MPAs were most commonly reported as having the most impact on fishermen in the port. Across the port and across the fisheries, Point Buchon SMR, Cambria SMCA, and White Rock-Cambria SMCA impacted the largest number of fishermen interviewed.

Table 40. Percent of respondents indicating specific MPA impacting commercial fishery, Morro Bay

MPAs	California halibut – hook & line	Nearshore finfish – live	Salmon–troll	Spot prawn – trap	All target fisheries
Number responding	4	8	2	1	15
Big Creek SMCA	25.0%	—	*	*	13.3%
Big Creek SMR	25.0%	25.0%	*	*	33.3%
Cambria SMCA	75.0%	50.0%	*	*	53.3%
Morro Bay SMR	25.0%	—	*	*	6.7%
Morro Bay SMRMA	50.0%	—	*	*	13.3%
Piedras Blancas SMCA	50.0%	37.5%	*	*	40.0%
Piedras Blancas SMR	50.0%	62.5%	*	*	53.3%
Point Buchon SMCA	75.0%	12.5%	*	*	33.3%
Point Buchon SMR	50.0%	62.5%	*	*	53.3%
Point Sur SMCA	25.0%	25.0%	*	*	20.0%
Point Sur SMR	25.0%	50.0%	*	*	33.3%
Vandenberg SMR	50.0%	25.0%	*	*	33.3%
White Rock-Cambria SMCA	75.0%	37.5%	*	*	46.7%
Total number of MPAs impacting port/fishery combination	13	10	*	*	14

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to select multiple MPAs

In the port of Avila/Port San Luis, all fishermen interviewed in the nearshore finfish-live fishery indicated they were directly impacted by MPAs and loss traditional fishing grounds to MPAs. Of the 5 responses from fishermen across all fisheries, 80.0 percent of them indicated experiencing direct impacts from MPAs and 80.0 percent of responses indicated loss of traditional fishing grounds. Again, the all target fisheries row includes individuals more than once if they participated in multiple fisheries.

Table 41. Percent of individuals indicating specific direct impact from MPAs for each fishery, Avila/Port San Luis

Fisheries	Number responding	Percent of respondents indicating direct impacts by MPAs	Type of impact			
			Fishing at borders	Traveling longer distances	Shifted efforts to areas with less predictable/worse weather	Loss of traditional fishing grounds
California halibut – hook & line	1	*	*	*	*	*
Coastal pelagic species – seine/net	—	—	—	—	—	—
Dungeness crab – trap	—	—	—	—	—	—
Market squid – seine	—	—	—	—	—	—
Nearshore finfish – live	4	100.0%	25.0%	50.0%	50.0%	100.0%
Salmon–troll	—	—	—	—	—	—
Spot prawn – trap	—	—	—	—	—	—
All target fisheries	5	80.0%	20.0%	40.0%	40.0%	80.0%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Participants were allowed to select multiple types of impacts

In addition to the commonly mentioned impacts from MPAs displayed in the table above, Table 42 provides additional perceived impacts from MPAs that fishermen discussed during interviews. Several fishermen with smaller vessels indicated that MPAs have decreased the overall area of available fishing grounds as their vessels may only travel safely a certain distance from port. Furthermore, with both MPAs and the RCA—fishermen are forced to fish harder in remaining open areas or expend more effort/increase operating costs/increase the number of trips than in the past to fish less productive grounds. Lastly, fishermen also noted that MPAs have disrupted traditional fishing patterns as they often have a portfolio of fishing grounds they fish in rotation to let areas rest and that there are particular sequences in the fishing grounds they might fish on a given trip. This type of knowledge of fishing grounds is built over years of experience and fishermen indicated that MPAs have disrupted these long-standing patterns of use.

Table 42. Other ways MPAs have impacted specific commercial fisheries, Avila/Port San Luis

Responses	Number responding
	Nearshore finfish – live
Concentration of fishing effort into smaller areas/over-crowding	—
Decrease in available fishing grounds	2
Fishery less profitable	—
Less time at home	—
Fishing less productive areas	—
Loss of fishing opportunities	—
Distress around unintended infractions	—
Disrupts traditional fishing pattern	2
Increase in the number of trips	1
Increased operating costs	2
Total number responding	4

Source: Current study

Participants were allowed to include multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The 6 MPAs listed in Table 40 were reported to have impacted at least one person in the nearshore finfish-live fishery. Within this fishery in this port, Point Buchon SMCA and SMR and Vandenberg SMR, impacted the largest number of fishermen interviewed.

Table 43. Percent of respondents indicating specific MPA impacting commercial fishery, Avila/Port San Luis

MPAs	Nearshore finfish – live
Number responding	4
Point Buchon SMCA	100.0%
Point Buchon SMR	75.0%
Point Sur SMCA	25.0%
Point Sur SMR	25.0%
Vandenberg SMR	100.0%
White Rock-Cambria SMCA	25.0%
Total number of MPAs impacting port/fishery combination	6

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

Participants were allowed to select multiple MPAs

4.4. Regional Commercial Fishery Profiles

4.4.1. California Halibut—Hook & Line: Initial Changes and Baseline Characterization

In the past, California halibut (*Paralichthys californicus*) was targeted primarily by trawl and gill net gear types and the hook and line gear made up a fairly small portion of the California halibut landings (CDFG 2004). However, in 2001 gill nets were banned in waters less than 60 fathoms in the Central Coast Region (CDFG 2004) and in 2006 the Pacific Fisheries Management Council prohibited the use of trawl gear in designated Essential Fish Habitat conservation zones (Frey et al. 2012). With these limitations placed on other types of gear and the fact that the California halibut fishery remains an open access fishery, the number of fishermen and ex-vessel revenue levels have increased since 2007 as shown in Figure 13 below. During interviews, fishermen reported that increases in the number of fishermen participating in the fishery was due to increasing restrictions on other commercial fisheries and fishermen seeking to diversify their fishing portfolios. As the California halibut—hook & line fishery remains an open access fishery, fishermen may participate in the fishery without large upfront costs of purchasing a permit or investments in specialized gear. Although it is easy to participate in the fishery, fishermen noted that California halibut are an elusive fish and to be successful in the fishery requires significant investment in time to develop the necessary skill and experience. For the reasons above fishermen noted that the California halibut fishery has many fishermen who enter and exit the fishery relatively quickly and make a small amount of landings while they test out the fishery. This can be observed in Table 4 which shows a large number of fishermen making small amounts of landings in the California halibut—hook & line fishery in 2011.

The California halibut—hook & line fishery is a high value fishery, where fishermen receive a relatively high ex-vessel price per pound landed, as can be seen in Figure 13. In 1992 and 2011, landings remained around 26,000 pounds, though fluctuated some across this study period. Over the study period, a maximum of 36,600 pounds was landed in 2003. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

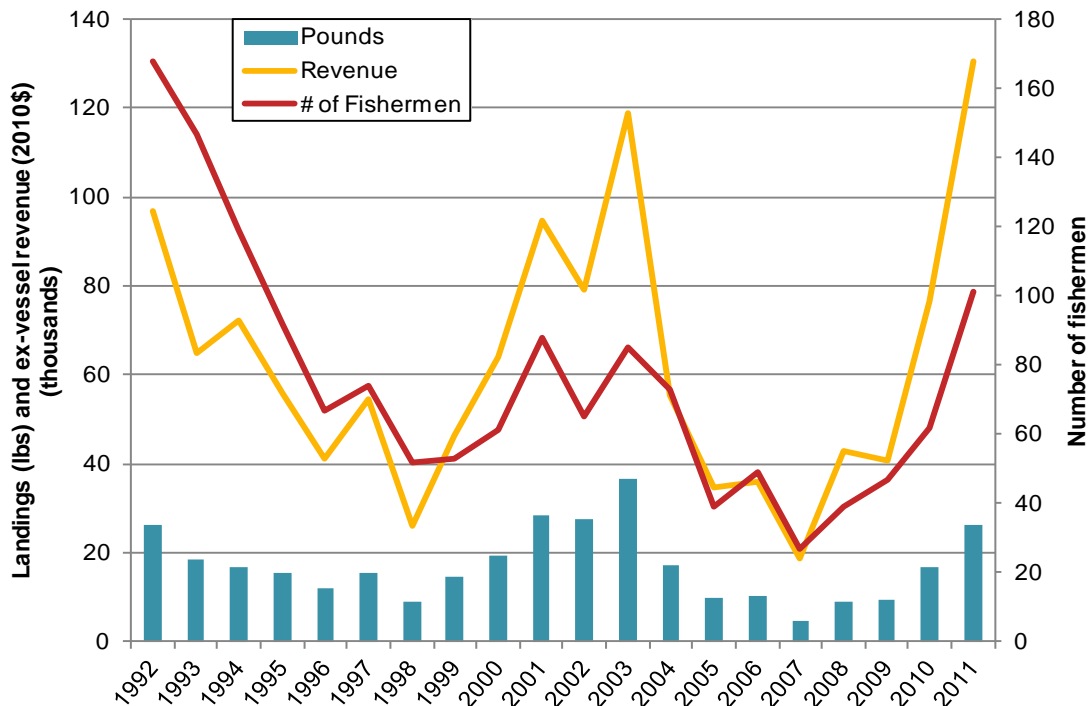
Over the study period, on average, a Central Coast Region California halibut—hook & line fisherman landed an annual total of 237 pounds for \$863 in ex-vessel revenues, making five landings a year on average to do so, see Figure 14. The count of landings per fisherman per year stayed relatively stable between three to six landings over the study period, while average ex-vessel revenues per fisherman increased 124.4 percent from 1992 (\$576) to 2011 (\$1,293). These low amounts of average pounds and ex-vessel revenue landed for each fisherman is indicative of the fact that many fishermen make small amounts of landings in this fishery for the reasons mentioned above.

Average ex-vessel price per pound rose steadily from 1992 to 2011 from \$3.66 per pound to \$4.97 per pound respectively, see Figure 15. Although landings were relatively similar between 1992 and 2011, with 1992 landings even slightly greater, 2011 ex-vessel revenues were almost 35 percent higher and were, in fact, the highest ex-vessel revenues made in the fishery over the entire study period at \$130,577. Input from the fishing community indicated that fishermen are catching larger sized fish and thus receiving higher prices for them. The year of the highest landings (36,600 pounds), 2003, ex-vessel revenues reached the second highest value in the study period at \$118,880.

Like the state of California and the Central Coast Region, the California halibut—hook & line fishery also experienced an overall decline in the number of fishermen, down nearly 40 percent in 2011 from 1992 levels. The year with the lowest number of fishermen was 2007 where only 27 fishermen made landings in this fishery. Input from the fishing community indicated that declines in landings in 2006 and 2007 were due to Korean flatfish flooding foreign markets and thus demand was low for California halibut during these years.

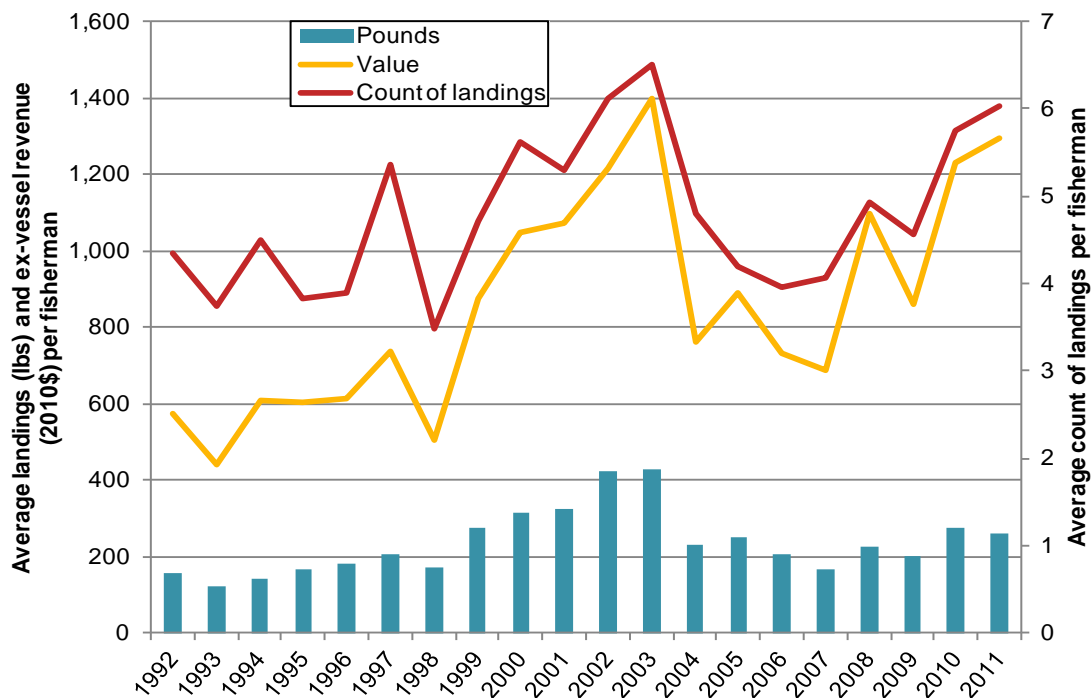
Although the California halibut—hook & line fishery did not constitute a large portion of the Central Coast Region's total landings and ex-vessel revenues, on average it has become an increasingly important fishery in its contribution to fishing income, see Figure 12. In 2011 alone it accounted for 16.5 percent of the average fisherman's fishing income, up from 4.6 percent in 1992.

Figure 13. California halibut–hook & line commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



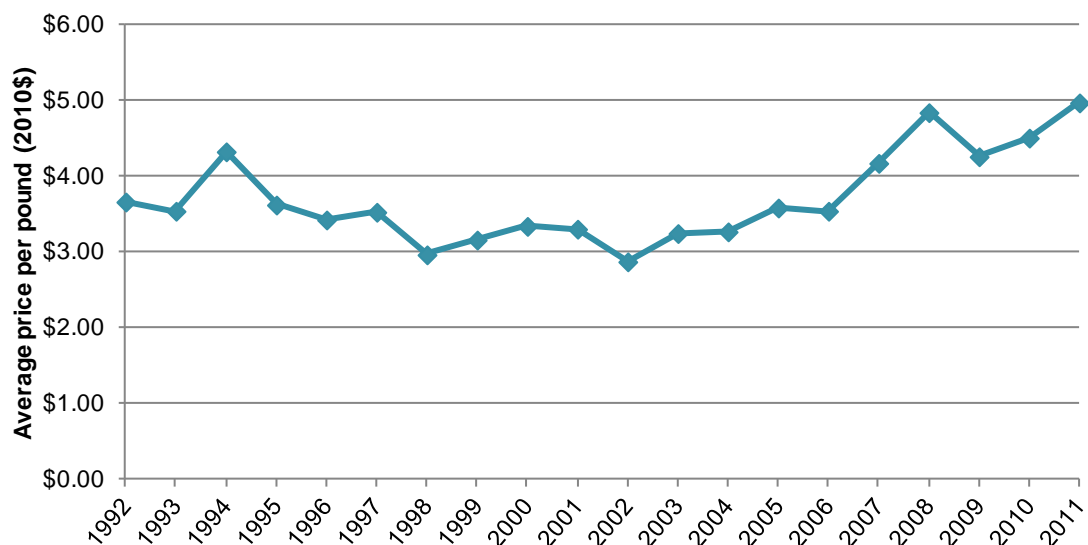
Source: Landings data from CDFG

Figure 14: California halibut–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Source: Landings data from CDFG

Figure 15. California halibut–hook & line commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Table 44 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the California halibut–hook & line fishery over recent time periods organized into both pre and post MPA implementation periods. Changes are presented for the Central Coast Region and compared with those observed in the fishery at the state level. In the Central Coast Region and throughout the state, California halibut–hook & line ex-vessel revenues increased from 2000 to 2003 then decreased from 2004 to 2007, though more significantly in the study area. Then, from 2008 to 2011, after MPA implementation, while declines in the fishery's revenue continued at the state level, in the Central Coast Region they increased significantly by 205.2 percent. It is interesting to note that changes in average ex-vessel revenues per fishermen in the Central Coast Region have not been as drastic as changes observed for total ex-vessel revenues, this may have occurred as more fishermen are making landings in the fishery. Overall, the Central Coast Region saw a greater increase in revenues from this fishery than was observed at the state level.

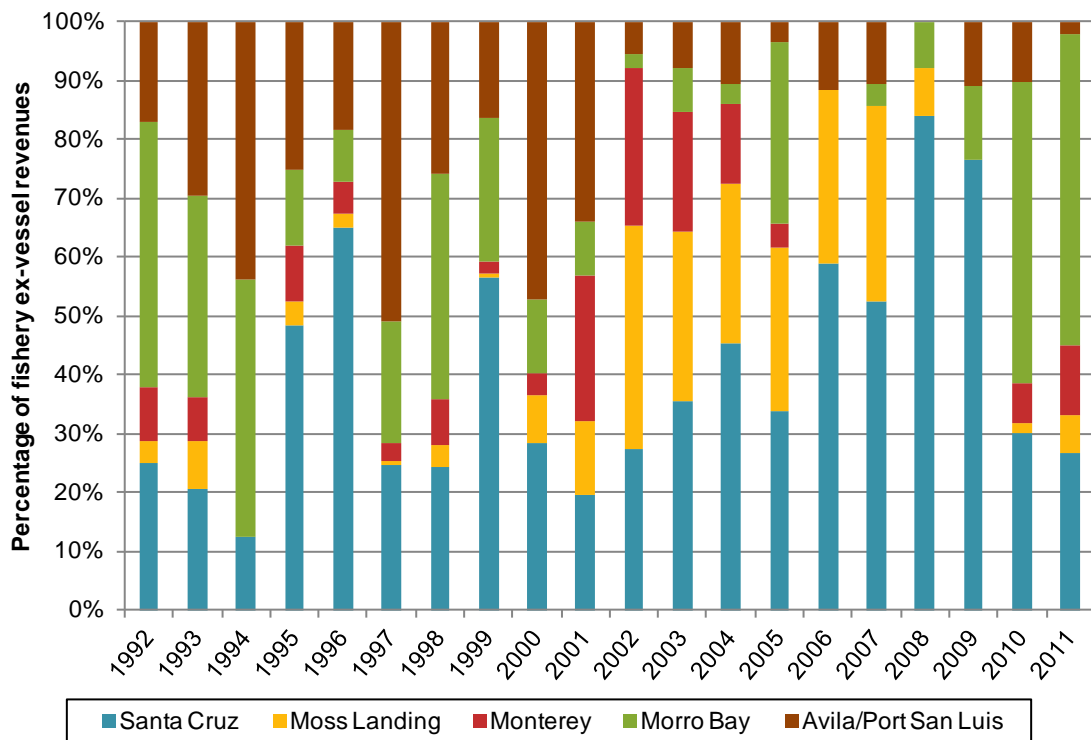
Figure 16 displays the commercial ex-vessel revenues for the California halibut–hook & line fishery by Central Coast Region ports. The port of Santa Cruz had the highest percent of total ex-vessel revenues among Central Coast Region ports over the study period at 39.7 percent on average annually. In 2008, Santa Cruz ex-vessel revenues constituted 83.9 percent of all California halibut–hook & line ex-vessel revenues in the Central Coast Region. While Moss Landing averaged only 12.2 percent annually of total Central Coast Region ex-vessel revenues for this fishery, this percentage nearly doubled to 23.7 percent over the years 2000 to 2008. Avila/Port San Luis' portion of California halibut–hook & line ex-vessel revenues declined considerably over the study period 16.9 percent in 1992 to 2.1 percent in 2001 and it was the only port in the Central Coast region with a general overall decline of California halibut–hook & line ex-vessel revenues. In the year with the highest California halibut–hook & line ex-vessel revenues, 2011, Morro Bay had the highest ex-vessel revenue among Central Coast Region ports (\$69,192) for any year over the study period.

Table 44: California halibut-hook & line: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	85.6%	-66.6%	205.2%	103.9%
	Average per fisherman	33.2%	-9.8%	17.8%	23.1%
State	Total	75.9%	-32.5%	-21.3%	61.7%
	Average per fisherman	68.5%	-4.5%	-27.0%	66.6%

Source: Landings data from CDFG

Figure 16: California halibut-hook & line commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

We interviewed ten California halibut-hook & line fishermen in the Central Coast Region, four of which were from Morro Bay, and three of which were from Santa Cruz. Their average ages and number of years experience commercial fishing are shown below in Table 45.

Table 45. Average age and years experience commercial fishing, California halibut–hook & line

Ports	Individuals Interviewed	Age		Years experience	
		Average	Standard deviation	Average	Standard deviation
Santa Cruz	3	47.7	7.1	25.7	13.1
Monterey/Moss Landing	2	*	*	*	*
Morro Bay	4	40.3	12.6	19.5	18.0
Avila/ Port San Luis	1	*	*	*	*
Central Coast Region	10	43.4	12.5	18.8	14.2

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

Region wide, California halibut–hook & line fishermen experienced a reduction in overall commercial fishing related income and this decrease was more prevalent in Morro Bay than Santa Cruz (Table 46). Across the Central Coast Region California halibut–hook & line fishermen reported that only 52.5 percent of their income came from commercial fishing in 2011 and only slightly more (60.6 percent) in 2006 (Table 46). This is lower than the average across all fisheries and the lowest fishery average of all target fisheries. Only two fishermen we spoke who participated in the California halibut–hook & line fishery derived 100 percent of their income from commercial fishing—all the others indicated they held a part time job and/or collected retirement benefits. Additional sources of income are shown below in Table 49.

Table 46. Percent change in income from overall commercial fishing from 2006–2011, California halibut–hook & line

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	70.0%	26.5%	66.7%	28.9%	-5.6%	9.6%
Moss Landing/Monterey	*	*	*	*	*	*
Morro Bay	66.7%	41.6%	47.5%	32.8%	-20.8%	68.8%
Avila/ Port San Luis	*	*	*	*	*	*
Central Coast Region	60.6%	31.9%	52.2%	34.2%	-9.5%	43.8%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

All of the California halibut–hook & line fishermen who reported a change in their percent income in fishing provided further information on the factors to which they attributed this change. Additional reasons for change in percent income are shown below in Table 47. Respondents were asked this open-ended question and the interviewer took notes that were later coded into the categories listed below. Some fishermen responded that they added the California halibut–hook & line fishery to their portfolio because of declines in other fisheries, mainly salmon.

Table 47. Cause of change in percent income from commercial fishing from 2006–2011, California halibut–hook & line

Response	Number responding
Increased regulation	2
Intensified fishing efforts	1
Had additional job or source of income	1
Found additional job or source of income	1
Change in fish abundance	2
Total number responding	6

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 48. Other sources of income other than commercial fishing in 2011, California halibut–hook & line

Response	Number responding
Skilled labor	5
Investments/retirement/social security	1
Business/Office work	5
Other maritime occupation	2
Total number responding	8

Source: Current study

Participants were allowed to give multiples responses

Fishermen who participated in the California halibut–hook & line fishery reported the greatest increase in overall commercial fishing operating costs from 2006 to 2011. Despite this increase, California halibut–hook & line they have on average the lowest percent of overall commercial fishing operating costs than all other fisheries in 2006 and less than all others except nearshore finfish–live in 2011. Changes in commercial fishing operating cost were higher for fishermen in Morro Bay than Santa Cruz for both 2006 and 2011 although Morro Bay reported a much bigger increase over that time frame.

Table 49. Percent change in overall commercial fishing operating costs from 2006–2011, California halibut–hook & line

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	43.3%	40.4%	46.7%	37.9%	11.1%	19.2%
Moss Landing/Monterey	*	*	*	*	*	*
Morro Bay	17.5%	3.5%	48.3%	45.4%	40.0%	56.6%
Avila/ Port San Luis	*	*	*	*	*	*
Central Coast Region	34.1%	27.0%	47.0%	31.7%	23.8%	32.8%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

California halibut–hook & line fishermen reported a variety of reasons for increasing operating costs. Again responses to this open ended question were coded into categories shown below in

Table 50. Two individuals mentioned that they had to invest in a large upgrade or where just getting into the fishery and had to invest in new gear. Additionally, fishermen expressed that a general decrease in income and an increase in costs has resulted in a larger percent of their commercial fishing gross revenue being spent on operating costs.

Table 50. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, California halibut–hook & line

Response	Number responding
Large capital investment	2
Decrease in fishing income	2
Decrease in fishing grounds	—
Increase in fishing expenses	3
Fishing less in 2006	—
Fishing less in 2011	1
Total number responding	6

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

All respondents had either one crew member or fished alone without a crew - for an average of 0.5 crew across the Central Coast Region. Additional summary statistics for the California halibut–hook & line fishery are show below in Table 51.

Table 51. Additional commercial fishery specific data, California halibut–hook & line

Fisheries	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	28.7	11.8	—	—	—	—	15.0%	5.0%
Moss Landing/Monterey	*	*	*	*	*	*	*	*
Morro Bay	18.3	19.2	0.8	0.5	20.0%	14.1%	15.7%	5.1%
Avila/ Port San Luis	*	*	*	*	*	*	*	*
Central Coast Region	19.2	15.3	0.5	0.5	11.0%	12.6%	12.4%	5.8%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Some individuals indicated they had added the California halibut—hook & line fishery since 2006, while the remaining reported they had been fishing it prior to 2006 and were currently fishing in 2011.

Table 52. California halibut, added/dropped since 2006 or not fished in 2011

Ports	Number responding	Percent responding		Not fished in 2011
		Added	Dropped	
Santa Cruz	3	—	—	*
Moss Landing/Monterey	2	*	*	*
Morro Bay	4	25.0%	—	—
Avila/ Port San Luis	1	*	*	*
Central Coast Region	10	30.0%	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

As shown in Table 53, those who provided a reason for adding the California halibut—hook & line fishery responded that they were new to commercial fishing.

Table 53. California halibut, reason for adding/dropping since 2006 or not fishing a fishery in 2011

Responses	Number responding
Started commercial fishing	2
Change in fish population	—
Diversify fisheries	—
Was able to obtain permit	—
High costs	—
Total number responding	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked to compare the success of the California halibut—hook & line fishery in 2011 to the success in this fishery in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 4) somewhat worse; and 5) significantly worse.

When asked how the success of their fishery in 2001 compared to the previous five years most respondents replied that it was the same or somewhat better. No one felt that the fishery was significantly worse than recent previous years, although 50.0 percent of the respondents from Morro Bay responded that the fishery was somewhat worse, while only 25.0 percent responded that it was somewhat better.

Table 54. Overall success in specific commercial fishery compared to previous five years, California halibut—hook & line

Fisheries	Number responding	Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Santa Cruz	3	—	—	33.3%	33.3%	33.3%	—
Moss Landing/Monterey	2	*	*	*	*	*	*
Morro Bay	4	—	—	25.0%	25.0%	50.0%	—
Avila/ Port San Luis	1	*	*	*	*	*	*
Central Coast Region	10	—	10.0%	30.0%	30.0%	30.0%	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were then asked what factors they felt had contributed to the level of success in California halibut—hook & line fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

Several California halibut—hook & line fishermen mentioned that the fishery seemed to be recovering from the reduction of the trawl fleet and has also benefited from the ban on gill nets. Additional regulatory factors/changes that impacted the success of the fishery are shown below in Table 55. An additional issue that was brought up is competition with recreational or CPFV fishermen. A few environmental and economic factors were also mentioned as detailed in the tables below. Two fishermen noted an increase in market squid for the year and felt that this had helped the California halibut—hook & line fishery (Table 158). One fisherman noted an increase in operating costs and that there was an increase in the number of people in the fishery (Table 57). Lastly, when asked about any other factors influencing success in the California halibut—hook & line fishery one individual mentioned a general decline in fishing knowledge and cultural fishing heritage (Table 58).

Table 55. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, California halibut–hook & line

Response	Number responding
MPA impacts	1
Insufficient monitoring/enforcement/communication of MPAs	—
Trawlers impacting nearshore fleet	2
Quota limit issues	1
Concentration of fishing effort into smaller areas/over-crowding	—
Regulations have resulted in less competition	—
Inefficiencies in bycatch regulations	—
Inefficiencies/inconsistencies in fishery regulations	1
Inequities in fishery regulations	—
Inadequate research for policy	—
Inequities in obtaining fishery permits	—
Insufficient regulation on land-based impacts to fisheries	—
Lack of influence on policy/regulation development	—
Insufficient communication of fishery regulations	—
Populations recovering from fishing gear ban	3
Distress around unintended infractions	—
Increased number of fishermen participating in the fishery	—
Increased personal fishing effort	—
Rockfish conservation area (RCA)	1
Total number responding	5

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 56. Environmental changes/factors influencing success in specific commercial fishery in previous five years, California halibut–hook & line

Response	Number responding
Increase in bait fish	2
Increase in fish abundance	—
Stable fish abundance	3
Increase in catch	2
Decrease in catch	1
Increase in predators	—
Good weather	—
Biomass of fish largely in MPAs	—
PG&E seismic testing impacts	1
Decrease in habitat or water quality	—
Decrease in fish abundance	—
Change in normal water temp	—
Fish population moved further offshore	—
Decrease in fish size	—
Farmed fish spreading disease	—
Protected species overpopulated	—
Total number responding	6

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 57. Economic changes/factors influencing success in specific commercial fishery in previous five years, California halibut–hook & line

Response	Number responding
Increased number of fishermen participating in the fishery	1
Increase in operating costs	1
Increase in fish price	—
Decrease in fish price	—
Market flooded	—
Longer season allowed increase in catch	—
Increased demand for fish	—
Decrease in demand for fish	—
Increased personal fishing effort	—
Increased number of outside vessels fishing in local grounds	—
Lack of port infrastructure	—
Increase in travel distance	—
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 58. Other changes/factors influencing success in specific commercial fishery in previous five years, California halibut–hook & line

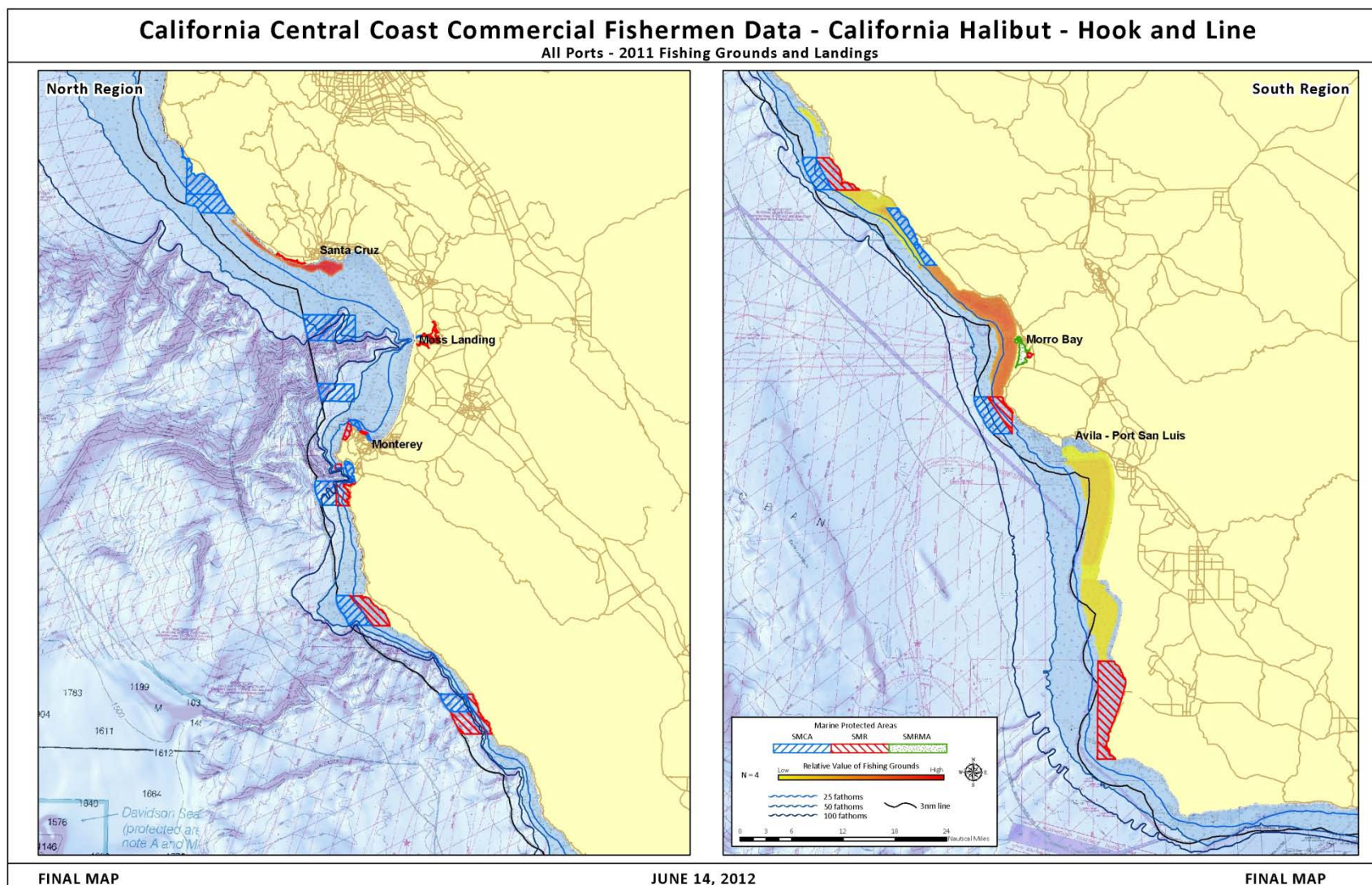
Response	Number responding
Increase in fishing experience	—
Loss of historical fishing knowledge	1
Fisherman's knowledge not valued	—
Lack of outreach to fishing community	—
Loss of cultural fishing heritage	1
Total number responding	1

Source: Current study

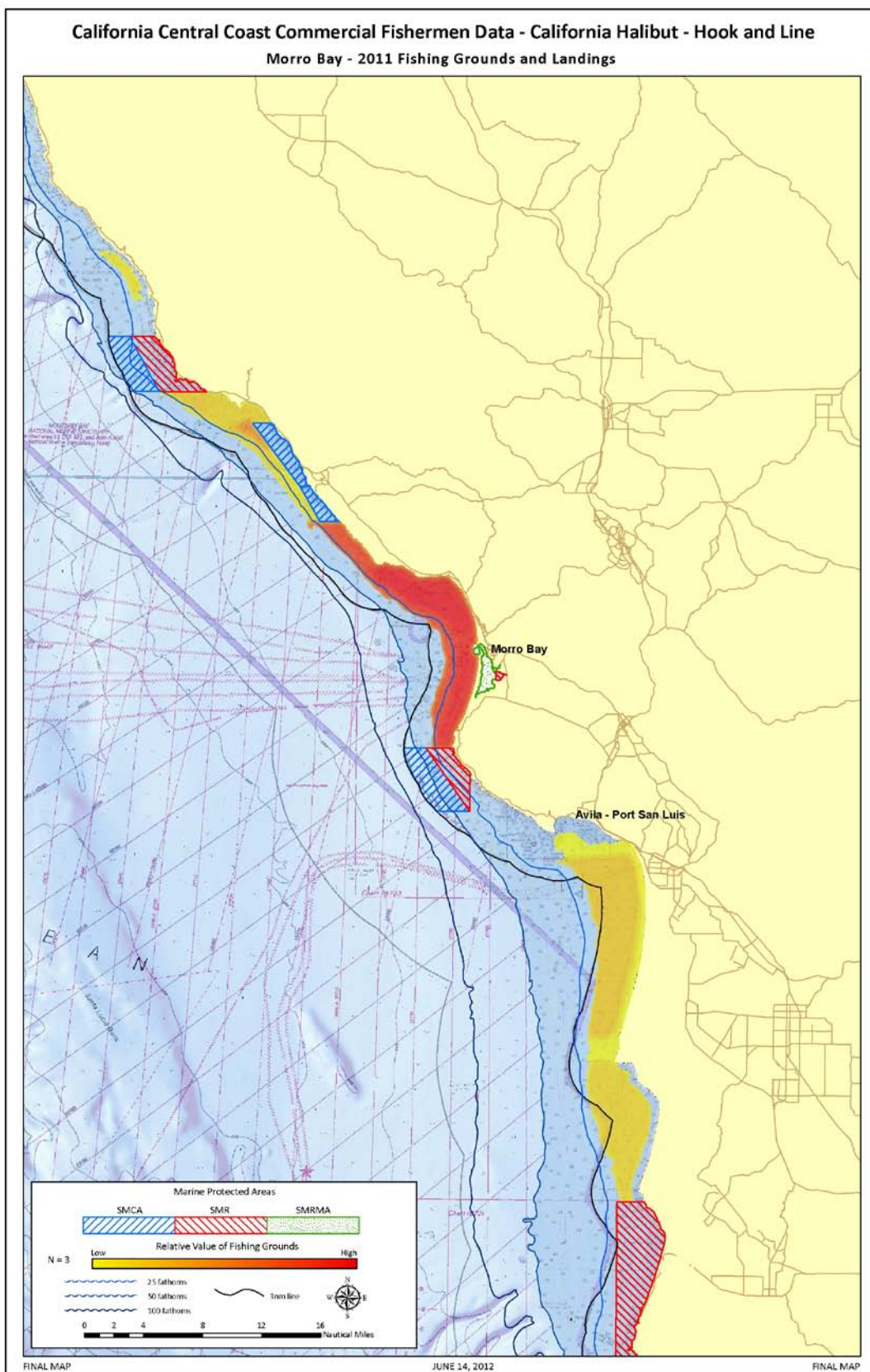
Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Map 3. California halibut–hook & line 2011 commercial fishing value map, Central Coast Region



Map 4. California halibut–hook & line 2011 commercial fishing value map, Morro Bay



4.4.2. Coastal Pelagic Species–Seine/Net: Initial Changes and Baseline Characterization

The coastal pelagic species fishery, often referred to as wetfish because of the traditional way they were packaged “wet” or raw in cans, include the species Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), and northern anchovy (*Engraulis mordax*). Together these species make up one of the largest fisheries in California, both in terms of pounds landed and ex-vessel revenue (Leet et al. 2001). In the Central Coast Region the coastal pelagic species—seine/net fishery lands almost exclusively in Monterey and Moss Landing where receivers and processors are set up to offload catch via a pump system. The majority of the catch is then frozen and sold overseas (Pomeroy et al. 2002). The coastal pelagic species–seine/net fishery is highly variable; often operating in a ‘boom or bust’ fashion (Leet et al. 2001) and species composition and abundance of catch often changes with water temperatures and El Niño patterns (Pomeroy et al. 2002).

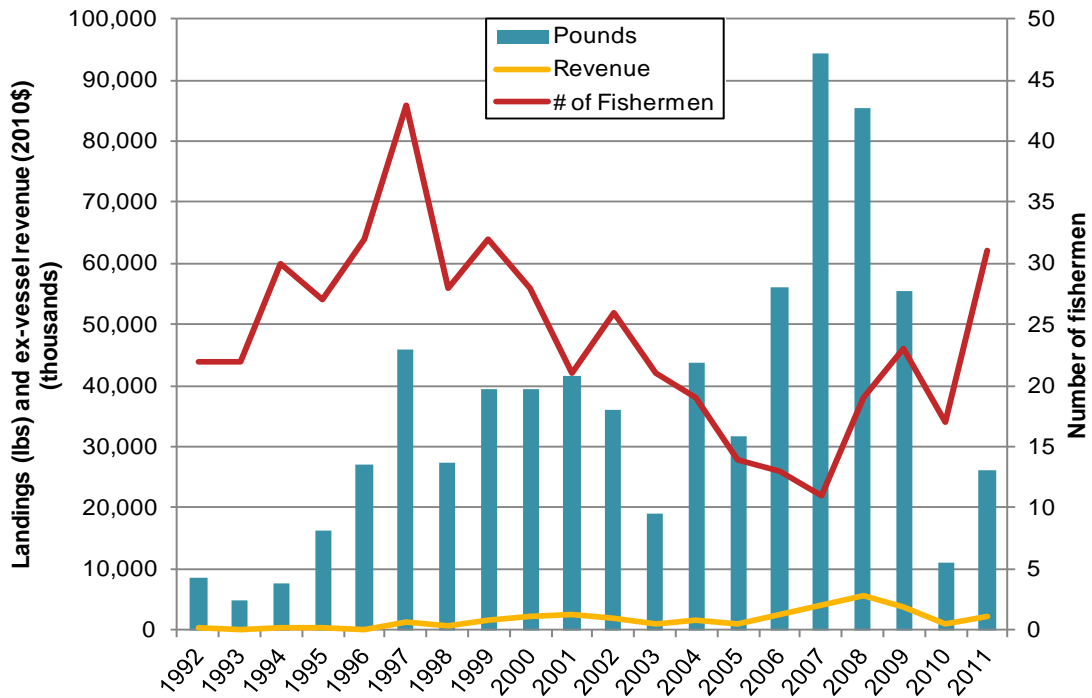
In interviews fishermen noted that the coastal pelagic species–seine/net fishery was still gaining momentum as the market re-developed in the early 1990s. As the market and demand developed and increased for the fishery in foreign markets the price has increased over time. For the years 2007-2009, the coastal pelagic species-seine/net fishery had high levels of quota and thus fishermen were able to fish year round. However, in 2010 low quota limits were set and fishermen report only being able to fish a couple months until the quota limit was reached. The coastal pelagic species-seine/net fishery is managed under a west coast wide quota system and fishermen noted that at times quota limits may be reached for the west coast before the majority of coastal pelagic fish stocks reach California. Fishermen also noted that as the market for coastal pelagic species develops and larger profit margins are realized more and more fishermen are entering the fishery. Of note is that in 2011 new market demands in Russia increased interest in the fishery. This new market demand lead to a higher price for coastal pelagic species and ex-vessel revenue for the fishery rose to levels not seen since 1999. Even though ex-vessel revenue levels were high quota limits were still set lower than 2008 and 2009 levels. In 2008 and 2009 fishermen noted that an abundance of fish in California coastal waters lead to rises in the pounds caught.

Unlike the California halibut–hook & line fishery, the coastal pelagic species–seine/net fishery is by weight a relatively low value fishery, where substantial landings pull in smaller ex-vessel prices relative to other fisheries. By weight and revenue, this fishery dominated landings in the Central Coast Region. Total landings were 8.7 million pounds in 1992, peaked in 2007 at 94.3 million pounds, and in 2011 were at 26.3 million pounds. Ex-vessel revenues over the study period began at \$251,149 in 1992, then increased substantially peaking in 2008 at \$5.5 million and by 2011 ex-vessel revenue levels were at \$2.2 million. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

Unlike most other fisheries of interest, the coastal pelagic species–seine/net fishery had a greater number of fishermen at the end of the study period (31) than at the beginning (22), representing an overall increase of 40.9 percent. The average Central Coast Region coastal pelagic species–seine/net fisherman made an average of 22 landings annually, and per year landed an overall total average of 1.9 million pounds for \$88,381 in ex-vessel revenues over the study period, see Figure 18.

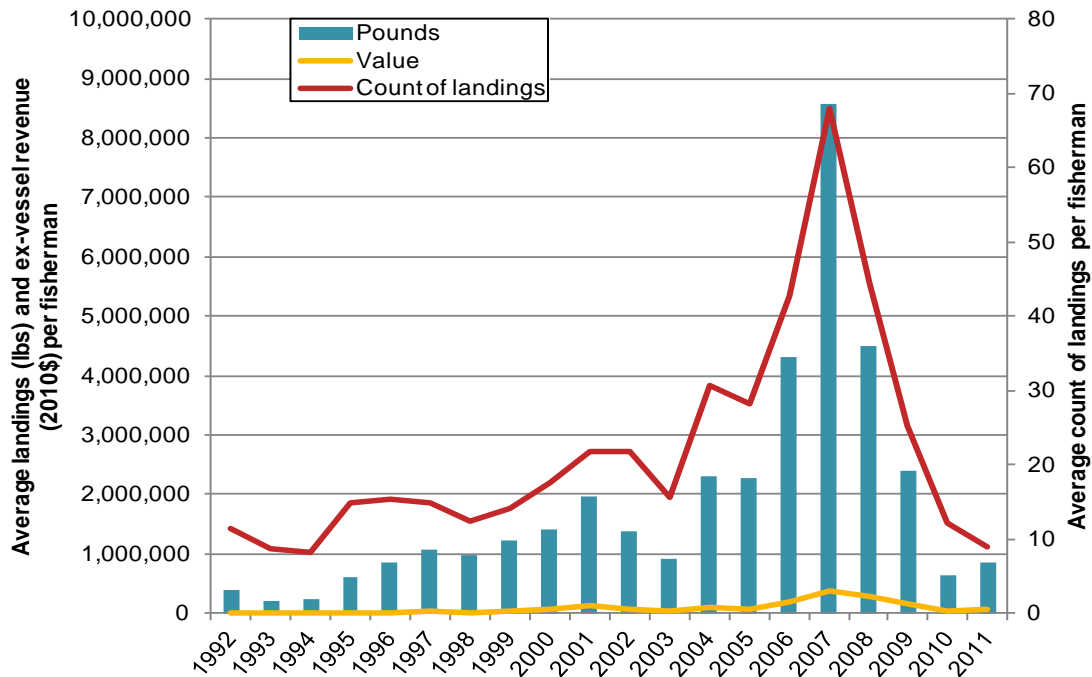
The average ex-vessel price of the coastal pelagic species–seine/net fishery substantially increased over the study period, almost 200 percent, from \$63.94 to \$188.20 per metric ton from 1992 to 2011.

Figure 17. Coastal pelagic species–seine/net commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



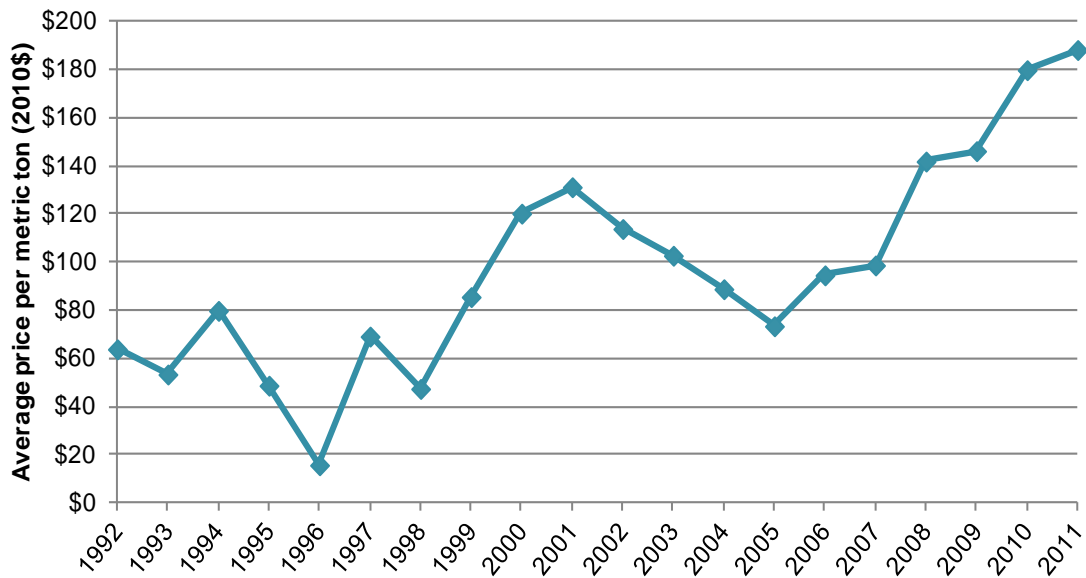
Source: Landings data from CDFG

Figure 18. Coastal pelagic species–seine/net: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Source: Landings data from CDFG

Figure 19. Coastal pelagic species–seine/net commercial fishery average ex-vessel price per metric ton in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Table 59 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the coastal pelagic species–seine/net fishery over recent time periods both pre and post MPA implementation. Changes are presented for the Central Coast Region and compared with changes in the fishery at the state level. At both the state and region levels, revenues increased considerably from 2004 to 2007, though they decreased in the time periods just before and afterwards. In the Central Coast Region, this large increase is likely due to 2007 being the year that the largest amount of landings were made throughout 1992–2011.

The average revenues per fishermen increased 314 percent from 2004 to 2007 as the number of fishermen had actually decreased by approximately 42.1 percent. The following year in 2008 (the year following the implementation of the MPA network) the coastal pelagic species–seine/net fishery landed its highest ex-vessel revenues recorded in the Central Coast Region over the study period for that fishery. By 2011, landings and ex-vessel revenues fell again in both the Central Coast Region and the state. From 2000 to 2011 the coastal pelagic species–seine/net fishery saw a four percent increase in ex-vessel revenue in the Central Coast Region in, however, at the state level revenues in 2011 were nearly half the value they were in 2000.

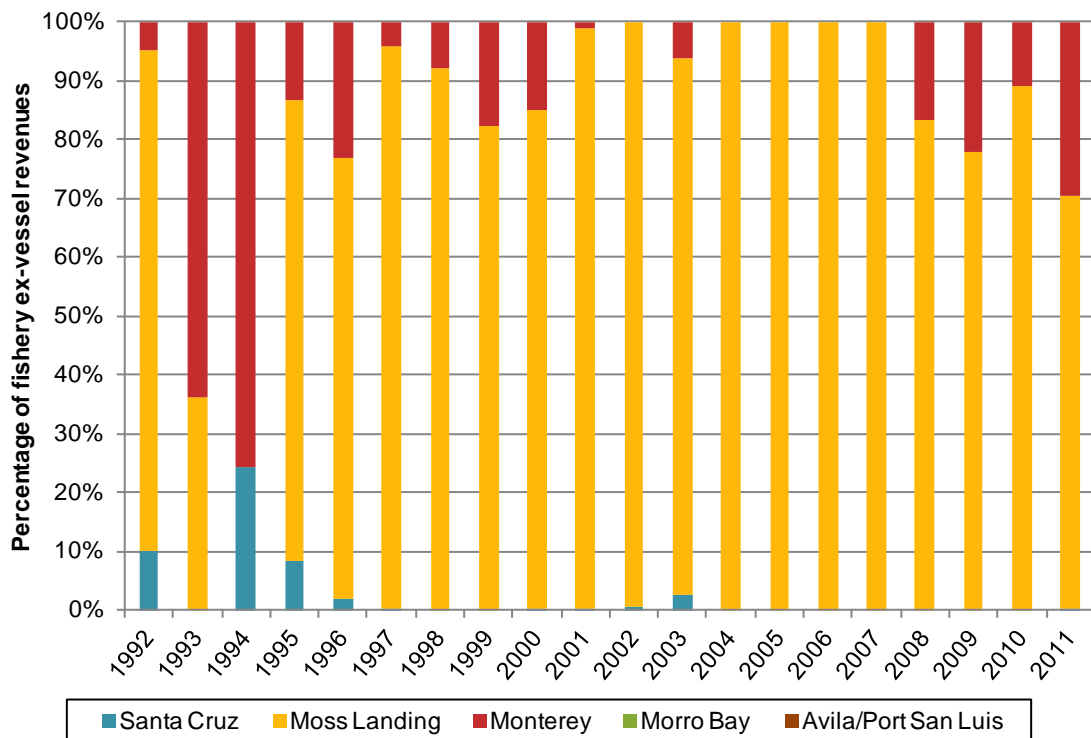
Moss Landing landed the majority of volume and ex-vessel revenues in the coastal pelagic species–seine/net fishery compared to other Central Coast Region ports, bringing in an average of 72.4 percent of total fishery landings among Central Coast Region ports and 82 percent of total ex-vessel revenues, see Figure 20. However, in the early part of the study period, when coastal pelagic species–seine/net landings volumes were relatively low, other ports such as Monterey constituted larger portions of total ex-vessel revenues in the fishery than later on. In fact, in 1994 Monterey landed approximately two thirds of total ex-vessel revenues. Although Figure 20 does not display contributions from Morro Bay or Avila/Port San Luis due to confidentiality constraints (as there are often less than three fishermen participating in the coastal pelagic species–seine/net fishery in those ports), coastal pelagic species–seine/net landings were made in those ports over the study period.

Table 59. Coastal pelagic species–seine/net: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	-58.8%	139.7%	-59.2%	4.0%
	Average per fisherman	-45.0%	314.0%	-75.0%	-6.0%
State	Total	-63.8%	70.0%	-37.9%	-49.4%
	Average per fisherman	-54.4%	48.3%	-41.8%	-37.8%

Source: Landings data from CDFG

Figure 20. Coastal pelagic species–seine/net commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

We interviewed four fishermen who participated in the coastal pelagic species–seine/net fishery, all of which were from either Monterey or Moss Landing. Fishermen noted that the fishing grounds for both ports were the same and fishermen often landed in Moss Landing because it is less crowded and has better facilities. All four coastal pelagic species–seine/net fishermen we spoke to also participate in the market squid–seine fishery and had the highest average years experience commercial fishing (35 years) compared to other target fisheries.

Table 60. Average age and years experience commercial fishing, Coastal pelagic species–seine/net

Ports	Individuals Interviewed	Age		Years experience	
		Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—
Moss Landing/Monterey	4	56.3	12.0	35.0	17.5
Morro Bay	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—
Central Coast Region	4	56.3	12.0	35.0	17.5

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

On average coastal pelagic species–seine/net fishermen make nearly 100 percent of their income from commercial fishing and reported no change in their overall percent income from commercial fishing between 2006 and 2011 (Table 61).

Table 61. Percent change in income from overall commercial fishing from 2006–2011, Coastal pelagic species–seine/net

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—	—
Moss Landing/Monterey	97.5%	5.0%	97.5%	5.0%	—	—
Morro Bay	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	97.5%	5.0%	97.5%	5.0%	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

The small portion of income that was not from commercial fishing was noted by one fisherman as from investments.

Table 62. Other sources of income other than commercial fishing in 2011, Coastal pelagic species–seine/net

Response	Number responding
Skilled labor	—
Investments/retirement/social security	1
Business/office work	—
Other maritime occupation	—
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

On average, coastal pelagic species–seine/net fishermen reported that 73.5 percent of their gross revenue went towards operating costs in 2011, a 7.1 percent increase from 2006 (70.0 percent) (Table 63). This (along with the market squid–seine fishery) is the highest percentage reported for operating

costs yet the smallest percent change over the study period. Fishermen attributed the slight increase mainly to an increase in fishing expenses, often naming fuel specifically (Table 64).

Table 63. Percent change in overall commercial fishing operating costs from 2006–2011, Coastal pelagic species–seine/net

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—	—
Moss Landing/Monterey	70.0%	13.2%	73.5%	5.1%	7.1%	12.4%
Morro Bay	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	70.0%	13.2%	73.5%	5.1%	7.1%	12.4%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 64. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Coastal pelagic species–seine/net

Response	Number responding
Large capital investment	1
Decrease in fishing income	—
Decrease in fishing grounds	—
Increase in fishing expenses	4
Fishing less in 2006	—
Fishing less in 2011	—
Total number responding	4

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The large percentage of revenue going towards operating costs is likely influenced by the large crew reported by these two fisheries (5.3 crew on average) with 46.3 percent of their gross economic revenue (GER) going towards crew. Respondents only reported 10.0 percent of gross revenue used on average towards fuel—the least average percent spent on fuel of all the target fisheries (Table 65).

Table 65. Additional commercial fishery specific data, Coastal pelagic species—seine/net

Ports	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—	—	—	—
Moss Landing/Monterey	27.8	5.9	5.3	1.0	46.3%	8.5%	10.0%	—
Morro Bay	—	—	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—	—	—
Central Coast Region	27.8	5.9	5.3	1.0	46.3%	8.5%	10.0%	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

As shown in Table 66 no one reported adding or dropping this fishery since 2006 or not fishing it in 2011. This is the only fishery where no one we interviewed reported entry or exit to the fishery between 2006 to 2011.

Table 66. Coastal pelagic species—seine/net, added/dropped since 2006 or not fished in 2011

Ports	Number responding	Percent responding		
		Added	Dropped	Not fished in 2011
Santa Cruz	—	—	—	—
Moss Landing/Monterey	4	—	—	—
Morro Bay	—	—	—	—
Avila/ Port San Luis	—	—	—	—
Central Coast Region	4	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked to compare the success of the coastal pelagic species—seine/net fishery in 2011 to the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse. This question returned varied responses, with each of the four coastal pelagic species—seine/net fishermen responding differently.

Table 67. Overall success in specific commercial fishery compared to previous five years, Coastal pelagic species–seine/net

Fisheries	Number responding	Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Santa Cruz	—	—	—	—	—	—	—
Moss Landing/Monterey	4	—	25.0%	—	25.0%	25.0%	25.0%
Morro Bay	—	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—	—
Central Coast Region	4	—	25.0%	—	25.0%	25.0%	25.0%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

The primary regulatory factor mentioned by coastal pelagic species–seine/net fishermen were in regards to quota limits with individuals specifying that they thought quota limits were inconsistent and/or inefficient. Specifically one person mentioned that quotas are west coast wide and in Washington and Oregon coastal pelagic is an open access fishery allowing those states to catch more than California (Table 68).

Table 68. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Coastal pelagic species–seine/net

Response	Number responding
MPA impacts	1
Insufficient monitoring/enforcement/communication of MPAs	1
Trawlers impacting nearshore fleet	—
Quota limit issues	4
Concentration of fishing effort into smaller areas/over-crowding	—
Regulations have resulted in less competition	—
Inefficiencies in bycatch regulations	1
Inefficiencies/inconsistencies in fishery regulations	4
Inequities in fishery regulations	1
Inadequate research for policy	—
Inequities in obtaining fishery permits	—
Insufficient regulation on land-based impacts to fisheries	—
Lack of influence on policy/regulation development	—
Insufficient communication of fishery regulations	—
Populations recovering from fishing gear ban	—
Distress around unintended infractions	1
Increased number of fishermen participating in the fishery	—
Increased personal fishing effort	—
Rockfish conservation area (RCA)	—
Total number responding	4

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

A few respondents responded with environmental, economic, or other factors that impacted the success of the fishery, their responses can be found in Table 69, Table 70, and Table 71, respectively.

Table 69. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Coastal pelagic species–seine/net

Response	Number responding
Increase in bait fish	—
Increase in fish abundance	1
Stable fish abundance	—
Increase in catch	—
Decrease in catch	—
Increase in predators	—
Good weather	1
Biomass of fish largely in MPAs	—
PG&E seismic testing impacts	—
Decrease in habitat or water quality	—
Decrease in fish abundance	—
Change in normal water temp	—
Fish population moved further offshore	—
Decrease in fish size	—
Farmed fish spreading disease	—
Protected species overpopulated	—
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 70. Economic changes/factors influencing success in specific commercial fishery in previous five years, Coastal pelagic species–seine/net

Response	Number responding
Increased number of fishermen participating in the fishery	—
Increase in operating costs	—
Increase in fish price	2
Decrease in fish price	—
Market flooded	1
Longer season allowed increase in catch	—
Increased demand for fish	—
Decrease in demand for fish	—
Increased personal fishing effort	—
Increased number of outside vessels fishing in local grounds	1
Lack of port infrastructure	—
Increase in travel distance	—
Total number responding	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 71. Other changes/factors influencing success in specific commercial fishery in previous five years, Coastal pelagic species–seine/net

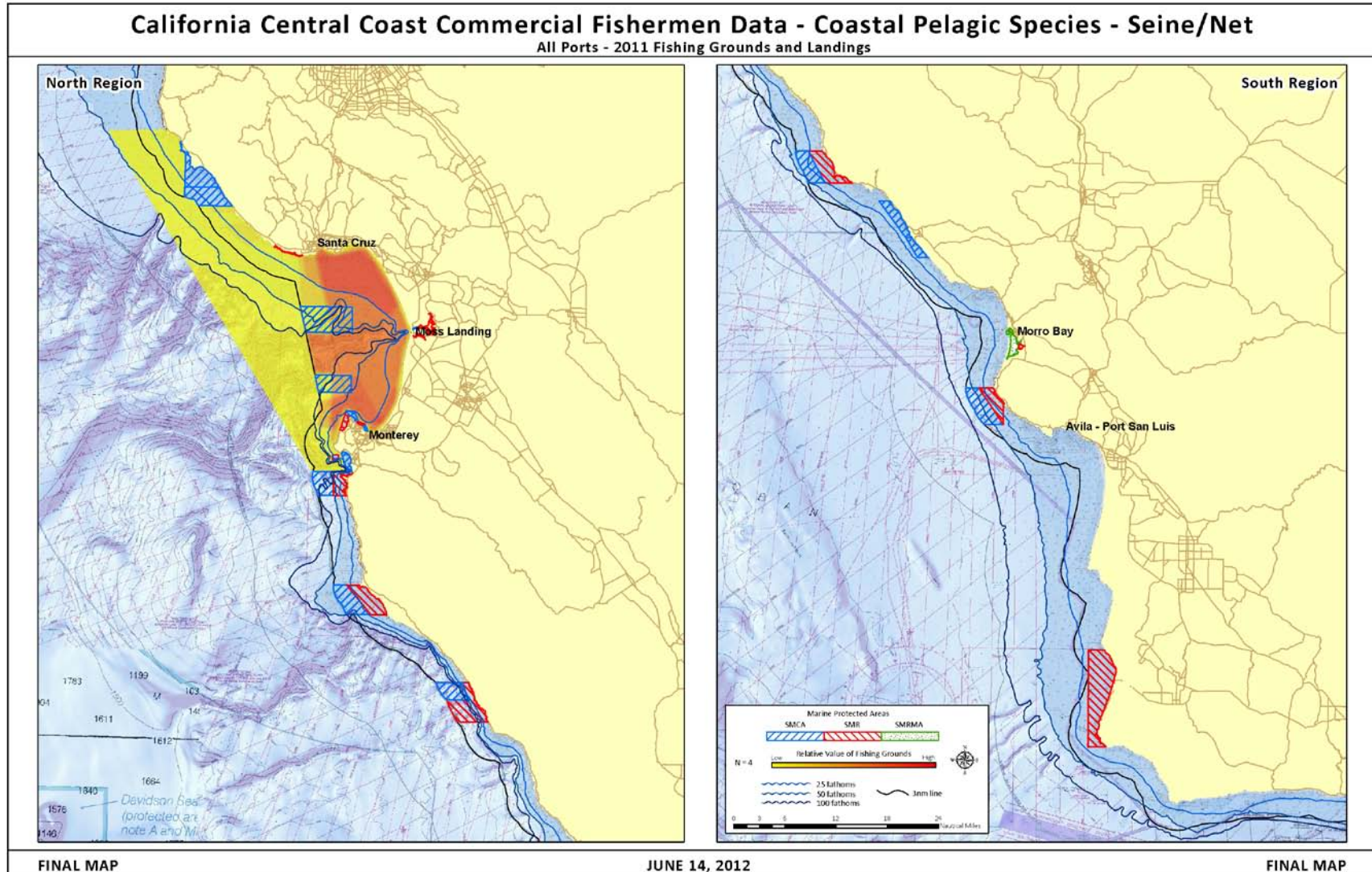
Response	Number responding
Increase in fishing experience	1
Loss of historical fishing knowledge	1
Fisherman's knowledge not valued	—
Lack of outreach to fishing community	—
Loss of cultural fishing heritage	1
Total number responding	1

Source: Current study

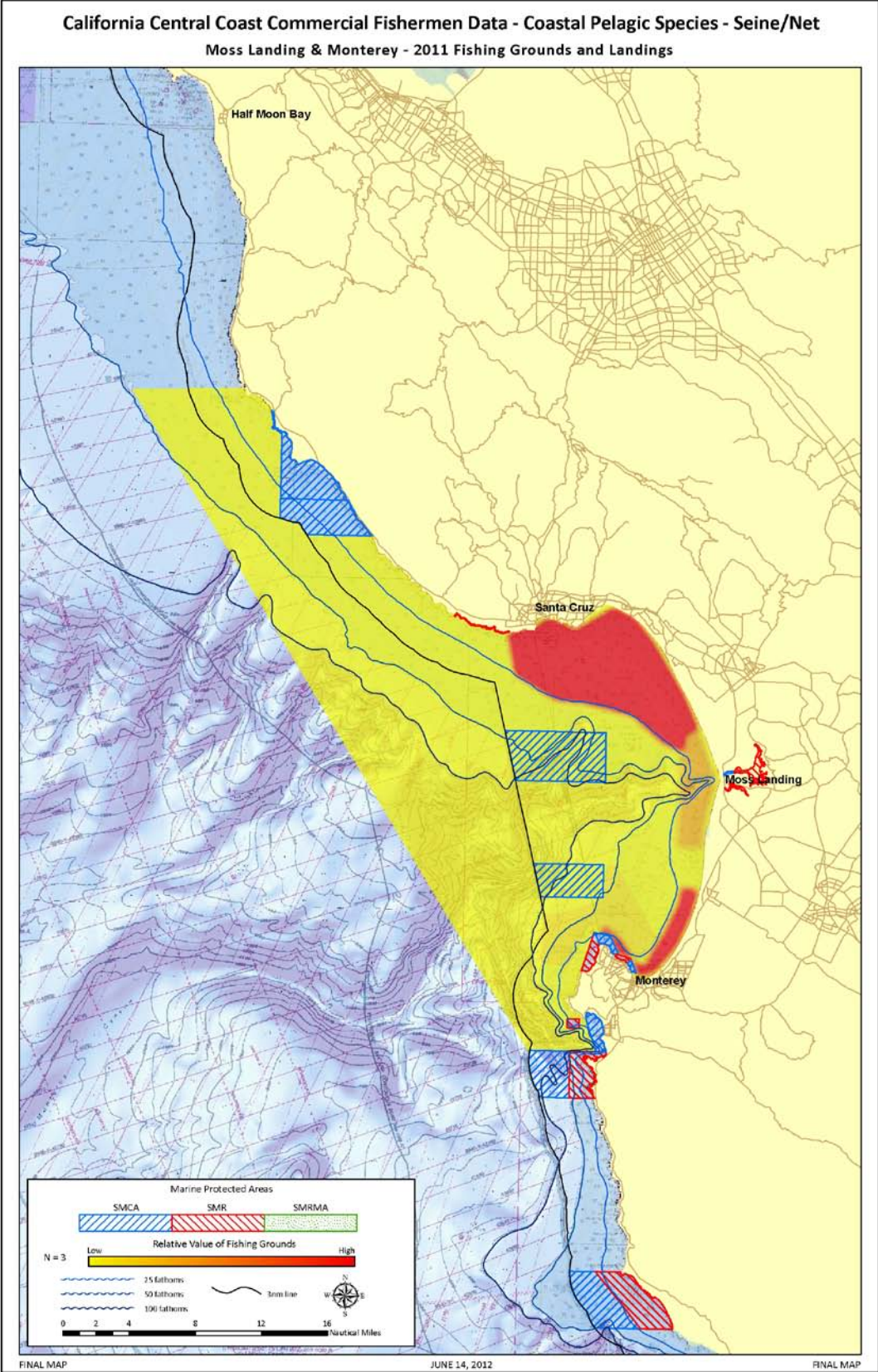
Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Map 5. Coastal pelagic species-seine/net 2011 commercial fishing value map, Central Coast Region



Map 6. Coastal pelagic species-seine/net 2011 commercial fishing value map, Moss Landing/Monterey



4.4.3. Dungeness Crab–Trap: Initial Changes and Baseline Characterization

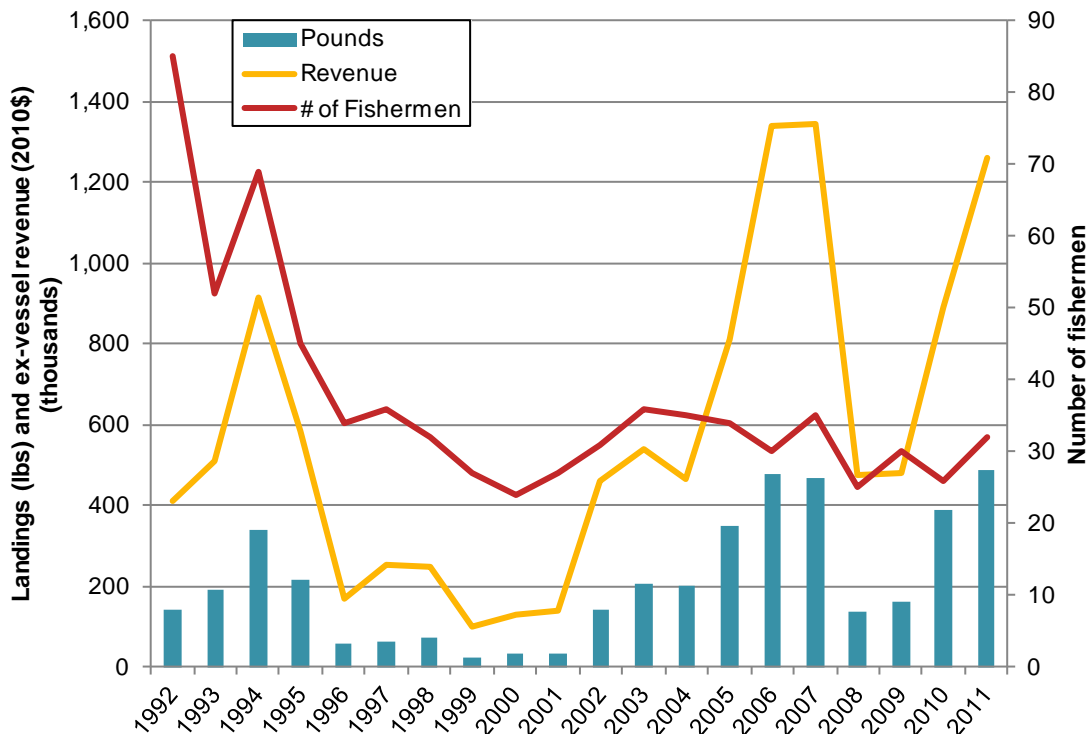
Dungeness crab (*Cancer magister*) is an important fishery along the entire Pacific Coast. It generally ranges from the Aleutian Islands to Point Conception, California. Only male Dungeness crabs are allowed to be kept and are required to be at least 6.25 inches in diameter in California. Additional management efforts have included designating the fishery limited access in 1995 which restricted residential permits to 600 and 70 non-resident permits (Petterson et al. 2010). In the Central Coast Region, Dungeness crab are primarily caught in the northern ports of Santa Cruz, Moss Landing, and Monterey, with smaller amounts of landings in ports further south. The season typically begins on November 15th and continues through June 30th, with catch abundance often significantly reduced in the later months. Often, the majority of the catch is caught during the highly competitive first few weeks of the season (Deweese et al. 2004). During interviews Dungeness crab fishermen often discussed impending regulations that will establish a Dungeness crab trap limit program. Additionally, many fishermen reported the cyclical nature of fish stocks and that currently the Dungeness crab fishery is experiencing strong abundant seasons such as seen in 2010 and 2011. It is estimated that Dungeness crab abundance peaks in approximately ten year cycles (Deweese et al. 2004). It should be noted that many fishermen who fish Dungeness crab also land in ports other than Santa Cruz such as Half Moon Bay and San Francisco as they are in closer proximity to productive crab grounds. Thus, the entire amount of revenue Central Coast fishermen may be gaining from landing Dungeness crab may not be fully reflected in the data presented.

The Dungeness crab–trap fishery saw both increased landings and ex-vessel revenues over the study period, though experienced a decline (62.4 percent less in 2011 than in 1992) in the number of fishermen. This suggests specialization and increased scales of operation targeting this fishery over the study period. Landings in the Central Coast Region in 1992 were at 140,722 pounds and despite a couple declines in certain years, have increased overall to a maximum of 486,234 pounds by 2011. Top ex-vessel revenues for this fishery in the Central Coast Region were approximately \$1.3 million made in 2006 and 2007. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

A Central Coast Region Dungeness crab–trap fisherman made an average of 14 landings annually, overall landing an average total of 6,051 pounds for \$16,683 in ex-vessel revenues a year over the study period, see Figure 22.

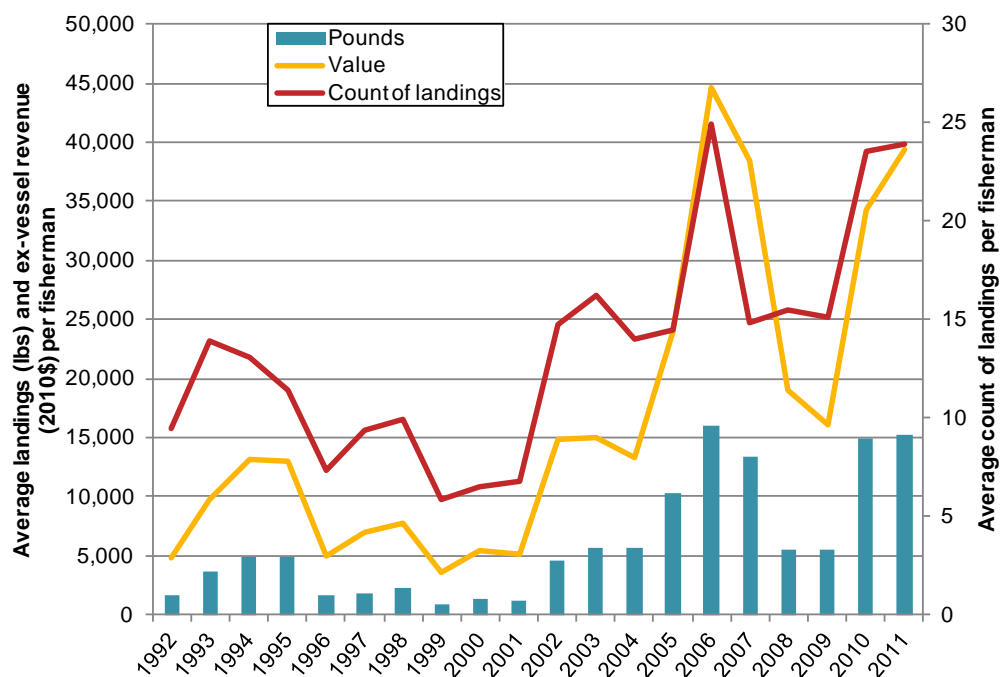
The Dungeness crab–trap fishery is one of only two fisheries of interest in the Central Coast Region to experience lower average ex-vessel prices per pound in 2011 than those observed in 1992 (the other being the nearshore finfish–dead–longline fishery). As shown in Figure 23, the average ex-vessel price per pound for this fishery began at \$2.92 in 1992 and ended at \$2.59 in 2011. The peak ex-vessel price for the Dungeness crab–trap fishery occurred in 2001 at \$4.14; landings in that year however were among some of the lowest over the study period at 33,416 pounds resulting in ex-vessel revenues of \$138,481 overall in the Central Coast Region.

Figure 21. Dungeness crab-trap commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



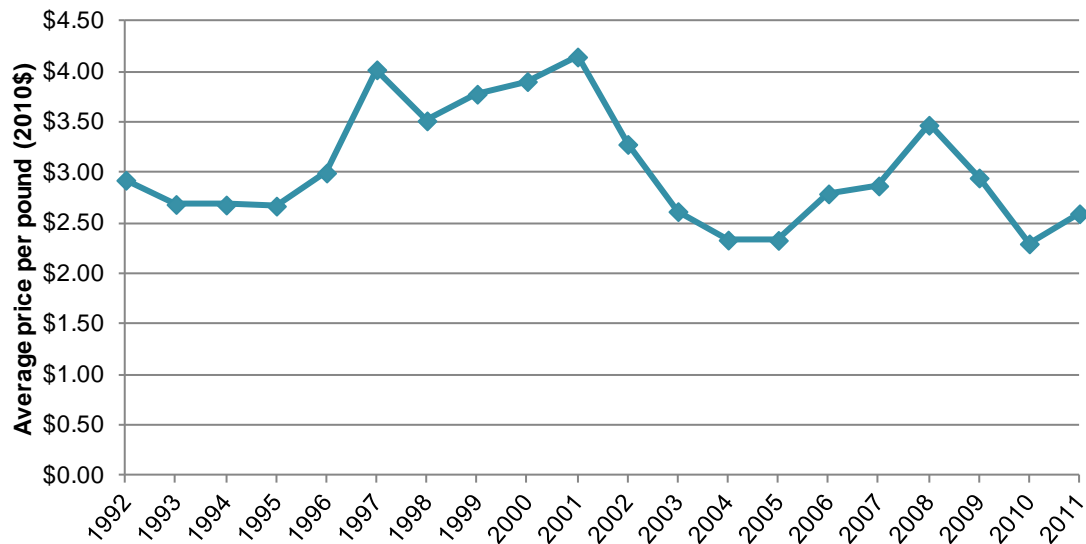
Source: Landings data from CDFG

Figure 22. Dungeness crab-trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Source: Landings data from CDFG

Figure 23. Dungeness crab–trap commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Table 72 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the Dungeness crab–trap fishery over recent time periods organized into both pre and post MPA implementation. Changes are presented for the Central Coast Region and compared with those observed in the fishery at the state level. At the Central Coast Region level, revenues from the Dungeness crab–trap fishery increased significantly over each time period, and were 864 percent higher in 2011 than in 2000. The fishery's revenues also increased at the state level, though not to the same degree, with ex-vessel revenue levels almost 200 percent higher in 2011 than in 2000. At the state level however, revenues declined from 2004 to 2007 before increasing again. Average revenues per fishermen increased as well in the Central Coast Region, though less so than total ex-vessel revenues as the number of fishermen participating in the fishery increased 33.3 percent overall from 2000 to 2011.

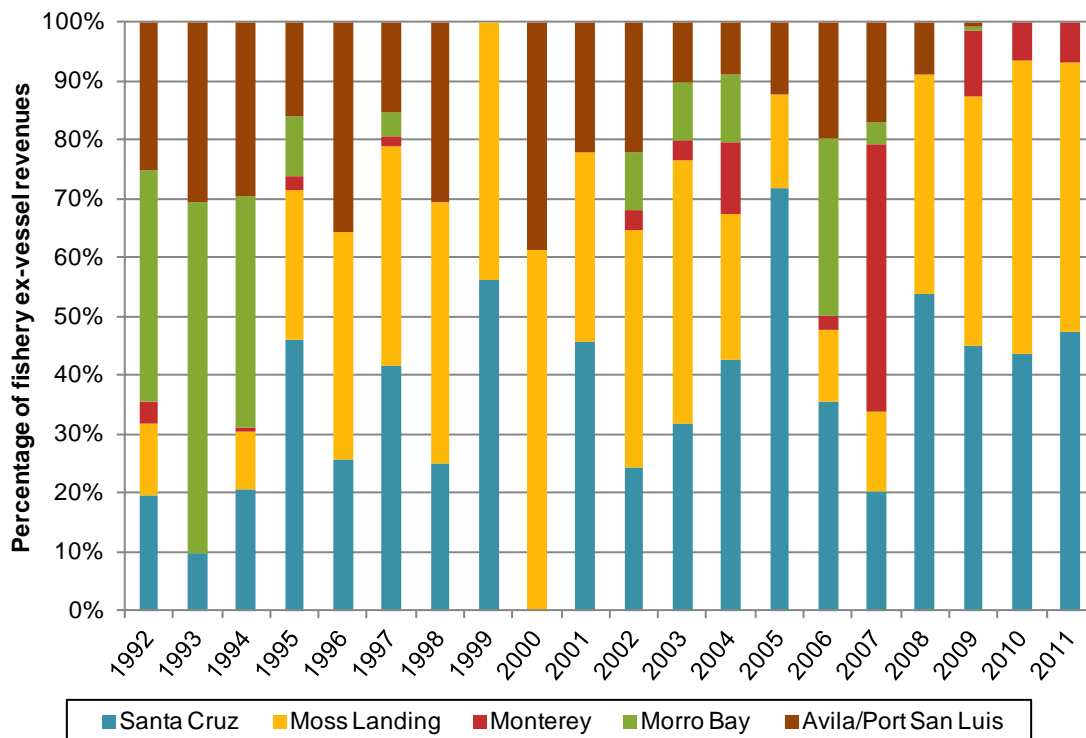
Figure 24 displays the portion of ex-vessel revenues made in the Dungeness crab–trap fishery from Central Coast Region ports over the study period. Among Central Coast Region ports, Santa Cruz had the highest annual average portion of total ex-vessel revenues at 35.5 percent (\$214,062), followed by Moss Landing at 31.6 percent (\$160,801), and Avila/Port San Luis at 17.2 percent (\$97,198). Towards the latter part of the study period, when Dungeness crab–trap landings increased overall, Santa Cruz and Moss Landing each constituted increasing shares of total ex-vessel revenues. Monterey had the lowest average annual percentage of total ex-vessel revenues in the Central Coast Region at approximately five percent.

Table 72. Dungeness crab-trap landings: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	313.7%	189.7%	165.3%	864.0%
	Average per fisherman	175.8%	189.7%	107.3%	623.0%
State	Total	145.4%	-39.2%	119.4%	194.5%
	Average per fisherman	154.2%	-34.0%	98.8%	200.6%

Source: Landings data from CDFG

Figure 24. Dungeness crab-trap commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

We interviewed seven Dungeness crab-trap fishermen, all of whom were from Moss Landing, Monterey, or Santa Cruz (Table 73). These fishermen varied in age with the average (51.3) being very close to the average age of all participants (51.2).

Table 73. Average age and years experience commercial fishing, Dungeness crab–trap

Ports	Individuals Interviewed	Age		Years experience	
		Average	Standard deviation	Average	Standard deviation
Santa Cruz	3	58.7	11.9	26.0	9.6
Moss Landing/Monterey	4	45.8	26.5	21.8	18.8
Morro Bay	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—
Central Coast Region	7	51.3	21.1	23.6	14.6

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked to estimate the percent of their personal income that came from commercial fishing for the years 2006 and 2011. Dungeness crab–trap fishermen reported that nearly all of their income (96.4 percent) came from commercial fishing in 2011 which was a 4.8 percent increase from 2006 (92.9 percent).

Table 74. Percent change in income from overall commercial fishing from 2006–2011, Dungeness crab–trap

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	91.7%	14.4%	91.7%	14.4%	—	—
Moss Landing/Monterey	93.8%	12.5%	100.0%	—	8.3%	16.7%
Morro Bay	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	92.9%	12.2%	96.4%	9.4%	4.8%	12.6%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

After reporting the percent of their income from commercial fishing for 2006 and 2011, fishermen who reported a change were asked to describe factors to which they attributed this change. This was posed as an open-ended question and respondents were encouraged to speak freely as the interviewer took notes on key aspects that were mentioned. After the interview, the notes were coded and summarized into the categories which are shown below (Table 75).

Table 75. Cause of change in percent income from commercial fishing from 2006–2011, Dungeness crab–trap

Response	Number responding
Increased regulation	—
Intensified fishing efforts	—
Had additional job or source of income	—
Found additional job or source of income	—
Change in fish abundance	1
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen in both Santa Cruz and Moss Landing/Monterey reported an increase in operating costs between the 2006 and 2011 period, 11.1 percent and 15.0 percent, respectively for an average of 13.3 percent. This was smallest increase after the market squid–seine and coastal pelagic species–seine/net fisheries.

Table 76. Percent change in overall commercial fishing operating costs from 2006–2011, Dungeness crab–trap.

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	46.7%	25.2%	50.0%	20.0%	11.1%	19.2%
Moss Landing/Monterey	48.8%	29.0%	52.5%	22.5%	15.0%	30.0%
Morro Bay	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	47.9%	25.1%	51.4%	19.7%	13.3%	24.0%

Source: Current study

Out of the four fishermen who gave a reason for changes in operating costs, two responded that an increase in fishing expenses was the reason, specifically citing increased fuel costs. Also shown in Table 77, another fishermen reported that he had recently purchased a larger boat and had to buy additional pots and permits in 2011, an investment which would not have to be made every year.

Table 77. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Dungeness crab-trap

Response	Number responding
Large capital investment	1
Decrease in fishing income	1
Decrease in fishing grounds	—
Increase in fishing expenses	2
Fishing less in 2006	—
Fishing less in 2011	—
Total number responding	4

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The average Dungeness crab-trap fisherman reported 16 years experience in the fishery and between one and two crew members (for an average of 1.4 crew). Additionally they responded that 20.7 percent of their gross economic revenue (GER) went to their crew and 23.6 percent of the GER went towards fuel. Across all fisheries in the Central Coast Region, Dungeness crab-trap fisherman reported spending the highest percent of their gross revenue on fuel.

Table 78. Additional commercial fishery specific data, Dungeness crab-trap

Ports	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	15.7	21.2	1.3	1.2	23.3%	25.2%	33.0%	n/a
Moss Landing/Monterey	16.3	15.9	1.5	0.6	18.8%	8.5%	21.3%	16.5%
Morro Bay	—	—	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—	—	—
Central Coast Region	16.0	16.6	1.4	0.8	20.7%	15.9%	23.6%	15.2%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

n/a indicates standard deviation could not be calculated because only person responded to the question

Two people indicated they had added the Dungeness crab-trap fishery since 2006 and three indicated they did not fish it in 2011. One fisherman responded that he did not fish Dungeness crab-trap in 2011 because the season coincides with the market squid-seine season and he only fished Dungeness crab-trap some years. Additional reasons for adding the fishery since 2006 or not fishing the fishery in 2011 are show below in Table 80.

Table 79. Dungeness crab—trap, added/dropped since 2006 or not fished in 2011

Ports	Number responding	Percent responding		Not fished in 2011
		Added	Dropped	
Santa Cruz	3	33%	—	33%
Moss Landing/Monterey	4	25%	—	50%
Morro Bay	—	—	—	—
Avila/ Port San Luis	—	—	—	—
Central Coast Region	7	25%	—	42.9%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 80. Dungeness crab—trap, reason for adding/dropping since 2006 or not fishing a fishery in 2011

Responses	Number responding
Started commercial fishing	1
Change in fish population	1
Diversify fisheries	1
Was able to obtain permit	—
High costs	—
Total number responding	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked for Dungeness crab—trap fishery to compare his/her to that of the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse.

Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

All respondents who fished Dungeness crab—trap in 2011 and in previous seasons indicated that the 2010-2011 crab season was significantly better than the previous five years (Table 81).

Table 81. Overall success in specific commercial fishery compared to previous five years, Dungeness crab–trap

Ports	Number responding	Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Santa Cruz	3	33.3%	66.7%	—	—	—	—
Moss Landing/Monterey	4	25.0%	75.0%	—	—	—	—
Morro Bay	—	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—	—
Central Coast Region	7	28.6%	71.4%	—	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Despite indicating that fishery was significantly better in 2011, three fishermen indicated that inequities in existing regulations affected their success in the fishery (Table 82). A couple individuals also mentioned the impact of MPAs and inadequate enforcement from poachers and communication of MPA boundaries/regulations.

Table 82. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Dungeness crab–trap

Response	Number responding
MPA impacts	4
Insufficient monitoring/enforcement/communication of MPAs	—
Trawlers impacting nearshore fleet	—
Quota limit issues	1
Concentration of fishing effort into smaller areas/over-crowding	—
Regulations have resulted in less competition	—
Inefficiencies in bycatch regulations	—
Inefficiencies/inconsistencies in fishery regulations	3
Inequities in fishery regulations	2
Inadequate research for policy	1
Inequities in obtaining fishery permits	—
Insufficient regulation on land-based impacts to fisheries	—
Lack of influence on policy/regulation development	—
Insufficient communication of fishery regulations	—
Populations recovering from fishing gear ban	—
Distress around unintended infractions	3
Increased number of fishermen participating in the fishery	—
Increased personal fishing effort	—
Rockfish conservation area (RCA)	—
Total number responding	4

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Several fishermen cited environmental conditions as the reason for the excellent crab season in 2011. There was a general increase in crab abundance and catch due natural crab cycles and other conditions.

A few fishermen even reported that the year had been their best ever and the 2011-2012 season was looking good so far.

Table 83. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Dungeness crab-trap

Response	Number responding
Increase in bait fish	—
Increase in fish abundance	3
Stable fish abundance	1
Increase in catch	3
Decrease in catch	—
Increase in predators	—
Good weather	1
Biomass of fish largely in MPAs	—
PG&E seismic testing impacts	—
Decrease in habitat or water quality	—
Decrease in fish abundance	—
Change in normal water temp	1
Fish population moved further offshore	—
Decrease in fish size	—
Farmed fish spreading disease	—
Protected species overpopulated	—
Total number responding	4

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Three fishermen provided economic factors they thought had impacted the fishery, listed below in Table 84.

Table 84. Economic changes/factors influencing success in specific commercial fishery in previous five years, Dungeness crab-trap

Response	Number responding
Increased number of fishermen participating in the fishery	—
Increase in operating costs	—
Increase in fish price	—
Decrease in fish price	—
Market flooded	—
Longer season allowed increase in catch	1
Increased demand for fish	1
Decrease in demand for fish	—
Increased personal fishing effort	—
Increased number of outside vessels fishing in local grounds	—
Lack of port infrastructure	—
Increase in travel distance	1
Total number responding	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 85. Other changes/factors influencing success in specific commercial fishery in previous five years, Dungeness crab-trap

Response	Number responding
Increase in fishing experience	—
Loss of historical fishing knowledge	1
Fisherman's knowledge not valued	—
Lack of outreach to fishing community	—
Loss of cultural fishing heritage	—
Total number responding	1

Source: Current study

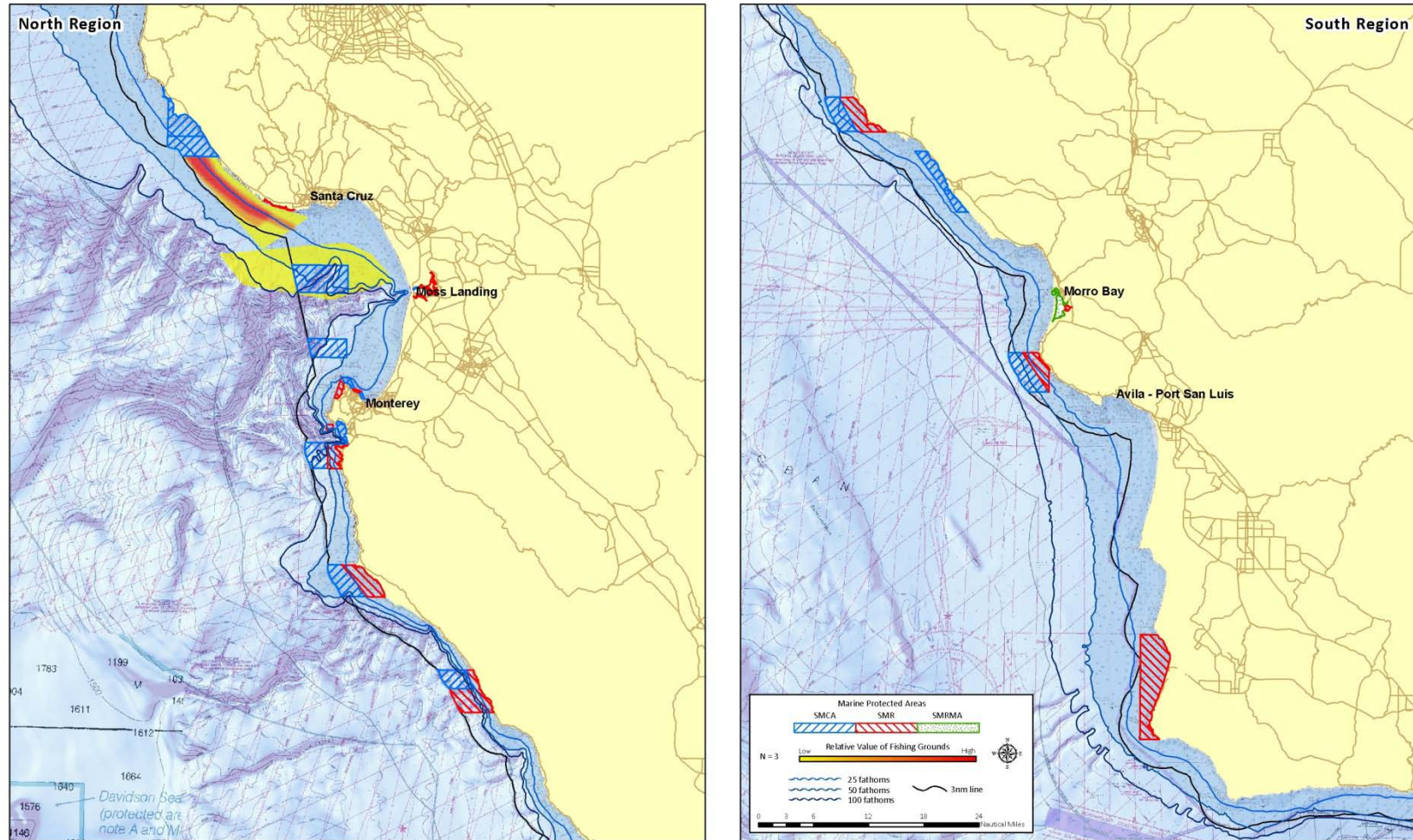
Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Map 7. Dungeness crab-trap 2011 commercial fishing value map, Central Coast Region

California Central Coast Commercial Fishermen Data - Dungeness Crab - Trap

All Ports - 2011 Fishing Grounds and Landings



FINAL MAP

JUNE 14, 2012

FINAL MAP

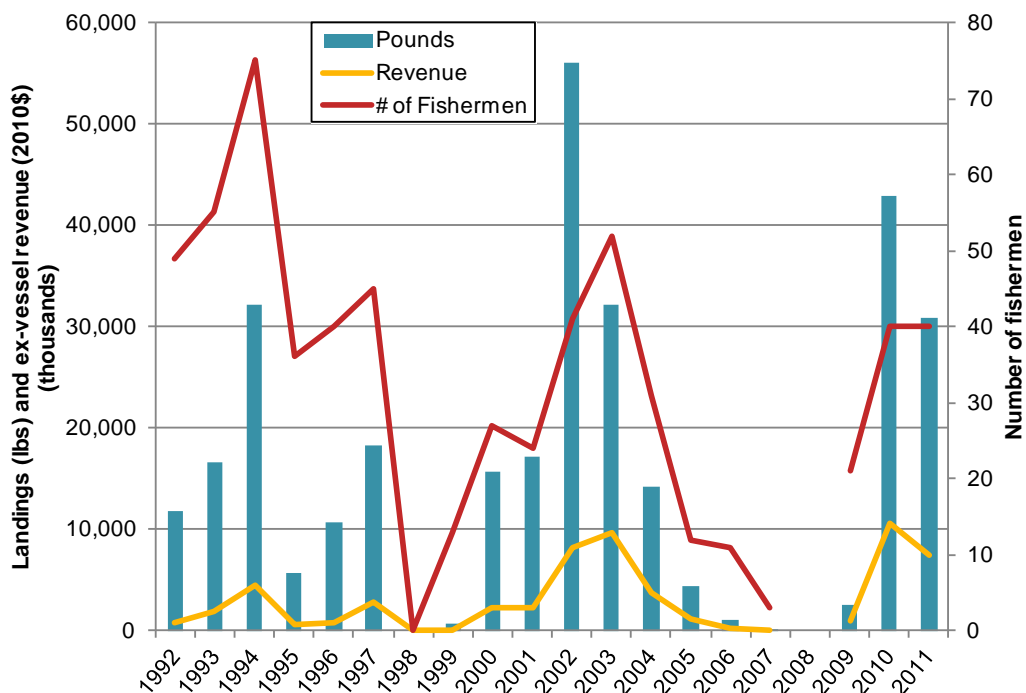
4.4.4. Market Squid–Seine: Initial Changes and Baseline Characterization

Market squid (*Loligo opalescens*) has a wide range that stretches from Baja, California to southwestern Alaska. Within the state of California the fishery is primarily landed in the southern region, at the ports of Ventura, Port Hueneme, and San Pedro/Terminal Island and in the Central Coast region at the ports of Monterey and Moss Landing (CDFG 2005). Like other coastal pelagic species the market squid – seine fishery is one of California’s most valuable fisheries both in terms of pounds landed and revenue. Similar to other coastal pelagic species, the market squid – seine fishery is known to be highly sensitive to environmental conditions and populations fluctuate with water temperatures, El Niño patterns, and natural fishery abundance cycles (Pomeroy et al. 2003). Indeed during interviews with fishermen, many noted the lack of squid in 1998 due to the strong 1997-1998 El Niño event. Also, fishermen noted the lack of squid in the Central Coast Region for the years 2007 and 2008, however these were not strong El Niño years and the lack of abundance may be due to other environmental factors or natural fish cycles. Indeed, market squid are sensitive to warm temperatures that are associated with El Niño years and are more prevalent in cold water during La Niña years (CDFG 2008). Ex-vessel revenue levels of market squid are often dependent on the status of international markets and demand which highly impact price. Dramatic shifts in price can be observed such as seen in Figure 27 in which the price per metric ton more than doubled between the years 2002 and 2003. The market squid–seine fishery is a restricted access fishery (as of 2005), closed to fishing on weekends, and managed by a quota system (Pettersen et al. 2010). In 2010, the fishery reached its quota (118,000 tons) for the first time since it was implemented in 2002 and the fishery closed for the season on December 17th, 2010 (CDFG 2010).

Figure 25 displays landings and ex-vessel revenues from the market squid fishery made in the Central Coast Region from 1992–2011. This fishery often experiences intense peaks and declines, ranging from a low of zero pounds landed in 1998, to landings of 56 million pounds in 2002. The squid fishery is highly susceptible to environmental changes, with landings plummeting during El Niño events. Ex-vessel revenues peaked at \$10.7 million in 2010. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

The number of fishermen decreased 22.5 percent from 1992 to 2011, and closely mirrored the availability of the fishery. Over the study period, on average, a Central Coast Region market squid–seine fisherman landed an annual total of 423,175 pounds for \$80,244 in ex-vessel revenue, see Figure 26, making 13 landings a year to do so. Average revenues per fisherman increased substantially from 1992 to 2011, with fishermen in 2011 making almost eleven times what fishermen in 1992 made in ex-vessel revenue. The average ex-vessel price per pound of this fishery increased from \$154.56 per metric ton in 1992 to \$535.19 per metric ton in 2011, see Figure 27.

Figure 25. Market squid–seine commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 26. Market squid–seine: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011

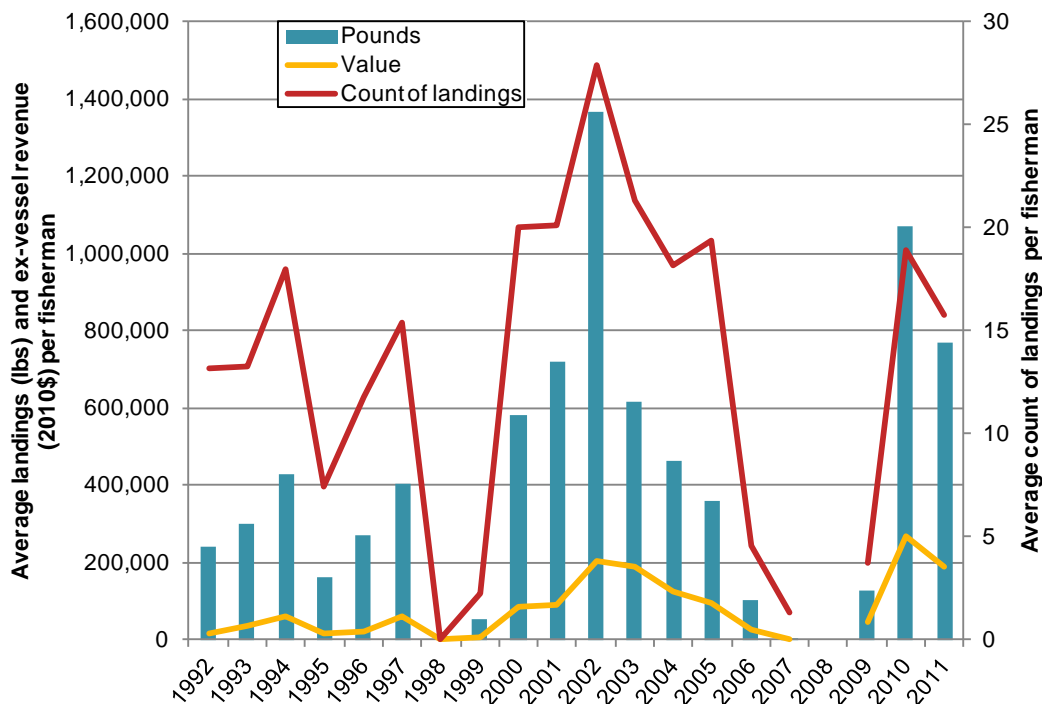
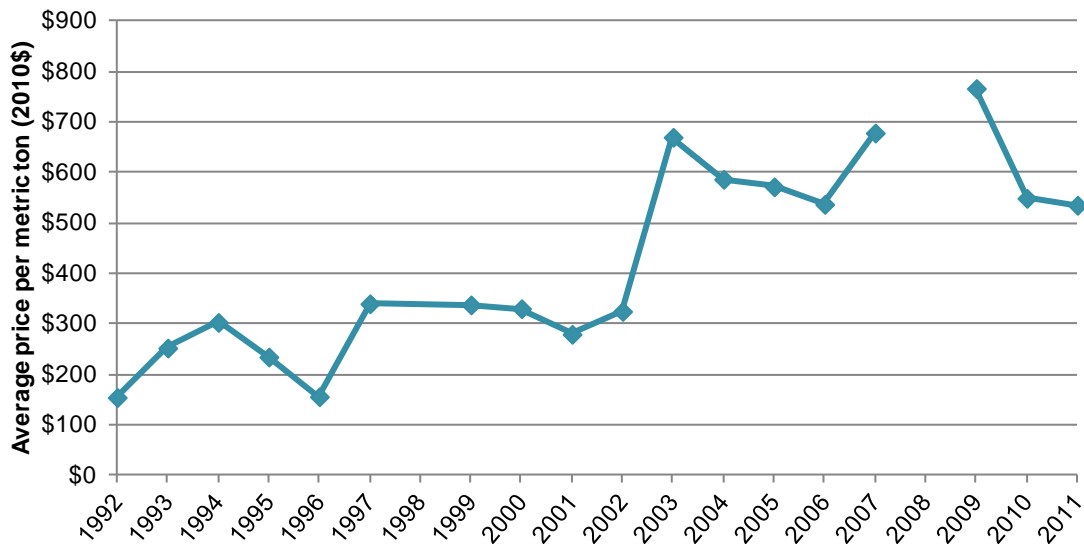


Figure 27. Market squid–seine commercial fishery average ex-vessel price per metric ton in the Central Coast Region, 1992–2011



*Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG*

Table 86 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the market squid–seine fishery over recent time periods categorized as both pre and post MPA implementation. Changes are presented at the Central Coast Region level and compared with those observed in the fishery at the state level. Again, the changes in this fishery are likely more influenced by environmental conditions than by other factors.

Moss Landing and Monterey capitalized on the market squid–seine fishery more than other Central Coast Region ports over the study period; see Figure 28, constituting approximately 60 percent and 35 percent respectively of total ex-vessel revenues on average annually. In 2002, when market squid–seine commercial landings were at their highest in the Central Coast Region over the study period, Moss Landing’s ex-vessel revenues for the fishery were nearly 74 percent of total ex-vessel revenues at over \$6.1 million that year.

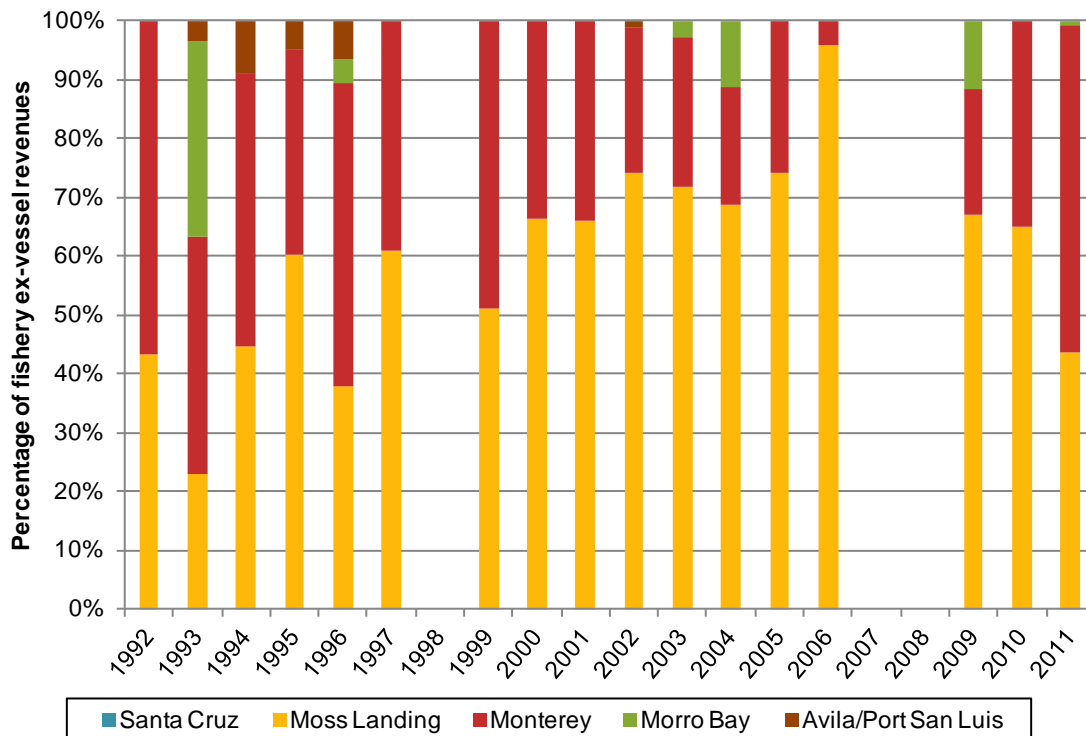
Table 86. Market Squid-Seine: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	314.6%	-99.8%	*	217.7%
	Average per fisherman	115.3%	-98.4%	*	114.4%
State	Total	-11.7%	32.6%	148.5%	98.4%
	Average per fisherman	12.7%	59.9%	65.1%	107.4%

Source: Landings data from CDFG

** indicates data were collected but cannot be shown due to confidentiality constraints*

Figure 28. Market squid–seine commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

We interviewed four fishermen who participated in the market squid–seine fishery. These four fishermen have an average of 35 years experience commercial fishing, the most of all the target fisheries (Table 87). As with coastal pelagic species–seine/net, all of the market squid–seine fishermen we interviewed were from Moss Landing/Monterey.

Table 87. Average age and years experience commercial fishing, Market squid–seine

Ports	Individuals Interviewed	Age		Years experience	
		Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—
Moss Landing/Monterey	4	56.3	12.0	35.0	17.5
Morro Bay	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—
Central Coast Region	4	56.3	12.0	35.0	17.5

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Again, as with fishermen in the coastal pelagic species–seine/net, market squid–seine fishermen reported that they received most of their income from commercial fishing and saw no change in this 2006 and 2011 (Table 88). The small portion of income not from commercial fishing was noted by one fisherman as coming from investments (Table 89).

Table 88. Percent change in income from overall commercial fishing from 2006–2011, Market squid–seine

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—	—
Moss Landing/Monterey	97.5%	5.0%	97.5%	5.0%	—	—
Morro Bay	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	97.5%	5.0%	5.0%	%	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Table 89. Other sources of income other than commercial fishing in 2011, Market squid–seine

Response	Number responding
Skilled labor	—
Investments/retirement/social security	1
Business/office work	—
Other maritime occupation	—
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were asked what percent of their total gross economic revenue (GER) from commercial fishing was spent on their overall operating costs across all his/her fisheries. Percent change between 2006 and 2011 was calculated after the interview (Table 90).

Table 90. Percent change in overall commercial fishing operating costs from 2006–2011, Market squid–seine

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—	—
Moss Landing/Monterey	70.0%	13.2%	73.5%	5.1%	7.1%	12.4%
Morro Bay	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	70.0%	13.2%	73.5%	5.1%	7.1%	12.4%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

The 7.1 percent increase in operating costs over the 2006 – 2011 period was explained primarily by an increase in fuel costs and gear purchases (Table 91).

Table 91. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Market squid–seine

Response	Number responding
Large capital investment	1
Decrease in fishing income	—
Decrease in fishing grounds	—
Increase in fishing expenses	4
Fishing less in 2006	—
Fishing less in 2011	—
Total number responding	4

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen reported having slightly more experience in the market squid–seine fishery (31.8 years) than the coastal pelagic species–seine/net fishery (27.8 years). However, the remaining averages in Table 92 were the same for both fisheries.

Table 92. Additional commercial fishery specific data, Market squid–seine

Ports	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—	—	—	—
Moss Landing/Monterey	31.8	1.7	5.3	1.0	46.3%	8.5%	10.0%	10.0%
Morro Bay	—	—	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—	—	—
Central Coast Region	31.8	1.7	5.3	1.0	46.3%	8.5%	10.0%	10.0%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

None of the respondents reported adding or dropping the fishery since 2006 or not fishing it in 2011 (Table 93).

Table 93. Market squid–seine, added/dropped since 2006 or not fished in 2011

Ports	Number responding	Percent responding		Not fished in 2011
		Added	Dropped	
Santa Cruz	—	—	—	—
Moss Landing/Monterey	4	—	—	—
Morro Bay	—	—	—	—
Avila/ Port San Luis	—	—	—	—
Central Coast Region	4	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked to compare his/her success in the market squid—seine fishery in 2011 to that in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse. Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

All respondents indicated that market squid—seine fishery was more successful than the previous five years, three indicated it was significantly better and one indicating it was somewhat better (Table 93)

Table 94. Overall success in specific commercial fishery compared to previous five years, Market squid—seine

Ports	Number responding	Did not participate in previous seasons	Percent response				
			Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Santa Cruz	—	—	—	—	—	—	—
Moss Landing/Monterey	4	—	75.0%	25.0%	—	—	—
Morro Bay	—	—	—	—	—	—	—
Avila/ Port San Luis	—	—	—	—	—	—	—
Central Coast Region	4	—	75.0%	25.0%	—	—	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

Despite 2011 being a better year than the last five years for the market squid—seine fishery, fishermen indicated several regulatory factors that have impacted the success in their fishery. All four fishermen indicated that their success had been impacted by MPAs (Table 95), either directly through loss of space and traditional fishing grounds, or less directly through the fear of unintentionally drifting fishing gear into an MPA. Additional regulatory factors that fishermen felt impacted the market squid—seine fishery are shown in the table below.

Table 95. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Market squid–seine

Response	Number responding
MPA impacts	4
Insufficient monitoring/enforcement/communication of MPAs	—
Trawlers impacting nearshore fleet	—
Quota limit issues	1
Concentration of fishing effort into smaller areas/over-crowding	—
Regulations have resulted in less competition	—
Inefficiencies in bycatch regulations	—
Inefficiencies/inconsistencies in fishery regulations	3
Inequities in fishery regulations	2
Inadequate research for policy	1
Inequities in obtaining fishery permits	—
Insufficient regulation on land-based impacts to fisheries	—
Lack of influence on policy/regulation development	—
Insufficient communication of fishery regulations	—
Populations recovering from fishing gear ban	—
Distress around unintended infractions	3
Increased number of fishermen participating in the fishery	—
Increased personal fishing effort	—
Rockfish conservation area (RCA)	—
Total number responding	4

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Most fishermen agreed that the success of their fishery was due to good environmental conditions that led to an increase in squid and therefore an increase in catch. One fisherman noted his concern that an increase in Humboldt squid would prey on market squid catch (Table 96).

Table 96. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Market squid–seine

Response	Number responding
Increase in bait fish	—
Increase in fish abundance	1
Stable fish abundance	1
Increase in catch	1
Decrease in catch	—
Increase in predators	1
Good weather	—
Biomass of fish largely in MPAs	1
PG&E seismic testing impacts	—
Decrease in habitat or water quality	—
Decrease in fish abundance	—
Change in normal water temp	—
Fish population moved further offshore	—
Decrease in fish size	—
Farmed fish spreading disease	—
Protected species overpopulated	1
Total number responding	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

In addition to good environmental conditions fishermen noted that there has been an increase in the demand for market squid and subsequently an increase in price (Table 97).

Table 97. Economic changes/factors influencing success in specific commercial fishery in previous five years, Market squid–seine

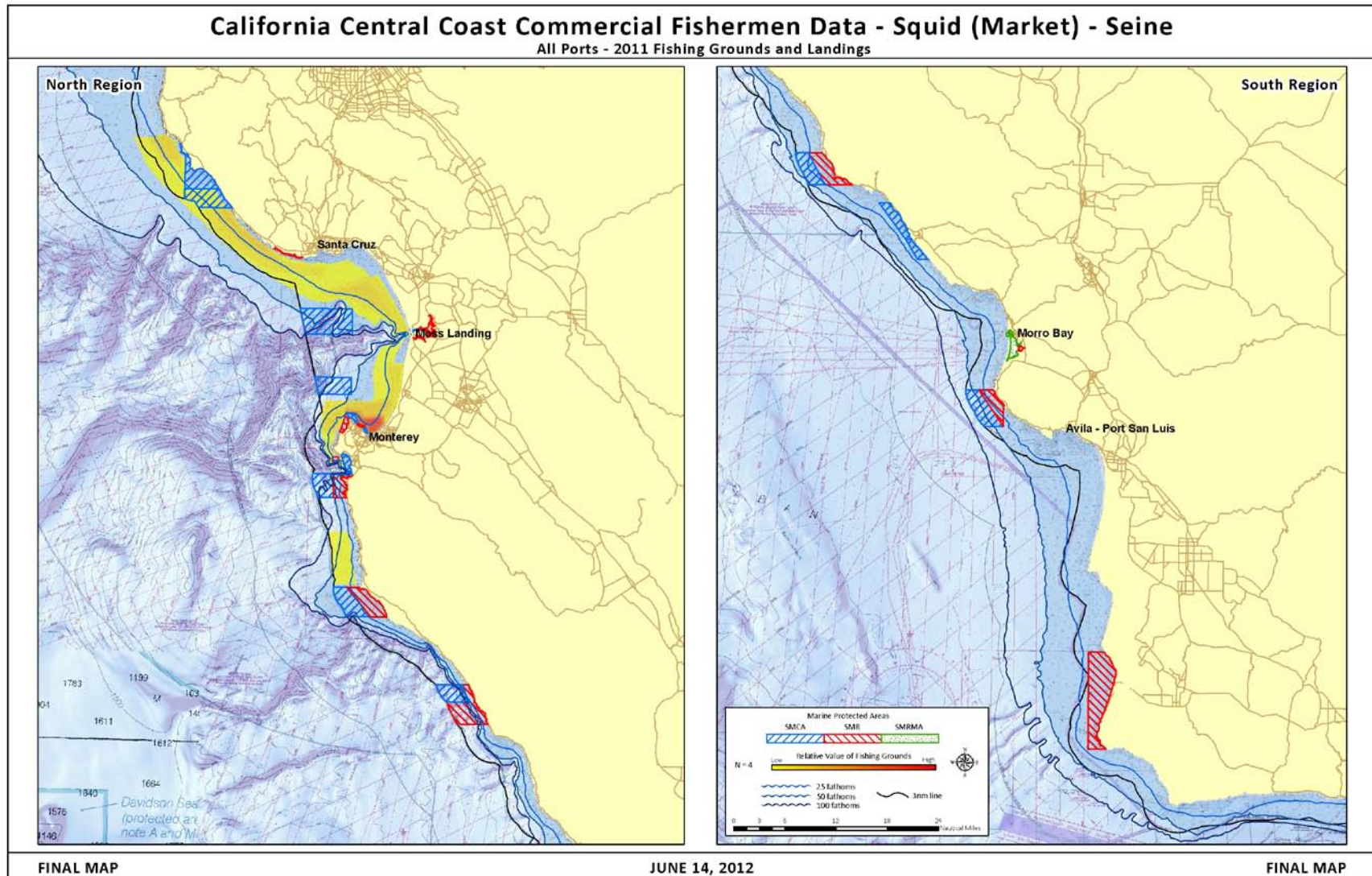
Response	Number responding
Increased number of fishermen participating in the fishery	—
Increase in operating costs	—
Increase in fish price	1
Decrease in fish price	—
Market flooded	—
Longer season allowed increase in catch	—
Increased demand for fish	1
Decrease in demand for fish	—
Increased personal fishing effort	—
Increased number of outside vessels fishing in local grounds	—
Lack of port infrastructure	—
Increase in travel distance	—
Total number responding	2

Source: Current study

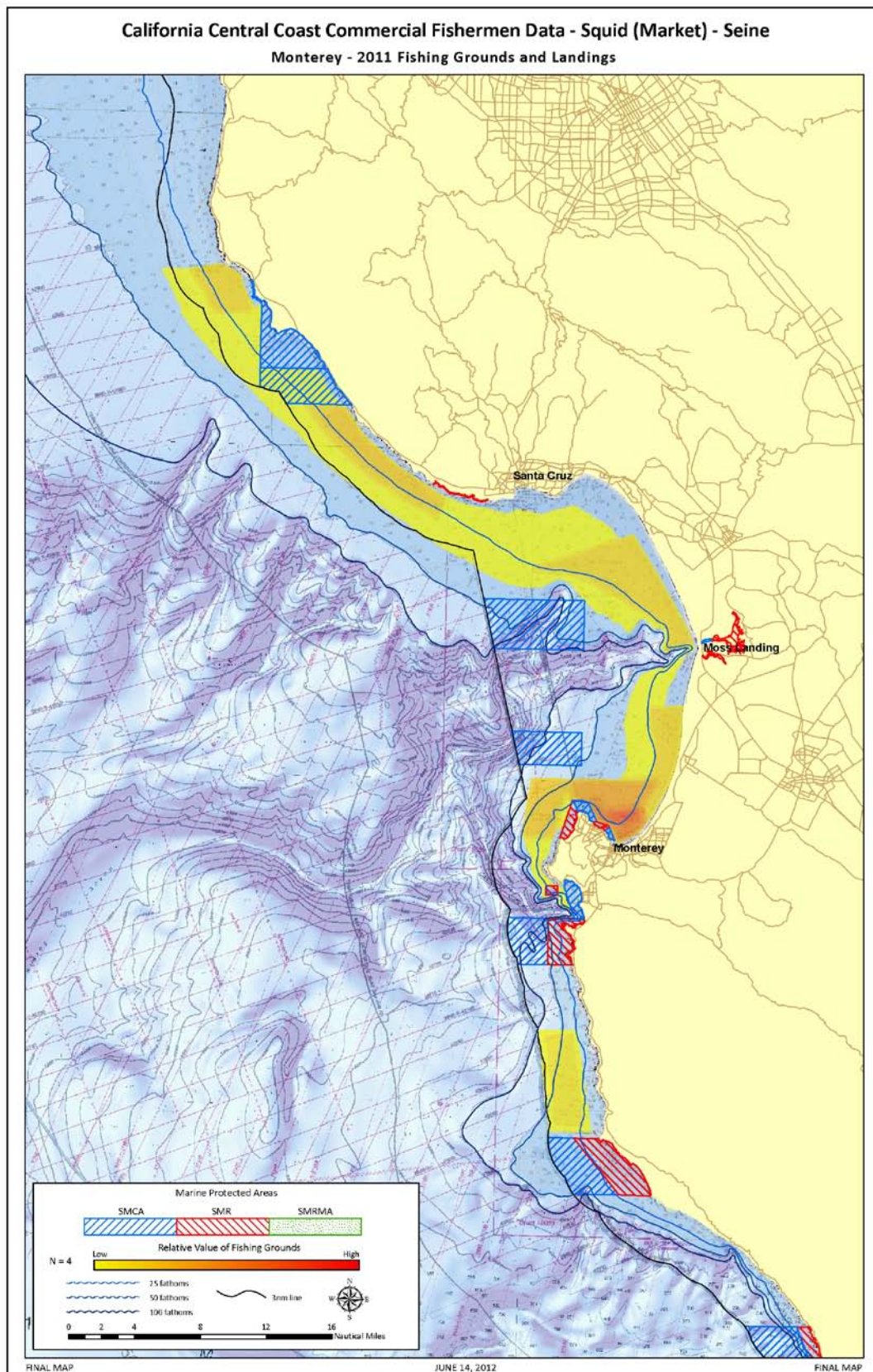
Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Map 8. Market squid-seine 2011 commercial fishing value map, Central Coast Region



Map 9. Market squid-seine 2011 commercial fishing value map, Monterey



4.4.5. Nearshore Finfish–Dead Historical Profile

The nearshore finfish fishery is a California state managed fishery and is comprised of 19 different species of groundfish found primarily in rocky reef or kelp habitat. Nearshore finfish were traditionally fished with gill net and trawl gear but these gear types have decreased in use as stricter regulations have been enacted such as the Rockfish Conservation Area and other depth and area restrictions on gill net and trawl gear (CDFG 2002). During the 1990's groundfish landings decreased by 60 percent largely from these restrictions and the use of hook and line and trap gear increased to target nearshore fish. Since the late 1990's the nearshore fishery has shifted into the live fish fishery. While total landings of groundfish decreased, landings of nearshore fish have increased since the late 1990's (CDFG 2002). In interviews fishermen noted that live fish fishery makes up the majority of the nearshore finfish catch now and often dead fish are landed only if they cannot be sold as live fish.

Nearshore fish are highly regulated under a variety of different management structures. The California Nearshore Fishery Management Plan in 2002 established permits to fish in nearshore waters (e.g., nearshore rockfish or deeper nearshore rockfish permits), limited the number of permits issued in each management region in California, and set individual quota limits. Additionally, in 2002 the Rockfish Conservation Area was implemented, restricting the depth of fishable areas. Currently, the number of nearshore and deeper nearshore permits issued are above target management goals and thus fishermen wishing to enter the fishery must purchase two permits from existing fishermen within their management region and retire one permit.

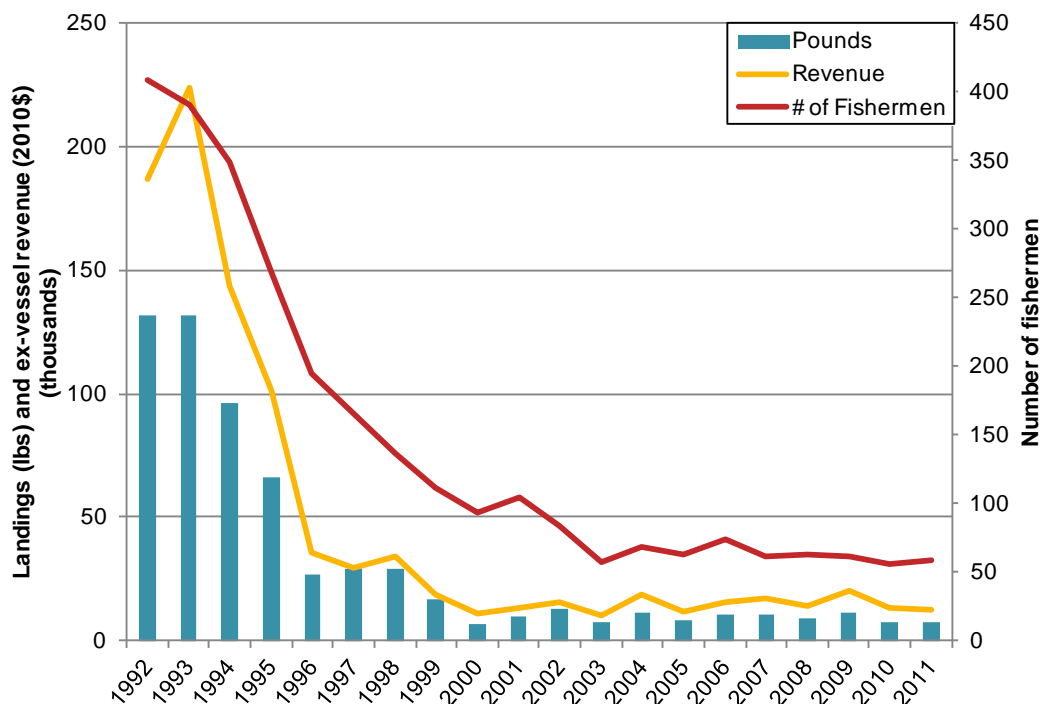
Nearshore Finfish-Dead-Hook & Line Fishery

The nearshore finfish–dead–hook & line fishery was in steady decline in the Central Coast Region over the study period, see Figure 30. The highest landings and ex-vessel revenues occurred early in the first two years of the study period at 132,091 pounds landed in 1992 and \$187,161 in ex-vessel revenues in 1993. By 2011, while not at their lowest, landings and ex-vessel revenues were significantly lower at 7,316 pounds and \$12,800 respectively. The number of fishermen in this fishery decreased by 85.6 percent from 409 fishermen in 1992 to 59 in 2011. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

The average nearshore finfish–dead–hook & line fisherman in the Central Coast Region made 8 landings per year, landing an annual total of 176 pounds for \$259 in ex-vessel revenues, see Figure 30. Both the average volume landed and ex-vessel revenues per fisherman decreased from 1992 to 2011 by 61.6 percent and 52.6 percent respectively. At the same time, after 2005, the count of landings continued to increase until the end of the study period, with fishermen in 2011 making an average total of 17 landings each.

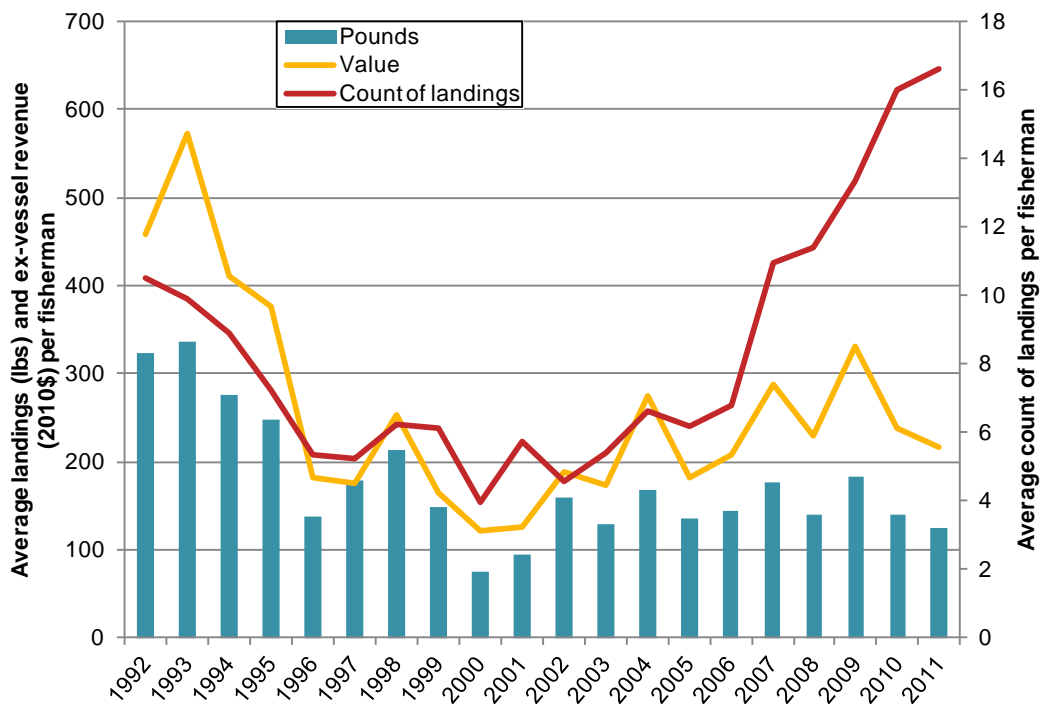
Figure 31 displays the average ex-vessel price per pound landed for the nearshore finfish–dead–hook & line fishery over the study period. With some fluctuation, the ex-vessel price increased 23.5 percent from 1992 to 2011, at \$1.75 per pound in 2011.

Figure 29. Nearshore finfish—dead—hook & line commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



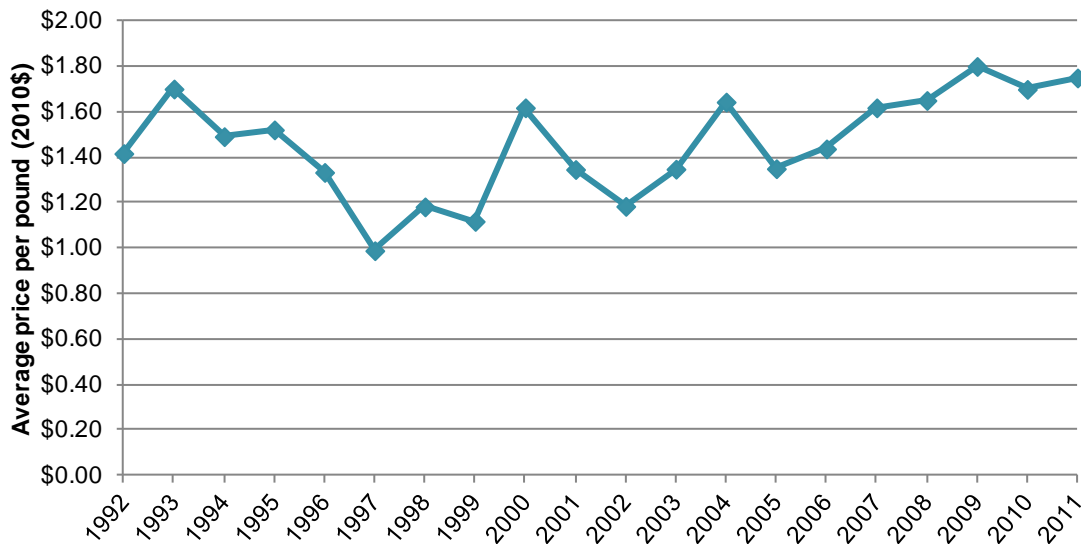
Source: Landings data from CDFG

Figure 30. Nearshore finfish—dead—hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Source: Landings data from CDFG

Figure 31. Nearshore finfish–dead–hook & line commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Table 98 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the nearshore finfish–dead–hook & line fishery over recent time periods which are organized into both pre and post-MPA implementation periods. Changes are presented for the study region and compared with those observed in the fishery at the state level. This fishery is interesting in that although total ex-vessel revenues fell for each examined time period, average ex-vessel revenues per fisherman usually increased. This was likely due to the rate of participating fishermen in the fishery declining faster than actual ex-vessel revenues. Looking back to Figure 29 and Figure 30, it is important to keep in mind that there was not much variation year to year overall in the nearshore finfish–dead–hook & line fishery over 2000–2011 when examining trends presented in Table 98.

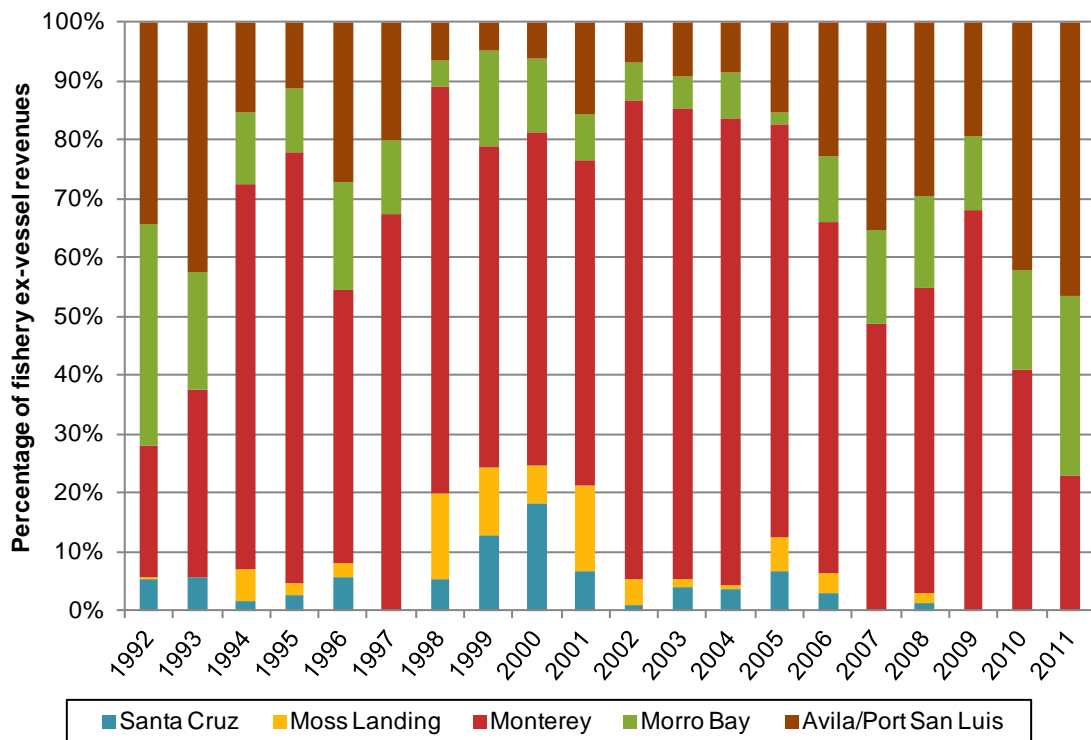
Figure 32 displays nearshore finfish–dead–hook & line ex-vessel revenue portions by Central Coast Region ports. Relative to other Central Coast Region ports, Monterey consistently made greater ex-vessel revenues in the nearshore finfish–dead–hook & line fishery over the study period and was responsible for over half of total ex-vessel revenues for this fishery on average annually in the region at \$22,651. However, although both Morro Bay and Avila/Port San Luis saw declining contributions to total nearshore finfish–dead–hook & line ex-vessel revenues initially, towards the latter half of the study period, their respective portions notably increased.

Table 98. Nearshore finfish–dead–hook & line: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	-12.9%	-6.3%	-11.6%	12.4%
	Average per fisherman	42.0%	4.5%	-5.6%	77.2%
State	Total	-42.6%	-2.8%	-44.3%	-64.4%
	Average per fisherman	10.3%	16.3%	-28.5%	7.8%

Source: Landings data from CDFG

Figure 32. Nearshore finfish–dead–hook & line commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

Nearshore Finfish-Dead-Longline

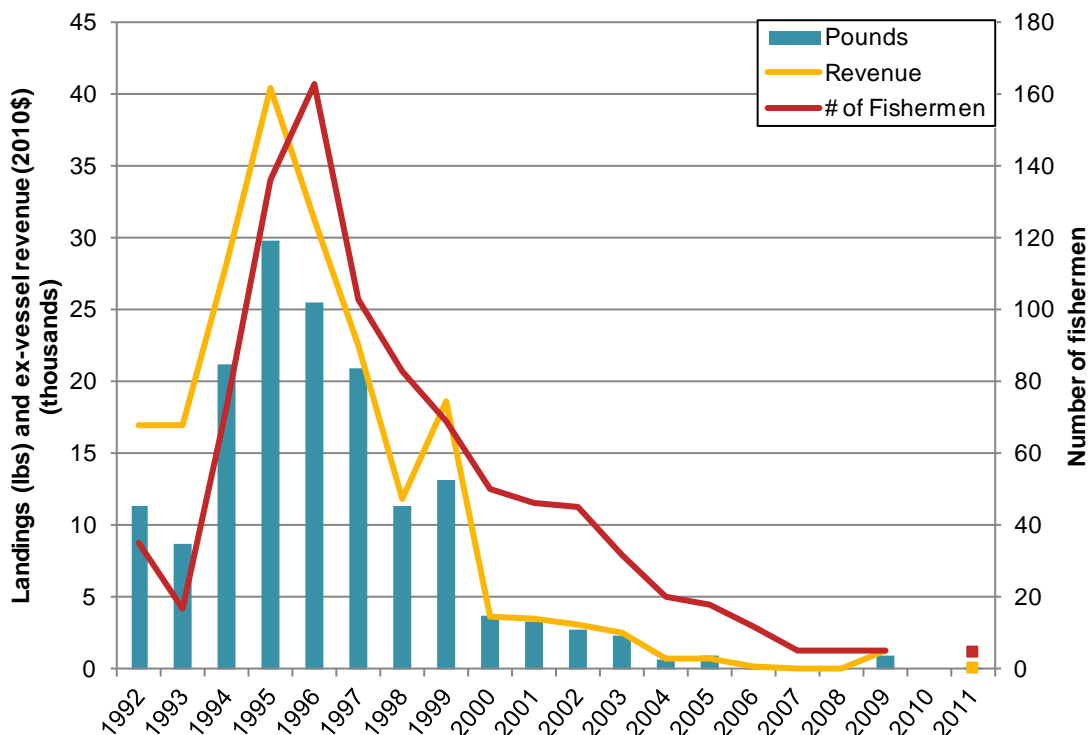
Figure 33 displays the landings, ex-vessel revenues, and number of fishermen for the nearshore finfish–dead–longline fishery for the Central Coast Region over 1992–2011. Though experiencing a peak in 1995 with landings of 29,848 pounds and ex-vessel revenues of \$40,414 and a peak of 163 fishermen in 1996, by 2011, landings, ex-vessel revenues, and number of fishermen dropped significantly to 85 pounds, \$70, and 5 fishermen respectively.

The average nearshore finfish–dead–longline fisherman in the Central Coast region landed 141 pounds for \$193 in ex-vessel revenues per year over the study period, making five landings to do so, see Figure 34. The count of landings jumped from three per fisherman in 1992 to a maximum of nine per fisherman in 1996 and fell overall, as did pounds landed and ex-vessel revenues per fisherman, until 2011. In 2011,

the average nearshore finfish–dead–longline fisherman made only one landing per year landing 19 pounds for \$17 each.

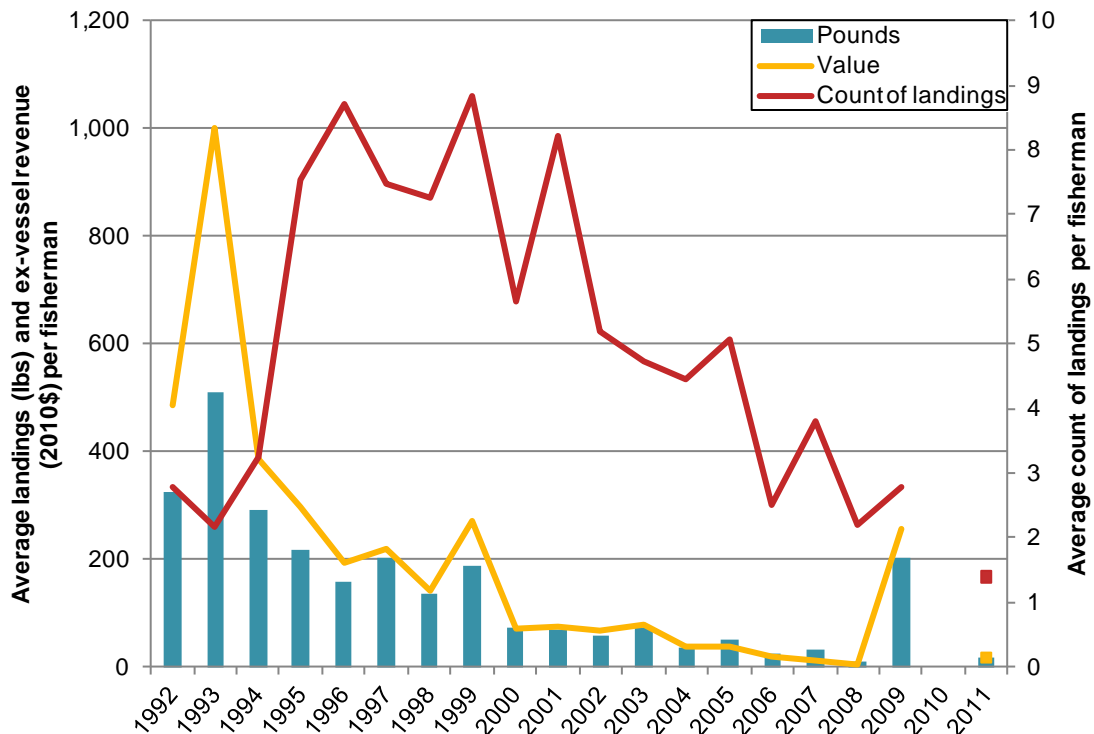
Similar to the Dungeness crab–trap fishery, the nearshore finfish–dead–longline is the only other fishery in the Central Coast Region to experience lower average ex-vessel prices per pound observed in 2011 than those observed in 1992. As show in Figure 35. the average ex-vessel price per pound for this fishery began at \$1.50 per pound in 1992 and decreased by approximately 45 percent to \$0.83 per pound in 2011.

Figure 33. Nearshore finfish–dead–longline commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



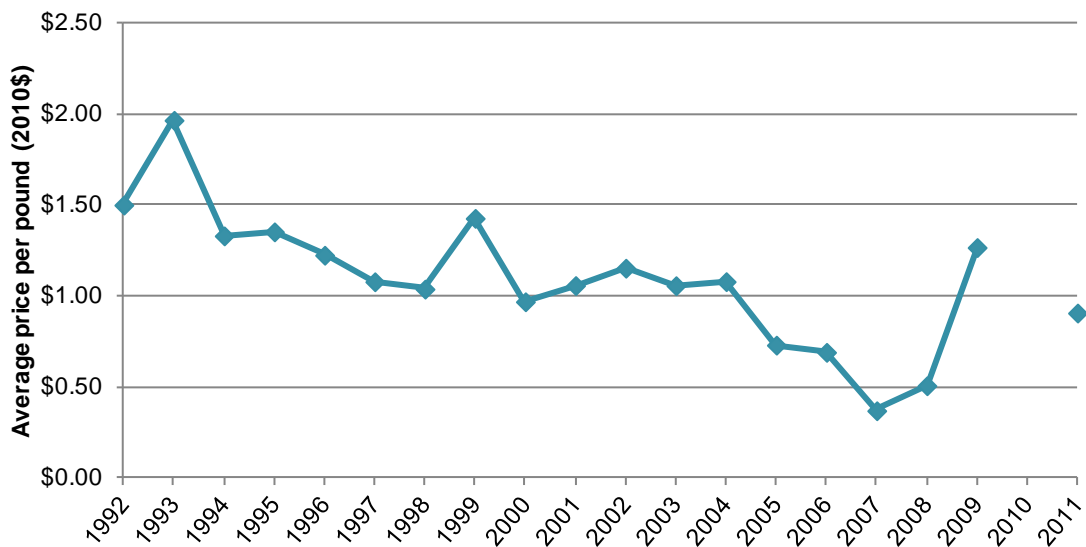
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 34. Nearshore finfish–dead–longline: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 35. Nearshore finfish–dead–longline commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Table 99 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the nearshore finfish–dead–longline fishery over recent time periods for both pre and post MPA implementation periods. Changes are presented for the study region and compared with those observed in the fishery at the state level. Aside from relatively higher landings made in the year 2009 in the Central Coast Region, this fishery largely declined in significance during the latter half of the study period. Trends in the Central Coast Region for the nearshore finfish–dead–longline fishery rarely followed trends at the state level for this fishery. While ex-vessel revenues fell statewide for this fishery from 2008 to 2011, the Central Coast region experienced an increase of 251.4 percent in ex-vessel revenues, although remained at relatively low overall values (from \$24 to \$84 respectively). While an upswing in landings and ex-vessel revenues in the more recent years of the study period has transpired, it is difficult to tell if it will be maintained.

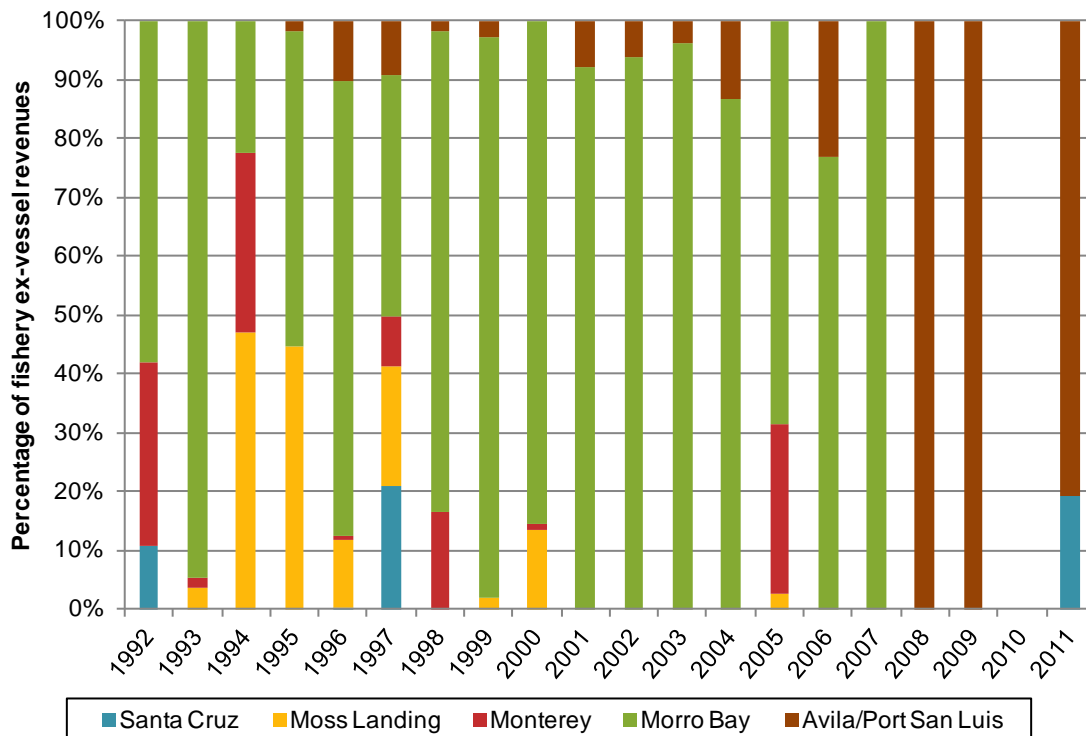
Figure 36 displays nearshore finfish–dead–longline ex-vessel revenue portions by Central Coast Region ports over 1992–2011. Relative to other Central Coast Region ports, the percentage of ex-vessel revenues from Morro Bay were highest on average at 64.5 percent of total ex-vessel revenues for the fishery (\$7,282). As landings neared close to zero for most Central Coast Region ports towards the end of the study period, most ex-vessel revenues were made in Avila/Port San Luis, with that port constituting over 90 percent of total ex-vessel revenues in 2009 alone.

Table 99. Nearshore finfish-dead-longline: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	-31.2%	-92.3%	251.4%	-97.7%
	Average per fisherman	7.5%	-69.3%	195.8%	-80.6%
State	Total	-83.9%	35.7%	-60.9%	-94.5%
	Average per fisherman	-67.9%	121.1%	-44.8%	-64.3%

Source: Landings data from CDFG

Figure 36. Nearshore finfish–dead–longline commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



*Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG*

4.4.6. Nearshore Finfish–Live: Initial Changes and Baseline Characterization

The nearshore finfish fishery is a California state managed fishery and comprised of 19 different species of groundfish found primarily in rocky reef or kelp habitat. Nearshore finfish were traditionally fished with gill net and trawl gear but these gear types have decreased in use as stricter regulations have been enacted such as the Rockfish Conservation Area and other depth and area restrictions on gill net and trawl gear (CDFG 2002). During the 1990's groundfish landings decreased by 60 percent largely from these restrictions and the use of hook and line and trap gear increased to target nearshore fish. Since the late 1990's the nearshore fishery has shifted into the live fish fishery. While total landings of groundfish decreased, landings of nearshore fish have increased since the late 1990's (CDFG 2002). In interviews fishermen noted that live fish make up the majority of the nearshore finfish catch now and often dead fish are landed only if they cannot be sold as live fish.

Nearshore finfish are highly regulated under a variety of different management structures. The California Nearshore Fishery Management Plan in 2002 established permits to fish in nearshore waters (e.g., nearshore rockfish or deeper nearshore rockfish permits), limited the number of permits issued in each management region in California, and set individual quota limits. Additionally, in 2002 the Rockfish Conservation Area was implemented, restricting the depth of fishable areas. Currently, the number of nearshore and deeper nearshore permits issued are above target management goals and thus fishermen wishing to enter the fishery must purchase two permits within their management region and retire one permit.

The live fish fishery was primarily developed for Asian markets in the Los Angeles and San Francisco areas. As demand increased so did the price – and in 1999 a live cabezon averaged \$3.80 per pound as compared to \$0.50 per pound for dead cabezon in 1989 (CDFG 2002). Live nearshore finfish are caught

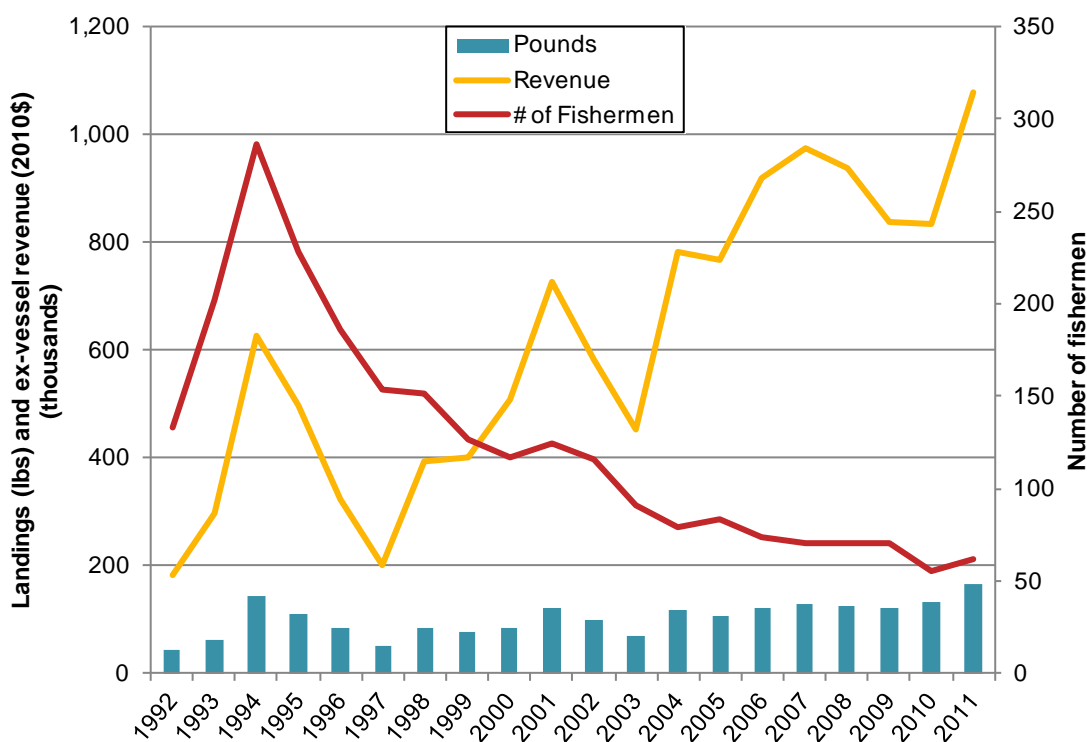
using hook and line, trap, and longline gear types. Trap permit endorsement are required as a mandate of the of the 1998 Nearshore Fisheries Management Act.

Nearshore Finfish-Live-Hook & Line

The nearshore finfish-live-hook & line fishery experienced notable growth over the study period with landings and ex-vessel revenues increasing nearly 300 and 500 percent respectively from 1992 to 2011. In 2011, landings and ex-vessel revenues were at their highest at 166,433 pounds and \$1.1 million; see Figure 37. Over the study period, the average ex-vessel price per pound, see Figure 39, increased by approximately 50 percent to \$6.47 in 2011.

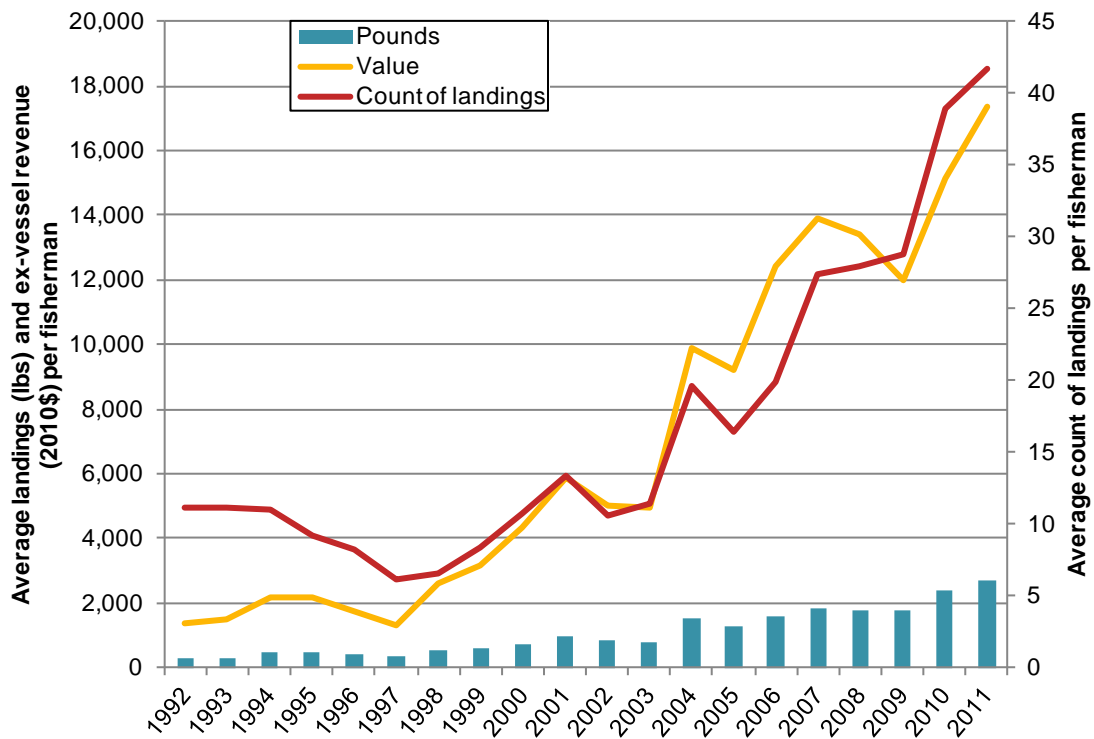
In most other fisheries of interest in the Central Coast Region the number of fishermen and ex-vessel revenues trends have declined together, however, in the nearshore finfish-live-hook & line fishery the ex-vessel revenue levels have increased while the number of fishermen has decreased. A smaller number of fishermen thus shared substantially larger ex-vessel revenues for almost every year in the study period. In 2011, the individual fisherman's average share of ex-vessel revenues was nearly 13 times higher than the average share in 1992, see Figure 38. The count of landings per fisherman also increased from 11 landings in 1992, to a maximum of 42 landings per fisherman in 2011. On average over the entire study period, Central Coast Region nearshore finfish-live-hook & line fishermen landed 1,088 pounds for \$6,979 in ex-vessel revenues over an average of 17 landings annually.

Figure 37. Nearshore finfish-live-hook & line commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



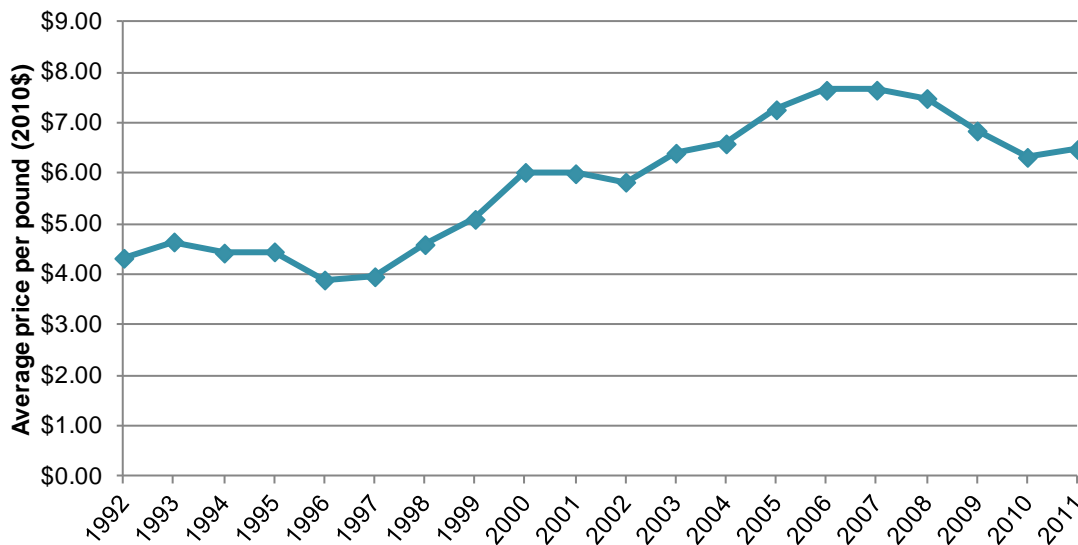
Source: Landings data from CDFG

Figure 38. Nearshore finfish–live–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Source: Landings data from CDFG

Figure 39. Nearshore finfish–live–hook & line commercial fishery average ex-vessel price per pound in Central Coast Region ports, 1992–2011



Source: Landings data from CDFG

Table 100 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the nearshore finfish–live–hook & line fishery over recent time periods categorized into both pre and post MPA implementation periods. Changes are presented for the study region and compared with those observed in the fishery at the state level. Trends in the Central Coast Region more closely mirrored those seen at the state level for the nearshore finfish–live–hook & line fishery; although ex-vessel revenues rose again (15 percent) from 2008 to 2011 in the Central Coast Region while they decreased again in the state (by 14.6 percent). More impressive, is the rate at which average ex-vessel revenues per fishermen have been consistently increased. From 2000 to 2011, fishermen were earning 298.8 percent more in ex-vessel revenue on average in the Central Coast Region. While all nearshore finfish–live–hook & line fishermen in the state were also earning more ex-vessel revenue on average (169.9 percent), it was not to the same extent. The large increase in average ex-vessel revenues per fishermen is due in part to both increasing total ex-vessel revenues and decreasing numbers of fishermen.

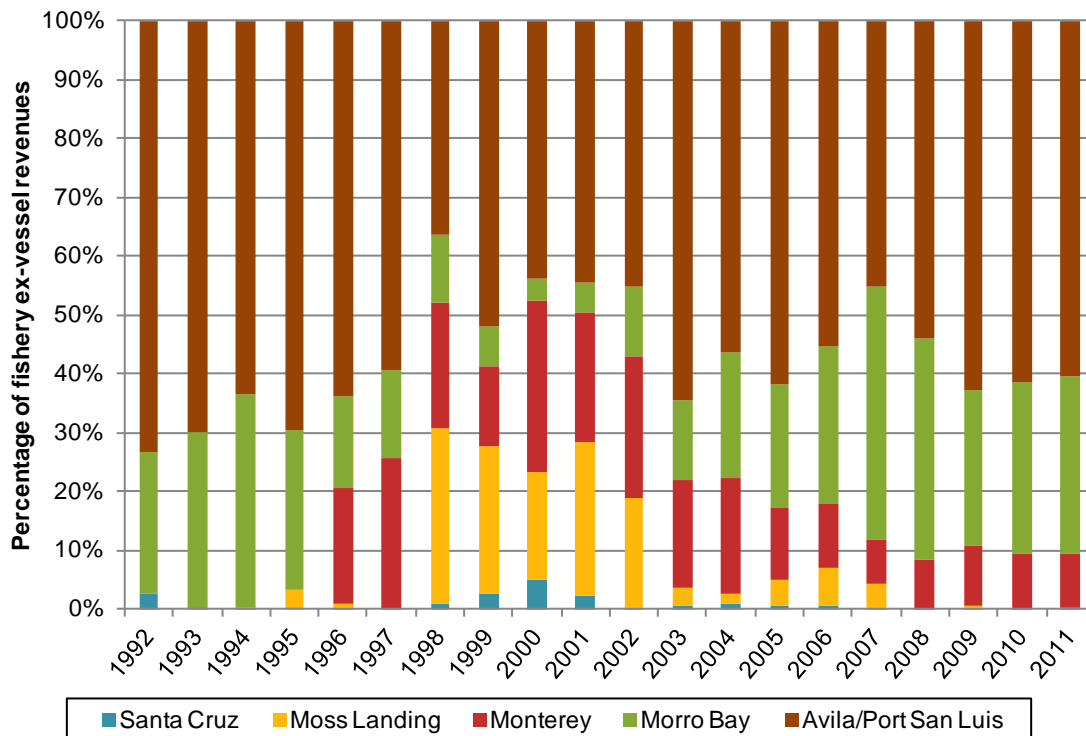
Figure 40 displays nearshore finfish–live–hook & line ex-vessel revenue portions by Central Coast Region ports over 1992–2011. Over the study period, Avila/Port San Luis consistently constituted the majority of nearshore finfish–live–hook & line ex-vessel revenues in the region averaging 57.2 percent annually of total ex-vessel revenues (\$344,862). The port with the next highest average annual contribution to total Central Coast Region nearshore finfish–live–hook & line ex-vessel revenues was Morro Bay (21.8 percent) followed by Monterey (13 percent).

Table 100. Nearshore finfish-live-hook & line: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	-11.3%	24.8%	15.0%	111.4%
	Average per fisherman	14.0%	40.8%	29.8%	298.8%
State	Total	-40.1%	15.7%	-14.6%	-16.4%
	Average per fisherman	10.9%	30.5%	8.4%	169.9%

Source: Landings data from CDFG

Figure 40. Nearshore finfish–live–hook & line commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



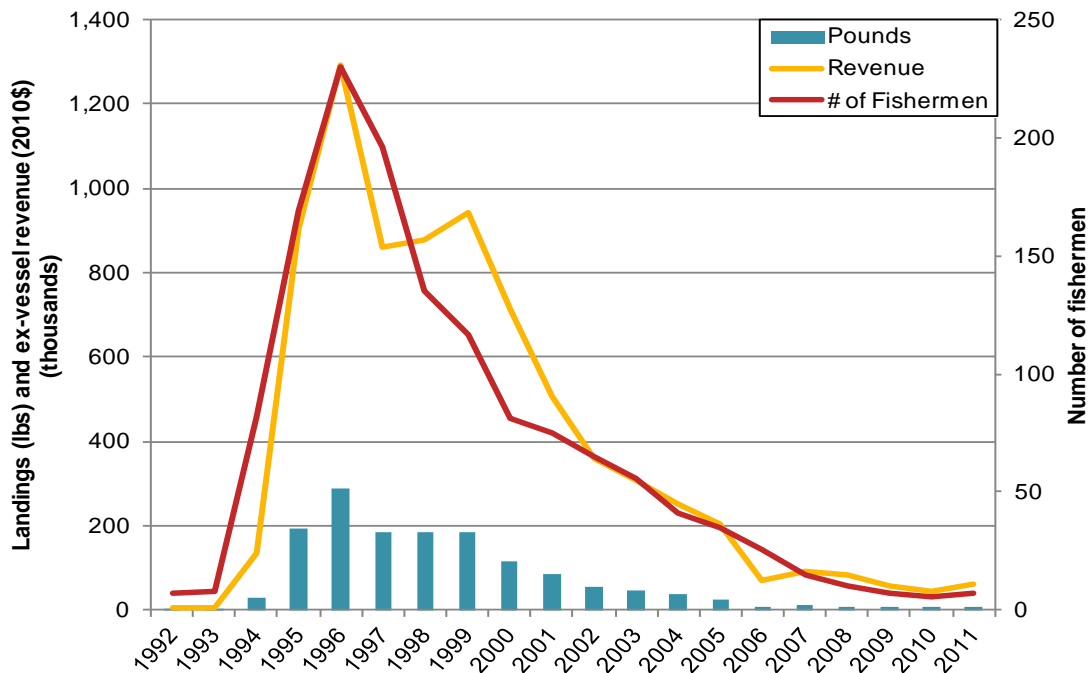
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Nearshore Finfish-Live-Longline

The nearshore finfish–live–longline fishery experienced a great peak in the mid 1990s before returning to lower levels in 2011, see Figure 41. In 1996, landings and ex-vessel revenues rose to 288,845 pounds and \$1.3 million respectively with 230 participating fishermen. By 2011, these numbers fell to 9,139 pounds, \$60,374 in ex-vessel revenues, and seven fishermen, but were higher than they had been in 1992.

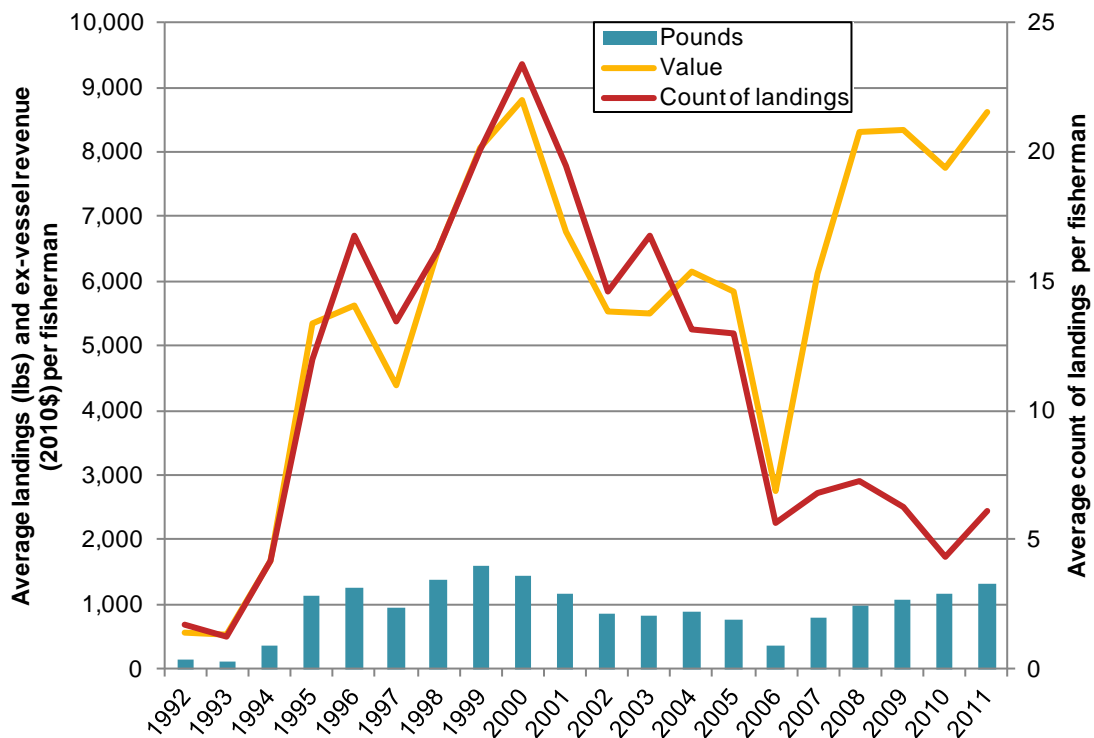
The average nearshore finfish–live–longline fisherman in the Central Coast Region landed 929 pounds for \$5,657 in ex-vessel revenues over a count of eleven landings annually, see Figure 42. Trends in the count of landings closely followed average ex-vessel revenues per fishermen, until about 2006 when the number of landings fishermen made per year on average dropped by approximately half and remained low for the remainder of the study period as fishermen landed more catch individually per landing. At the same time, average pounds landed and ex-vessel revenues per fisherman increased significantly with fishermen in 2011 earning an average of \$8,625 in ex-vessel revenues for each fisherman. Average ex-vessel price per pound increased 78.3 percent from 1992 to 2011, see Figure 43, to \$6.61 by 2011.

Figure 41. Nearshore finfish–live–longline commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



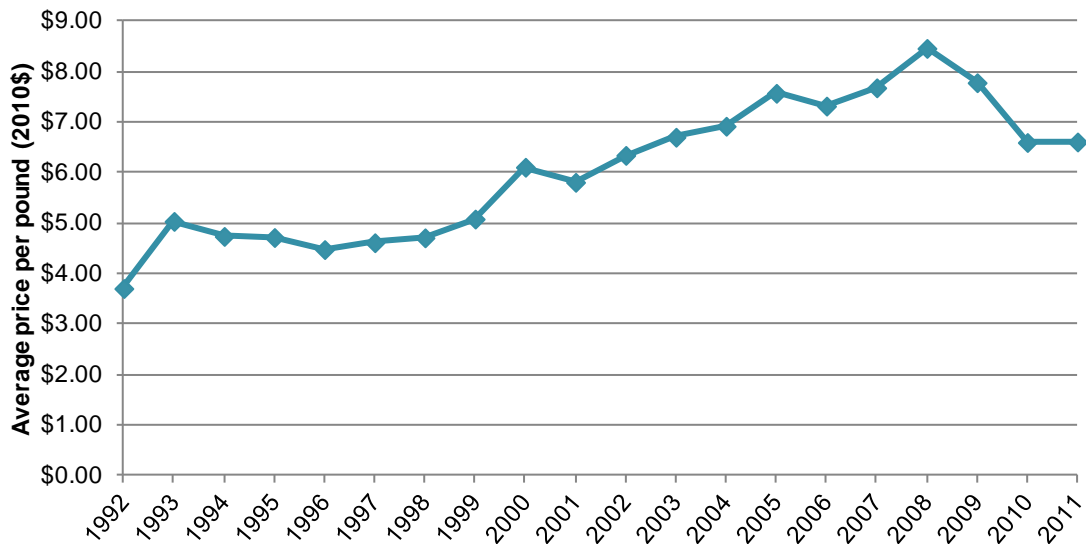
Source: Landings data from CDFG

Figure 42. Nearshore finfish–live–longline: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Source: Landings data from CDFG

Figure 43. Nearshore finfish–live–longline commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Table 101 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the nearshore finfish–live–longline fishery over recent time periods categorized as both pre and post MPA implementation periods. Changes are presented for the study region and compared with those observed in the fishery at the state level. Trends in this fishery differed greatly between the Central Coast Region and the state from 2004 to 2007 when Central Coast Region ex-vessel revenues decreased by nearly two thirds while average ex-vessel revenues per fisherman remained mostly constant; at the same time, the opposite occurred at the state level. However, examining the years between 2004 and 2007 (see Figure 42), average ex-vessel revenues actually dropped in the years between before continuing to climb. Meanwhile, ex-vessel revenues continued declining overall as fewer and fewer fishermen participated in this fishery over the study period.

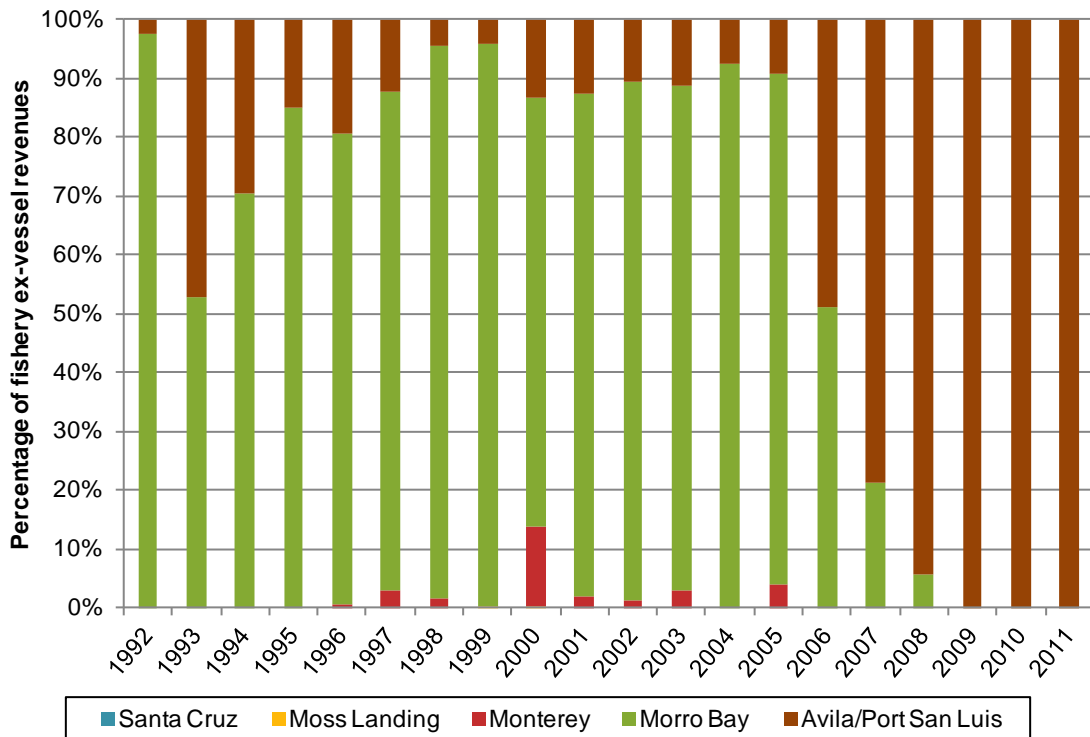
Figure 44 displays nearshore finfish–live–longline ex-vessel revenue portions by Central Coast Region ports over 1992–2011. The ports of Morro Bay and Avila/Port San Luis constituted the majority of Central Coast Region ex-vessel revenues for this fishery with annual averages of 62.5 percent (\$352,561) and 36.1 percent (\$61,346) respectively. Prior to 2007, Morro Bay consistently averaged well over half of total ex-vessel revenues in the Central Coast Region for the nearshore finfish–live–longline fishery, after 2007 the port of Avila/Port San Luis landed the majority of nearshore finsifhs—live—longline ex-vessel revenue.

Table 101. Nearshore finfish-live-longline: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	-56.8%	-63.5%	-27.4%	-91.5%
	Average per fisherman	-37.5%	-0.3%	3.8%	-1.9%
State	Total	-65.4%	-0.7%	-23.1%	-78.2%
	Average per fisherman	-39.3%	74.9%	15.3%	36.9%

Source: Landings data from CDFG

Figure 44. Nearshore finfish–live–longline commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

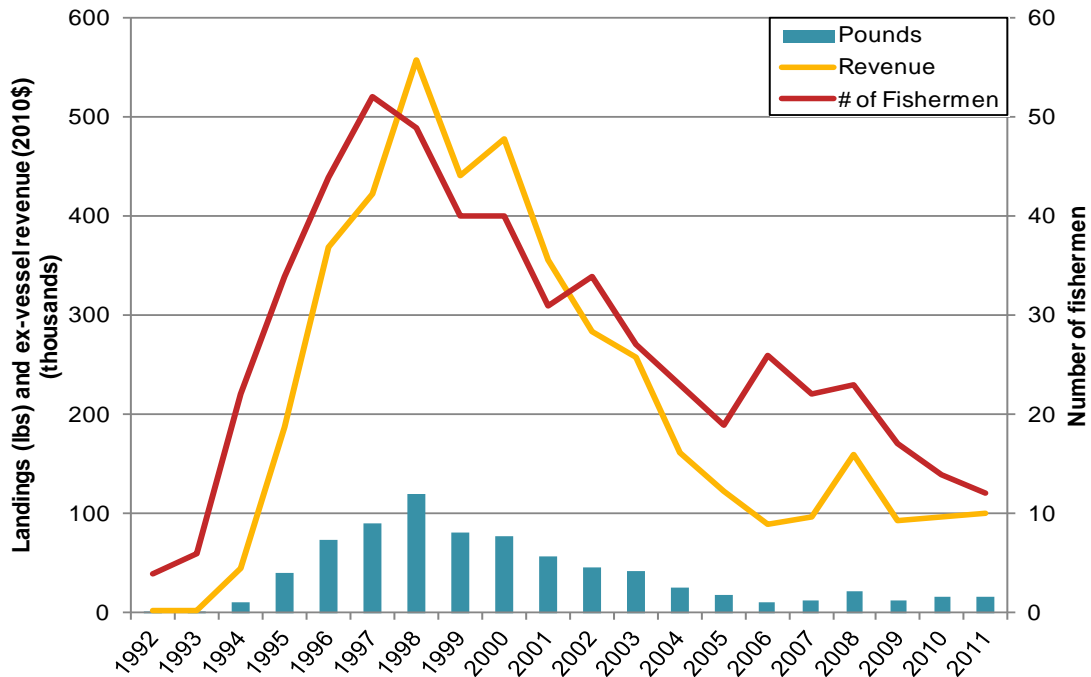
Nearshore Finfish-Live-Trap

Figure 45 displays landings and ex-vessel revenues for the nearshore finfish–live–trap fishery in the Central Coast Region over years 1992 to 2011. The landings and ex-vessel revenues trends for this fishery mirror those for the nearshore longline dead and live fisheries, peaking in mid/late 1990s before steadily declining. In 2011, landings and ex-vessel revenues were at 15,821 pounds and \$101,018.

Although the nearshore finfish–live–trap fishery in the Central Coast Region experienced a huge initial increase in pounds landed and ex-vessel revenues (as well as number of participating fishermen) before values dropped again in the remainder of the study period, landings and ex-vessel revenues were still much higher in 2011 than they were at the beginning in 1992. Unlike most other fisheries examined in this study, the number of fishermen in 2011 was higher than it was in 1992.

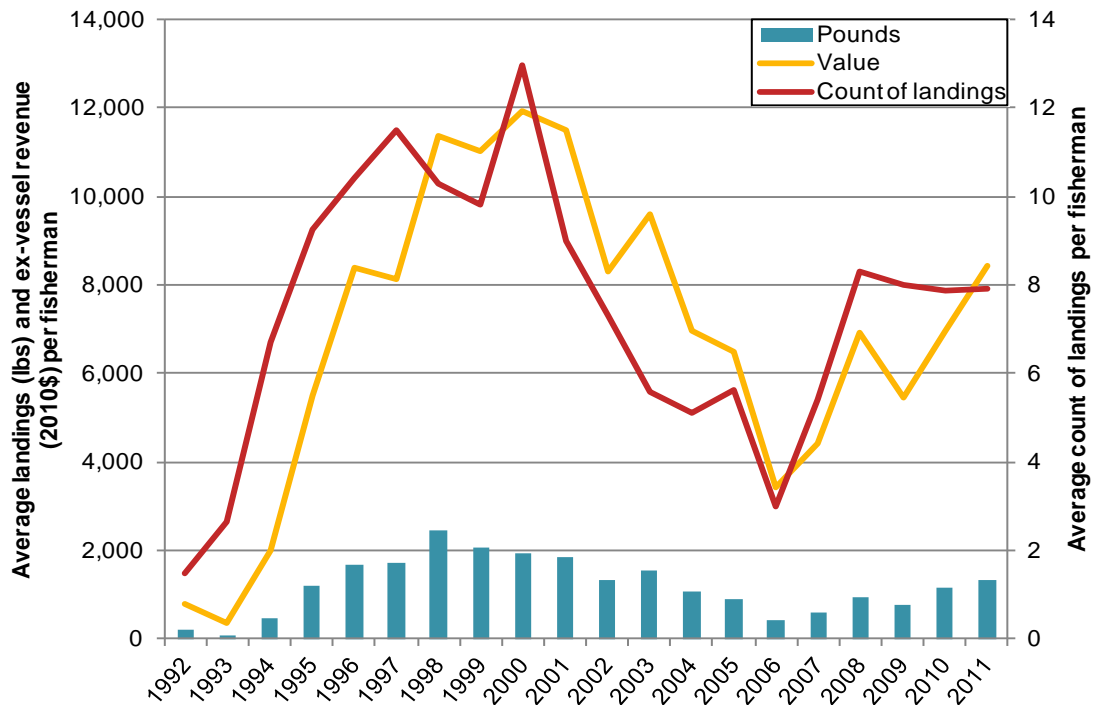
The average nearshore finfish–live–trap fisherman landed a total of 1,186 pounds for \$6,901 in ex-vessel revenues over a count of seven landings per year, see Figure 46. As seen in Figure 47, the average ex-vessel price per pound for this fishery increased over the study period by approximately 66 percent to \$6.39 per pound by 2011.

Figure 45. Nearshore finfish–live–trap commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



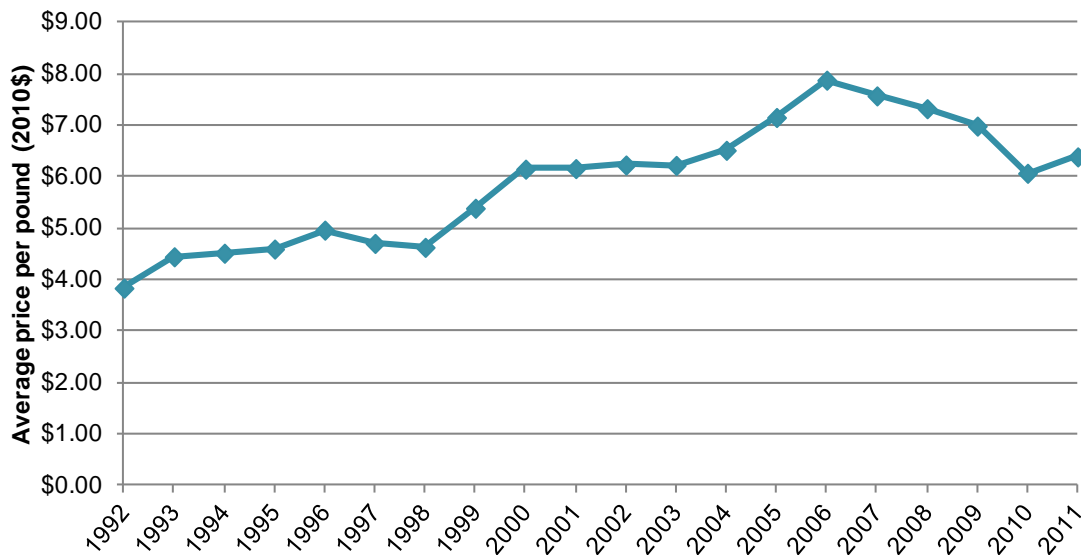
Source: Landings data from CDFG

Figure 46. Nearshore finfish–live–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Source: Landings data from CDFG

Figure 47. Nearshore finfish–live–trap commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Table 102 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the nearshore finfish–live–trap fishery over recent time periods categorized as both pre and post MPA implementation periods. Changes are presented for the study region and compared with those observed in the fishery at the state level. Total ex-vessel revenues declined continuously in both the Central Coast Region and in the state over the periods examined. The same is true for average ex-vessel revenues per fishermen except for from 2008 to 2011 in both the region and at the state level, and overall for the state from 2000 to 2011. For the Central Coast region, the rate of the number of nearshore finfish–live–trap fishermen participating in the fishery decreased faster than total ex-vessel revenues (47.8 percent vs. 36.7 percent respectively), thus allowing higher average ex-vessel revenues per fishermen although total ex-vessel revenues overall were lower. In 2011, nearshore finfish–live–trap fishermen in the Central Coast Region made 29.5 percent less on average than those in 2000. However, since 2007, this trend appeared to be on the upswing, see Figure 46.

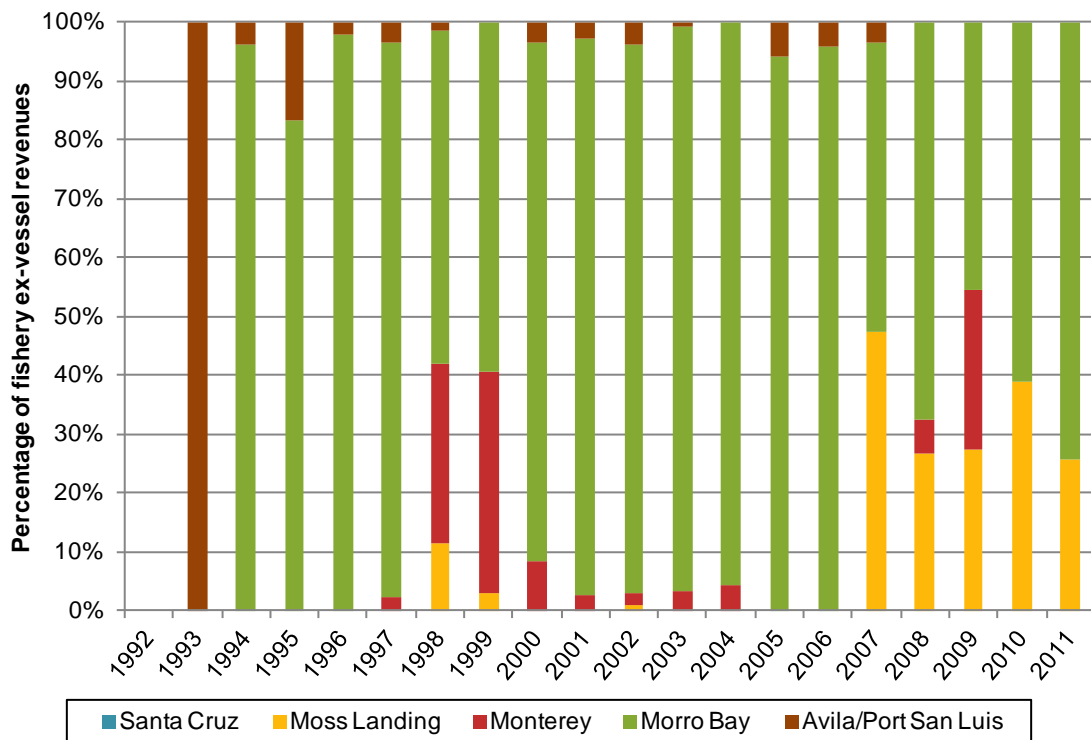
Figure 48 displays nearshore finfish–live–trap ex-vessel revenue portions by Central Coast Region ports over 1992–2011. Again, for almost every year from 1992 to 2011, Morro Bay consistently constituted well over half of total ex-vessel revenues for this fishery in the Central Coast Region over the study period, with an annual average portion of 76% (\$192,219). Moss Landing had relatively small ex-vessel revenues in this fishery until about 2007 when its share of total ex-vessel revenues increased significantly, averaging 33.2 percent of total ex-vessel revenues per year from 2007 to 2011.

Table 102. Nearshore finfish-live-trap: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	-45.9%	-39.6%	-36.7%	-78.9%
	Average per fisherman	-19.8%	-36.8%	21.3%	-29.5%
State	Total	-51.2%	-32.5%	-28.6%	-71.5%
	Average per fisherman	-0.8%	-21.6%	3.7%	24.0%

Source: Landings data from CDFG

Figure 48. Nearshore finfish-live-trap commercial ex-vessel revenues by Central Coast Region ports, 1992-2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

Due to the relatively low value of the nearshore finfish -- dead fishery we chose to only target the live fishery for interviews with fishermen. We targeted three gear types in the live fish fishery: hook & line, trap, and longline. The survey data collected for these gear types are presented in aggregate form as much of the data could not be presented separately due to confidentiality constraints. Nearshore finfish-live fishermen were often the most resistant to being interviewed, most citing having been highly impacted by multitude of regulations in the past decade including MPAs and a lack of trust for the state agencies, private interest groups, and nongovernmental organizations. We interviewed 12 commercial nearshore finfish fishermen across the region (Table 103). Some fishermen participated in more than one gear type and 16 data sets were generated, 10 of which are hook & line, 5 are trap, and 1 is longline. The largest number of interviews came from Morro Bay (5) followed by Avila (4). The Central Coast Region average age was 45.9 years and on average they had 21.1 years of commercial fishing experience.

Table 103. Average age and years experience commercial fishing, Nearshore finfish–live

Ports	Individuals Interviewed	Age		Years experience	
		Average	Standard deviation	Average	Standard deviation
Santa Cruz	1	*	*	*	*
Moss Landing/Monterey	2	*	*	*	*
Morro Bay	5	38.6	12.7	19.6	15.2
Avila/ Port San Luis	4	58.0	9.1	25.5	16.0
Central Coast Region	12	45.9	16.2	21.1	14.7

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

Fishermen were asked to estimate the percent of their personal income that came from commercial fishing for the years 2006 and 2011. In the table below, percent change was calculated after the interview was completed. As shown below in Table 104 Morro Bay fishermen experienced a 21.1 percent decrease in income from overall commercial fishing with on average 73.1 percent of total income derived from commercial fishing in 2011 from 83.3 percent in 2006. In Avila/Port San Luis, fishermen reported an average of 51.3 percent of their income coming from commercial fishing in 2006 and 75.5 percent in 2011. Based on each individual's percent change in income the four Avila/Port San Luis respondents average a 480 percent increase in percent of total income from commercial fishing. As indicated by the large standard deviation (946.7 percent) one fisherman in particular became a full-time fisherman significantly shifting his/her percent income from commercial fishing between 2006 to 2011.

With this outlier removed Avila/Port San Luis reports an average of 66.7 percent of total income from commercial fishing in 2006 (with a standard deviation of 49.3 percent) and 67.3 percent in 2011 (with a standard deviation of 48.2 percent). This results in an average increase of 6.7 percent (with a standard deviation of 11.5 percent) over the study period. Additionally, without the outlier, the average for the Central Coast Region would be 76.1 percent of total income from commercial fishing (with a standard deviation of 26.4 percent) and 2011 would be 75.4 percent (with a standard deviation of 31.7 percent). The resulting percent change in fishing related income from 2006 to 2011 would be -7.4 percent.

Table 104. Percent change in income from overall commercial fishing from 2006–2011, Nearshore finfish–live

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	*	*	*	*	*	*
Moss Landing/Monterey	*	*	*	*	*	*
Morro Bay	83.3%	25.8%	73.1%	29.0%	-21.7%	18.1%
Avila/ Port San Luis	51.3%	50.7%	75.5%	42.6%	480.0%	946.7%
Central Coast Region	75.4%	33.9%	80.4%	29.9%	132.6%	509.2%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

After reporting the percent of their income from commercial fishing for 2006 and 2011, fishermen who reported a change were asked to describe factors to which they attributed this change. This was posed as an open-ended question and respondents were encouraged to speak freely as the interviewer took notes on key aspects that were mentioned. After the interview, the notes were coded and summarized into the

categories which are shown below. Of the seven individuals who responded, three cited increased regulation, and four total cited having an additional job/sources of income in 2006 or 2011 (Table 105).

Table 105. Cause of change in percent income from commercial fishing from 2006–2011, Nearshore finfish–live

Response	Number responding
Increased regulation	3
Intensified fishing efforts	—
Had additional job or source of income	2
Found additional job or source of income	2
Change in fish abundance	—
Total number responding	7

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The most frequently cited source of additional income was skilled labor such as construction. Respondents noted that this gave them a stable income source to rely upon when fishing was not as successful.

Table 106. Other sources of income other than commercial fishing in 2011, Nearshore finfish–live

Response	Number responding
Skilled labor	5
Investments/retirement/social security	1
Business/office work	2
Other maritime occupation	—
Total number responding	6

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Across the Central Coast Region nearshore finfish–live fishermen reported a 19.4 percent increase in the amount of their gross economic revenue which goes towards overall operating costs.

Table 107. Percent change in overall commercial fishing operating costs from 2006–2011, Nearshore finfish–live

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	*	*	*	*	*	*
Moss Landing/Monterey	*	*	*	*	*	*
Morro Bay	31.7%	15.7%	35.0%	16.7%	13.3%	20.7%
Avila/ Port San Luis	47.0%	4.8%	53.3%	8.3%	9.6%	19.6%
Central Coast Region	35.6%	20.5%	40.8%	18.6%	19.4%	24.4%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

Like many of the other target fisheries, the most commonly reported reason for an increase in operating costs was an increase in fishing expenses, specifically increases in fuel costs. Some respondents also indicated that they had start up costs in 2011 that they considered an investment that would not have to be in subsequent years.

Table 108. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Nearshore finfish–live

Response	Number responding
Large capital investment	3
Decrease in fishing income	1
Decrease in fishing grounds	1
Increase in fishing expenses	5
Fishing less in 2006	1
Fishing less in 2011	—
Total number responding	9

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Of all the target fisheries, fishermen had the least number of years experience in the nearshore finfish–live fishery (14.9 years). On average, fishermen reported 0.9 crew members which receives 14.1 percent of the boats gross economic revenue (GER) from a trip. Further statistics can be found in Table 109.

Table 109. Additional commercial fishery specific data, Nearshore finfish–live

Ports	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	*	*	*	*	*	*	*	*
Moss Landing/Monterey	8.5	4.9	1.0	n/a	13.3%	12.6%	17.5%	10.6%
Morro Bay	13.6	7.2	1.0	—	17.0%	8.5%	13.0%	2.8%
Avila/ Port San Luis	16.8	7.9	1.0	—	12.5%	8.7%	14.3%	5.1%
Central Coast Region	14.9	8.1	0.9	0.3	14.1%	9.4%	14.6%	4.9%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

n/a indicates standard deviation could not be calculated because only person responded to the question

Across the Central Coast Region 31.3 percent of the fishermen interviewed in the nearshore finfish–live fishery reported adding the fishery since 2006.

Table 110. Nearshore finfish–live, added/dropped since 2006 or not fished in 2011

Ports	Number responding	Percent responding		Not fished in 2011
		Added	Dropped	
Santa Cruz	1	*	*	*
Moss Landing/Monterey	3	66.7%	—	—
Morro Bay	8	25.0%	—	—
Avila/ Port San Luis	4	25.0%	—	—
Central Coast Region	16	31.3%	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Two respondents indicated they added the fishery as they were new to commercial fishing and one indicated they were able to finally obtain a nearshore finfish–live permit and wanted to participate in this high value fishery.

Table 111. Nearshore finfish–live, reason for adding/dropping since 2006 or not fishing a fishery in 2011

Responses	Number responding
Started commercial fishing	2
Change in fish population	—
Diversify fisheries	—
Was able to obtain permit	1
High costs	—
Total number responding	4

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked to compare the success of the nearshore finfish—live fishery in 2011 to their success in this fishery in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse.

At the Central Coast Region level in the nearshore finfish–live fishery at least one individual responded in each of the possible response categories indicating that respondent experiences vary widely.

**Table 112. Overall success in specific commercial fishery compared to previous five years,
Nearshore finfish–live**

Ports	Number responding	Did not participate in previous seasons	Percent response				
			Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Santa Cruz	1	*	*	*	*	*	*
Moss Landing/Monterey	2	—	50.0%	—	50.0%	—	—
Morro Bay	7	—	12.5%	25.0%	12.5%	25.0%	25.0%
Avila/ Port San Luis	4	—	25.0%	—	50.0%	25.0%	—
Central Coast Region	14	—	21.4%	14.3%	28.6%	21.4%	14.3%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded and divided into four categories: regulatory, environmental, economic, and other as seen in the tables below.

Six respondents specified direct impacts from MPAs. Additionally, respondents mentioned the Rockfish Conservation Area (RCA) and quota limits as impacting their fishery. Additionally, four respondents mentioned that in general they felt many fishery regulations were inequitable (Table 113).

Table 113. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Nearshore finfish–live

Response	Number responding
MPA impacts	6
Insufficient monitoring/enforcement/communication of MPAs	—
Trawlers impacting nearshore fleet	—
Quota limit issues	2
Concentration of fishing effort into smaller areas/over-crowding	2
Regulations have resulted in less competition	1
Inefficiencies in bycatch regulations	1
Inefficiencies/inconsistencies in fishery regulations	3
Inequities in fishery regulations	4
Inadequate research for policy	2
Inequities in obtaining fishery permits	2
Insufficient regulation on land-based impacts to fisheries	—
Lack of influence on policy/regulation development	1
Insufficient communication of fishery regulations	—
Populations recovering from fishing gear ban	—
Distress around unintended infractions	—
Increased number of fishermen participating in the fishery	—
Increased personal fishing effort	1
Rockfish conservation area (RCA)	2
Total number responding	8

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Environmental, economic, and other factors were mentioned that impacted the success of the nearshore finfish–live fishery are shown below in Table 114, Table 115, and Table 116.

Table 114. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Nearshore finfish–live

Response	Number responding
Increase in bait fish	—
Increase in fish abundance	—
Stable fish abundance	1
Increase in catch	—
Decrease in catch	—
Increase in predators	—
Good weather	—
Biomass of fish largely in MPAs	—
PG&E seismic testing impacts	2
Decrease in habitat or water quality	—
Decrease in fish abundance	—
Change in normal water temp	—
Fish population moved further offshore	—
Decrease in fish size	—
Farmed fish spreading disease	—
Protected species overpopulated	1
Total number responding	4

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 115. Economic changes/factors influencing success in specific commercial fishery in previous five years, Nearshore finfish–live

Response	Number responding
Increased number of fishermen participating in the fishery	—
Increase in operating costs	1
Increase in fish price	—
Decrease in fish price	1
Market flooded	—
Longer season allowed increase in catch	—
Increased demand for fish	—
Decrease in demand for fish	1
Increased personal fishing effort	2
Increased number of outside vessels fishing in local grounds	—
Lack of port infrastructure	1
Increase in travel distance	—
Total number responding	5

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

**Table 116. Other changes/factors influencing success in specific commercial fishery in previous five years,
Nearshore finfish – live**

Response	Number responding
Increase in fishing experience	1
Loss of historical fishing knowledge	—
Fisherman's knowledge not valued	1
Lack of outreach to fishing community	1
Loss of cultural fishing heritage	1
Total number responding	2

Source: Current study

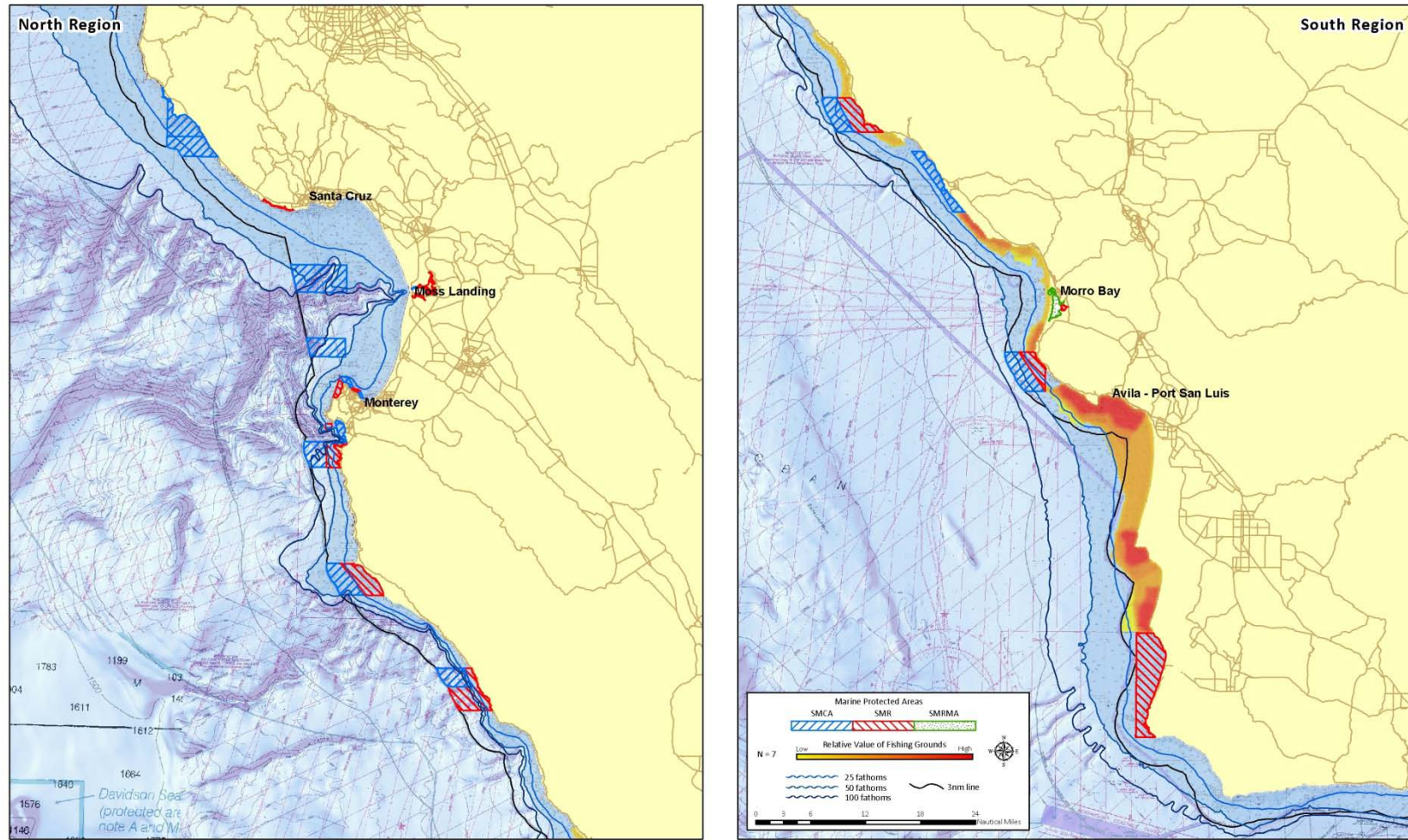
Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Map 10. Nearshore finfish-live-hook & line 2011 commercial fishing value map, Central Coast Region

California Central Coast Commercial Fishermen Data - Nearshore Finfish Live - Hook and Line

All Ports - 2011 Fishing Grounds and Landings

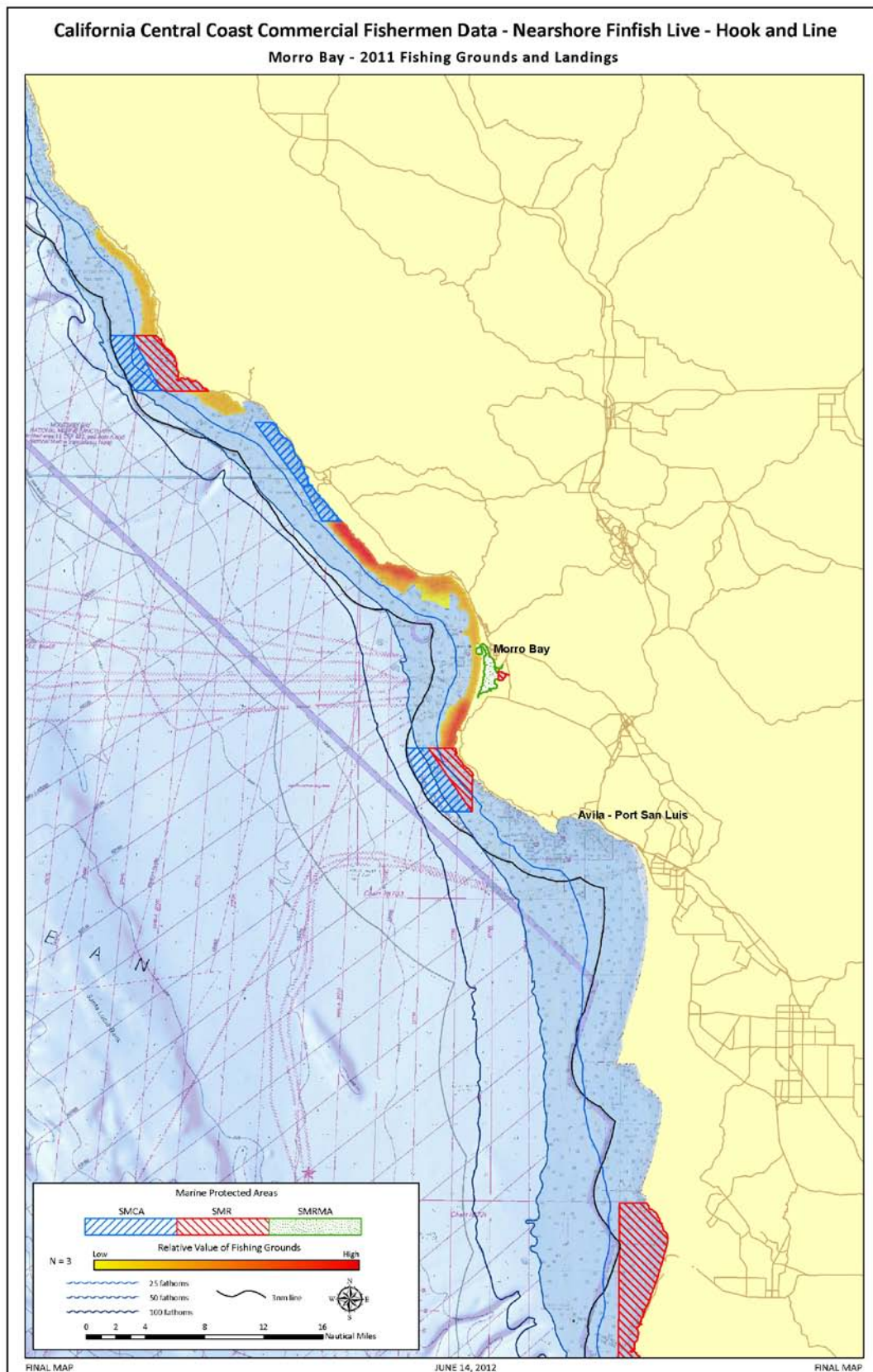


FINAL MAP

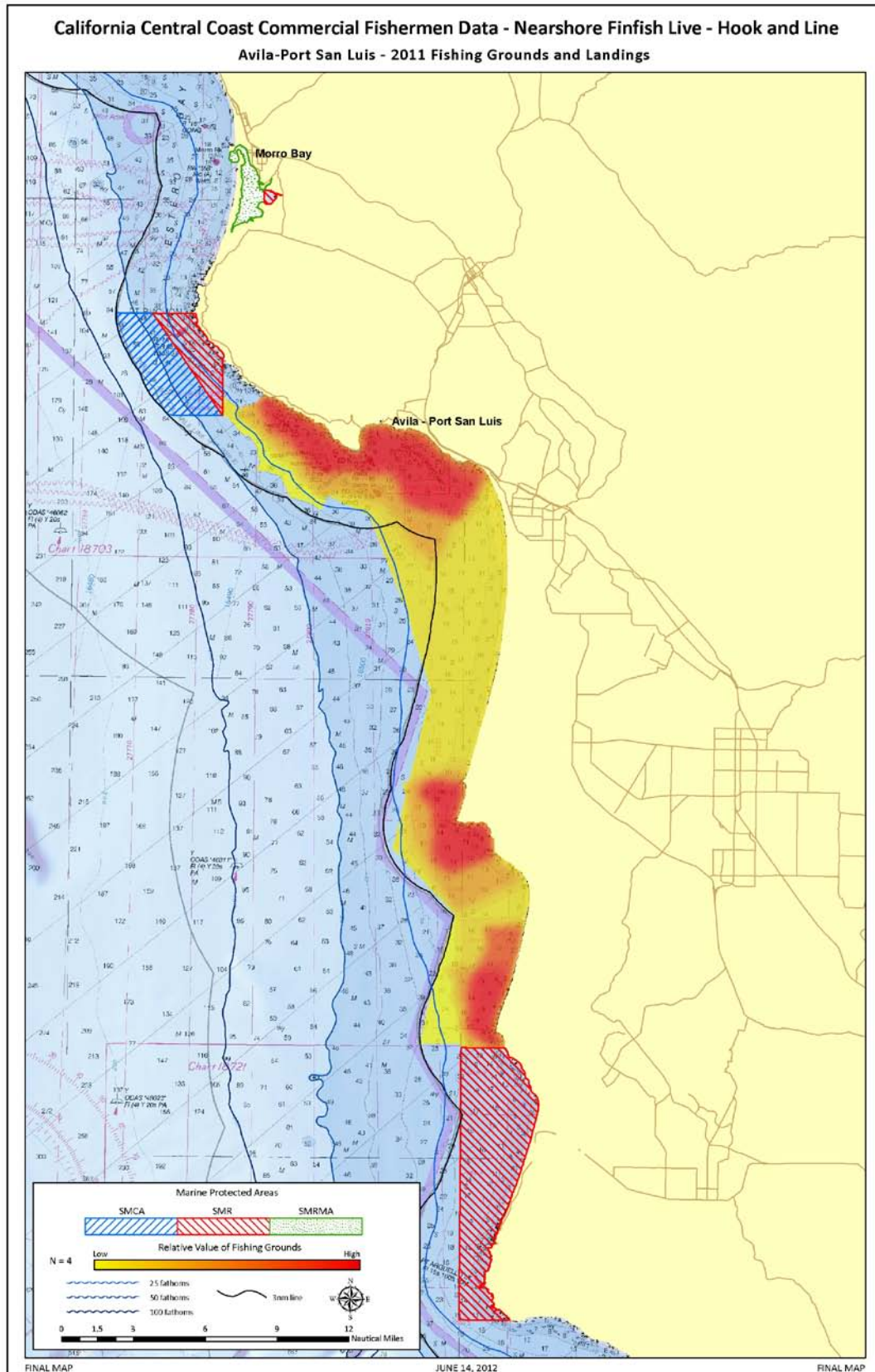
JUNE 14, 2012

FINAL MAP

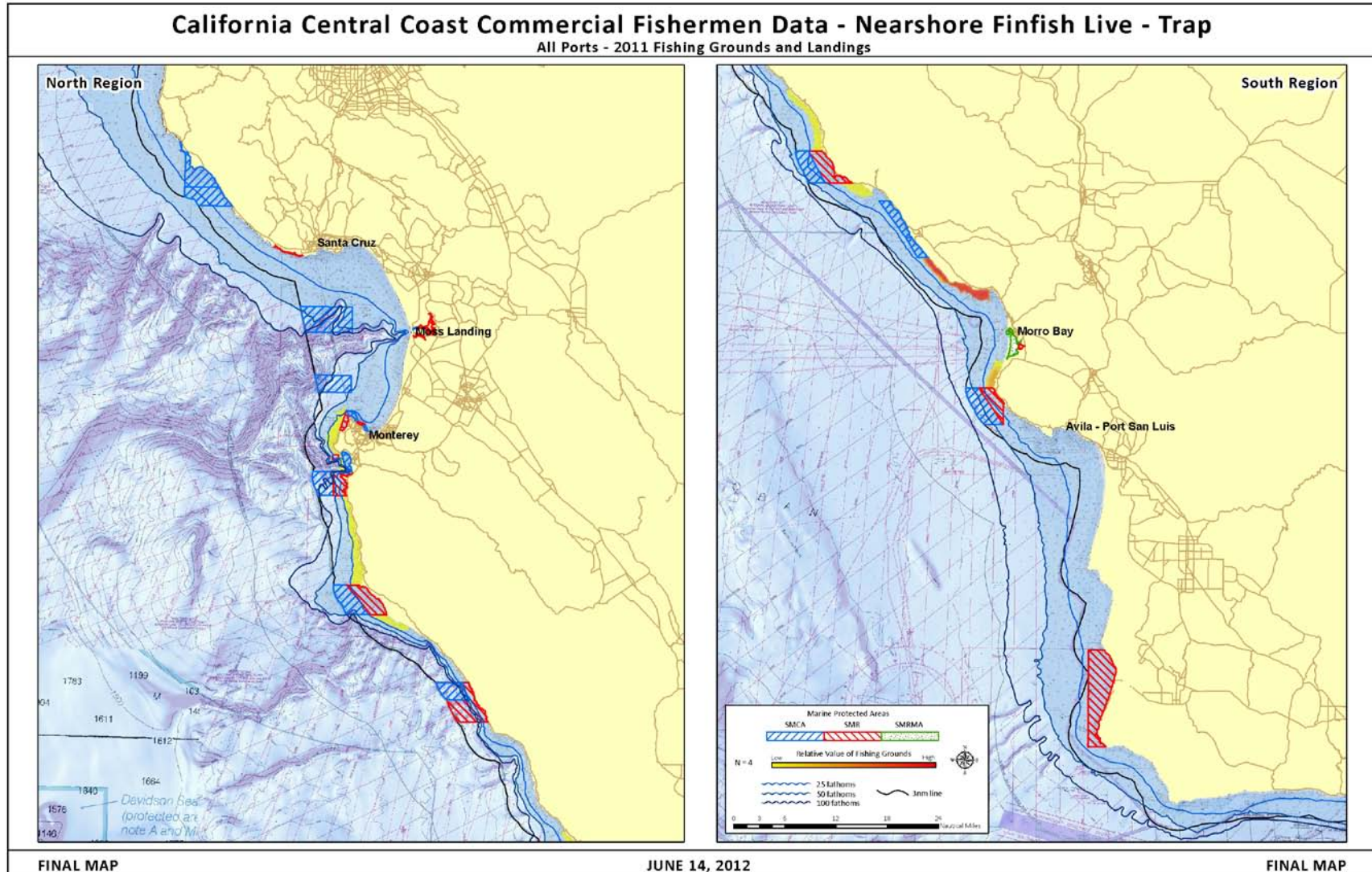
Map 11. Nearshore finfish-live-hook & line 2011 commercial fishing value map, Morro Bay



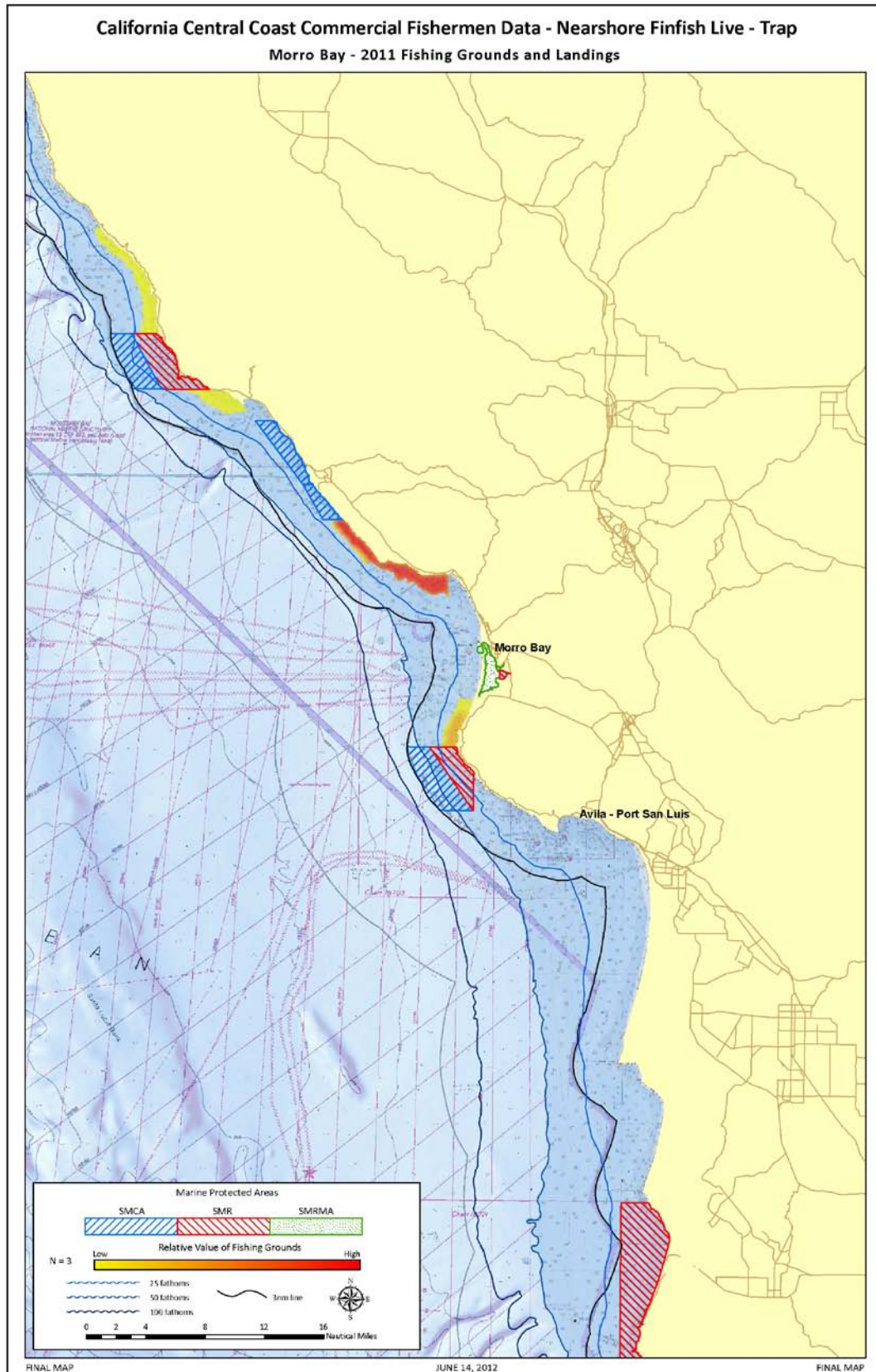
Map 12. Nearshore finfish-live-hook & line 2011 commercial fishing value map, Avila/Port San Luis



Map 13. Nearshore finfish-live-trap 2011 commercial fishing value map, Central Coast Region



Map 14. Nearshore finfish-live-trap 2011 commercial fishing value map, Central Coast Region



4.4.7. Salmon–Troll: Initial Changes and Baseline Characterization

The Chinook salmon (*Oncorhynchus tshawytscha*) fishery has a long history along the Pacific coast and in California. The ocean troll commercial salmon fishery began in the late 1880s in Monterey Bay. Fishing efforts increased during World War II and peaked in the 1970s with nearly 5,000 vessels trolling for salmon. The fishery became limited entry in 1983 and as of 2006 there were less than 500 vessels participating in the fishery (Pettersen 2010, CDFG 2008). Although the type of gear used has changed very little since the commercial fishery began, technology such as GPS and sonar, have increased the efficiency of the fishery. In recent years the salmon fishery has been severely restricted and was closed completely for the 2008 and 2009 season. The 2010 season was open for two two-week periods, however, many fishermen noted that bad weather prohibited fishing during the first two week period and that salmon were not present during the second two week period. Fishermen noted though that 2011 was a fairly successful salmon season. A major issue in the California Chinook salmon fishery has been land based management practices associated with water rights in the Klamath Basin (CDFG 2008). In interviews many salmon fishermen expressed hopes that the fishery is beginning to rebound as many entered commercial fishing through the highly lucrative years of salmon fishing in the 1980s and 90s and many have relied upon this fishery as an important contributor to their fishing portfolio as seen in Figure 12.

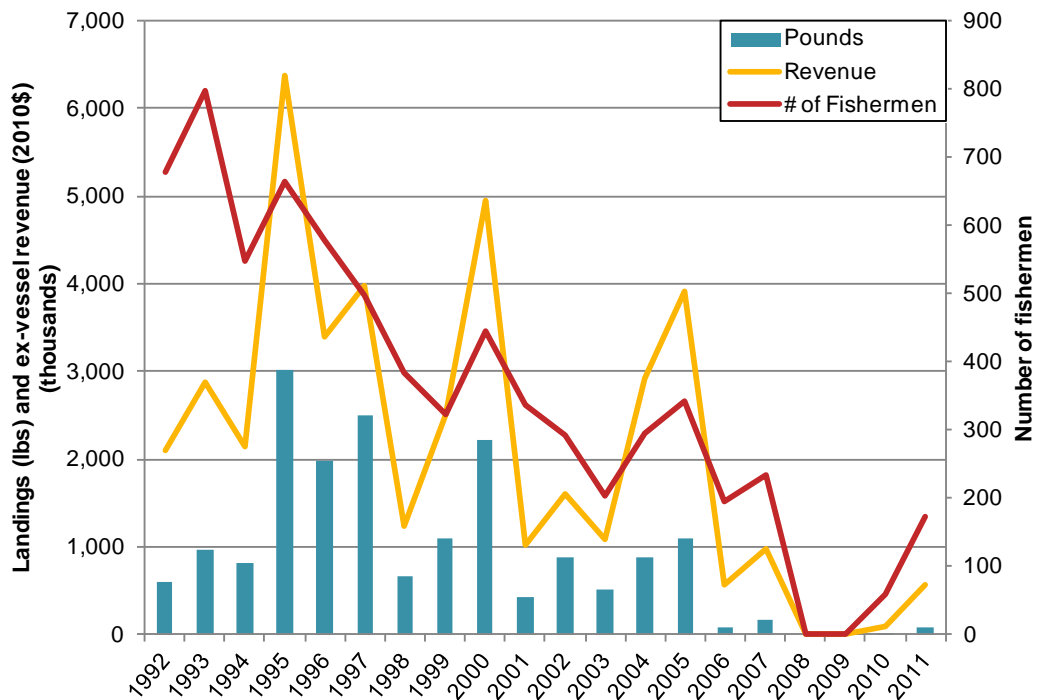
It should be noted that due to the nature of salmon fishing in which fishermen follow schools of salmon up and down along the coast—fishermen may land in several ports in California. Thus, the entire amount of revenue Central Coast fishermen may be gaining from fishing salmon may not be fully reflected in the data presented for the region.

The salmon–troll fishery was a very important fishery in the Central Coast Region. Figure 49 displays the landings, ex-vessel revenues, and number of participating fishermen for this fishery over the study period 1992–2011. While declining overall, the salmon–troll fishery experienced periodic peaks as seen in the years 1995, 2000, 2005, and appeared to be on the upswing again at the end of the study period after re-opening in 2010. Landings and ex-vessel revenues were highest in 1995 with 3 million pounds landed and \$6.4 million in ex-vessel revenues. In 2011, a total of 90,567 pounds were landed and just over half a million dollars was made in ex-vessel revenues. The number of participating fishermen in the fishery closely mirrored trends in landings and ex-vessel revenues over the study period. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

As overall trends in landings and revenues varied for the salmon–troll fishery over the study period in the Central Coast Region, so too did the average trends per fisherman, see Figure 50. The average salmon–troll fisherman landed 2,084 pounds of salmon for approximately \$5,164 in ex-vessel revenues over a total of eight landings per year.

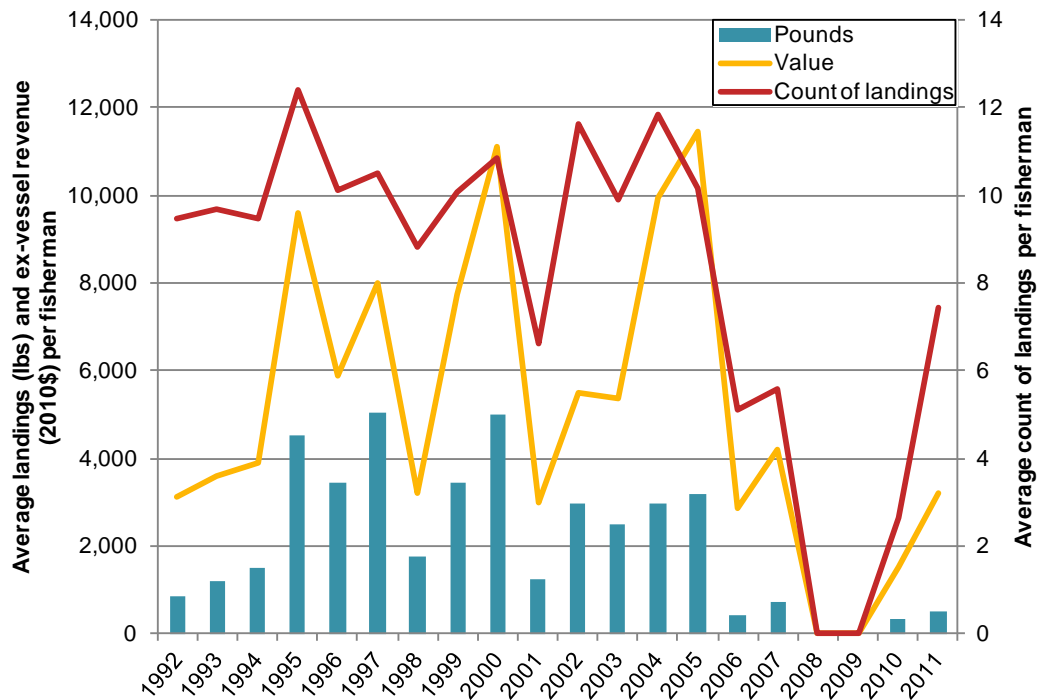
The average ex-vessel price per pound in the salmon–troll fishery increased by 73 percent from 1992 to 2011, see Figure 50. Over the entire study period, the average ex-vessel price per pound for the salmon–troll fishery was \$3.18, with higher ex-vessel prices occurring towards the later years. The highest average ex-vessel price in the Central Coast Region occurred in 2006 at \$6.58 per pound, while the lowest was in 1997 at \$1.59 per pound.

Figure 49. Salmon–troll commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



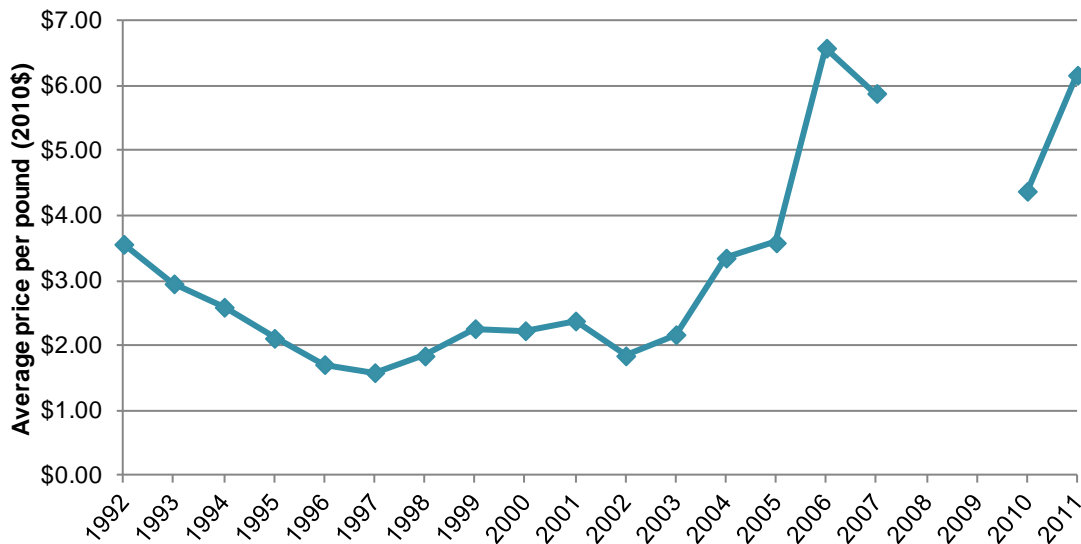
Source: Landings data from CDFG

Figure 50. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Source: Landings data from CDFG

Figure 51. Salmon–troll commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Table 117 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the salmon–troll fishery over recent time periods both pre and post MPA implementation. Changes are presented for the study region and compared with those observed in the fishery at the state level. Referring back to Figure 49, the salmon–troll fishery experienced many peaks and valleys in terms of landings and ex-vessel revenues from year to year over the study period. Ex-vessel revenues did decrease overall over the study period, but there were also periods of large increases year to year. Because the fishery was closed in 2008, region and statewide percentages are not available for presentation in Table 117. In 2003, ex-vessel revenues at the state level increased while the same trends were not observed at the Central Coast Region level, however from 2004 to 2007, Central Coast Region trends were similar to state trends (decreasing).

Figure 52 displays salmon–troll ex-vessel revenue portions by Central Coast Region ports over 1992–2011. While for most of the eleven fisheries of interest a single port would average close to half or more of total ex-vessel revenues among all ports, for this fishery all ports made considerable contributions to overall ex-vessel revenues for this fishery. The port with the largest average annual share of overall ex-vessel revenues was Moss Landing at 41.4 percent, followed by Santa Cruz at 27.2 percent, and Monterey at 15.2 percent. The lowest average portion of total ex-vessel revenues was Avila/Port San Luis at 4.4% annually over the study period. The highest percentage of total ex-vessel revenues one port ever contributed in one year was 55.4 percent of total ex-vessel revenues in the Central Coast Region, which was Moss Landing in 1999.

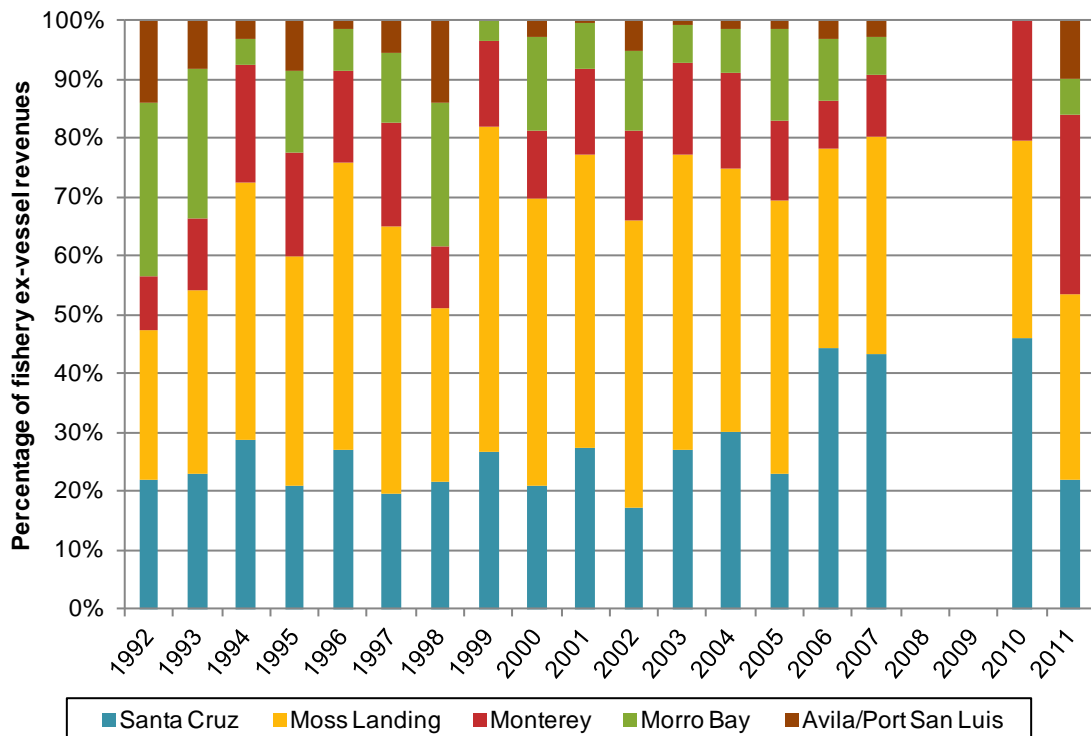
Table 117. Salmon-troll: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	-77.9%	-66.4%	—	-88.7%
	Average per fisherman	-51.7%	-57.8%	—	-71.0%
State	Total	12.1%	-60.5%	—	-62.2%
	Average per fisherman	50.9%	-50.3%	—	-34.4%

Source: Landings data from CDFG

— indicates a zero value data point in one of the sample years

Figure 52. Salmon-troll commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

The average fisherman interviewed who participated in the salmon–troll fishery has 26.7 years experience as a commercial fisherman and is 53.1 years old. The average salmon fisherman in Moss Landing/Monterey was about ten years younger than the average salmon fisherman in Santa Cruz (Table 118).

Table 118. Average age and years experience commercial fishing, Salmon–troll

Ports	Individuals Interviewed	Age		Years experience	
		Average	Standard deviation	Average	Standard deviation
Santa Cruz	6	56.7	12.3	27.5	11.8
Moss Landing/Monterey	5	45.8	23.0	21.8	16.3
Morro Bay	2	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—
Central Coast Region	13	53.1	16.7	26.7	13.4

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

We asked fishermen to estimate the percent of his/her overall income from commercial fishing in general. On average salmon–troll fishermen experienced a decrease in the percent of their income they derived from commercial fishing over the 2006 to 2011 period.

Table 119. Percent change in income from overall commercial fishing from 2006–2011, Salmon–troll

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	69.2%	28.0%	64.2%	34.7%	-13.9%	26.7%
Moss Landing/Monterey	85.0%	22.4%	84.0%	35.8%	-5.3%	33.8%
Morro Bay	*	*	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	78.5%	24.4%	70.4%	37.4%	-15.2%	34.3%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

If there was a change in the percent of total income from commercial fishing between 2006 and 2011, fishermen were asked an open-ended question as to why this change occurred. As indicated below, increased regulation and changes in the fish populations (specifically, a decline in salmon) led to a decrease in the percent of their income that salmon–troll fishermen generated from commercial fishing in general.

Table 120. Cause of change in percent income from commercial fishing from 2006–2011, Salmon–troll

Response	Number responding
Increased regulation	2
Intensified fishing efforts	—
Had additional job or source of income	1
Found additional job or source of income	1
Change in fish abundance	2
Total number responding	5

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Most salmon- troll fishermen derived the rest of their income either from skilled labor (such as construction work) or business/office work (Table 121).

Table 121. Other sources of income other than commercial fishing in 2011, Salmon–troll

Response	Number responding
Skilled labor	3
Investments/retirement/social security	1
Business/office work	3
Other maritime occupation	1
Total number responding	5

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Like many other fishermen, those that participated in the salmon–troll fishery experienced an increase in operating costs from the year 2006 to 2011. Moss Landing/Monterey cited over a threefold increase compared to Santa Cruz (Table 122). Again, like many other fishermen, an increase in fishing expenses such as fuel was the main reason that salmon — troll fishermen attributed to this rise in operating costs (Table 123).

Table 122. Percent change in overall commercial fishing operating costs from 2006–2011, Salmon–troll

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	44.2%	31.1%	45.8%	29.7%	5.6%	13.6%
Moss Landing/Monterey	49.0%	25.1%	56.0%	21.0%	17.7%	26.7%
Morro Bay	*	*	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	45.8%	26.5%	54.6%	28.2%	16.8%	27.8%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Table 123. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Salmon–troll

Response	Number responding
Large capital investment	1
Decrease in fishing income	2
Decrease in fishing grounds	—
Increase in fishing expenses	4
Fishing less in 2006	—
Fishing less in 2011	1
Total number responding	6

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

All fishermen indicated that they had between zero and two crew members when trolling for salmon and an average of 5.5 percent of their gross economic revenue (GER) went towards their crew. This was the least amount of GER that went towards crew amongst all of the other target fisheries.

Table 124. Additional commercial fishery specific data, Salmon–troll

Ports	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	25.5	15.0	0.3	0.5	2.5%	6.1%	24.4%	17.5%
Moss Landing/Monterey	26.3	15.7	0.8	1.0	7.4%	10.2%	11.3%	3.9%
Morro Bay	*	*	*	*	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—	—	—	—
Central Coast Region	26.7	13.2	0.6	0.7	5.5%	8.7%	18.6%	14.4%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Two fishermen noted that they did not fish for salmon in 2011 and one indicated he had added the fishery since 2006. Compared to the other target fisheries salmon-troll was the least commonly added fishery except for coastal pelagic species-seine/net and market squid-seine, in which none of the fishermen interviewed entered or exited the fishery. Salmon-troll is one of only two target fisheries that fishermen who had permits chose not to fish salmon-troll in 2011. The only other fishery that respondents chose not to participate in for 2011 was Dungeness crab-trap (Table 125).

Table 125. Salmon-troll, added/dropped since 2006 or not fished in 2011

Ports	Number responding	Percent responding		Not fished in 2011
		Added	Dropped	
Santa Cruz	6	—	—	33.3%
Moss Landing/Monterey	5	20.0%	—	—
Morro Bay	2	*	*	*
Avila/ Port San Luis	—	—	—	—
Central Coast Region	13	7.7%	—	15.4%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

One fisherman indicated that high operating costs in participating in the fishery was the reason he/she did not participate in the salmon-troll fishery in 2011 (Table 126).

Table 126. Salmon-troll, reason for adding/dropping since 2006 or not fishing a fishery in 2011

Responses	Number responding
Started commercial fishing	—
Change in fish population	—
Diversify fisheries	—
Was able to obtain permit	—
High costs	1
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked to compare his/her success in the salmon-troll fishery in 2011 to his/her success in this fishery in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse. Respondents were then asked what factors they felt had contributed to the the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below. . None of the responses in the salmon - troll fishery fell into the other category.

As seen in Table 127 63.7 percent of respondents indicated that salmon-troll fishery in 2011 was somewhat or significantly worse than it had been in the previous five years; however 18.2 percent of respondents indicated it was somewhat or significantly better

Table 127. Overall success in specific commercial fishery compared to previous five years, Salmon–troll

Ports	Number responding	Percent response					
		Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Santa Cruz	6	16.7%	—	16.7%	16.7%	50.0%	—
Moss Landing/Monterey	4	—	25.0%	—	—	25.0%	50.0%
Morro Bay	1	*	*	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—	—	—
Central Coast Region	11	9.1%	9.1%	9.1%	9.1%	36.4%	27.3%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

Six respondents provided regulatory factors influencing success in the salmon–troll fishery and provided a variety of responses. These are shown below in Table 128.

Table 128. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Salmon–troll

Response	Number responding
MPA impacts	—
Insufficient monitoring/enforcement/communication of MPAs	—
Trawlers impacting nearshore fleet	—
Quota limit issues	1
Concentration of fishing effort into smaller areas/over-crowding	—
Regulations have resulted in less competition	—
Inefficiencies in bycatch regulations	—
Inefficiencies/inconsistencies in fishery regulations	2
Inequities in fishery regulations	1
Inadequate research for policy	—
Inequities in obtaining fishery permits	—
Insufficient regulation on land-based impacts to fisheries	1
Lack of influence on policy/regulation development	—
Insufficient communication of fishery regulations	1
Populations recovering from fishing gear ban	—
Distress around unintended infractions	—
Increased number of fishermen participating in the fishery	—
Increased personal fishing effort	—
Rockfish conservation area (RCA)	1
Total number responding	6

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Of the seven respondents who reported environmental factors influencing their success in the salmon–troll fishery five indicated that there had been a decrease in habitat and water quality. Responses in this category included water being diverted for land use, warmer water temperatures, and a decrease in river spawning habitat.

Table 129. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Salmon–troll

Response	Number responding
Increase in bait fish	—
Increase in fish abundance	—
Stable fish abundance	—
Increase in catch	—
Decrease in catch	3
Increase in predators	—
Good weather	—
Biomass of fish largely in MPAs	—
PG&E seismic testing impacts	—
Decrease in habitat or water quality	5
Decrease in fish abundance	3
Change in normal water temp	1
Fish population moved further offshore	1
Decrease in fish size	2
Farmed fish spreading disease	1
Protected species overpopulated	—
Total number responding	7

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

One individual providing information on economic factors influencing success in the salmon–troll fishery noted that although the price increased for wild salmon, the market has been flooded with cheaper farmed fish. Other economic factors are shown below in Table 130.

Table 130. Economic changes/factors influencing success in specific commercial fishery in previous five years, Salmon–troll

Response	Number responding
Increased number of fishermen participating in the fishery	—
Increase in operating costs	1
Increase in fish price	1
Decrease in fish price	—
Market flooded	1
Longer season allowed increase in catch	1
Increased demand for fish	1
Decrease in demand for fish	—
Increased personal fishing effort	—
Increased number of outside vessels fishing in local grounds	—
Lack of port infrastructure	1
Increase in travel distance	—
Total number responding	5

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

4.4.8. Spot Prawn–Trap Initial Changes and Baseline Characterization

Spot prawn (*Pandalus platyceros*) are a large coldwater shrimp and a high value fishery in the Central Coast Region. Originally a trawl fishery, it reached a peak of over 375,000 pounds landed in 1981 using this gear type. However, restrictions in the use of trawl gear to harvest spot prawn during certain months of the year lead to the emergence of the trap fishery in 1985 in Southern California (CDFG 2004). In particular trap gear was used in areas that trawlers could not access from the ban on trawl gear within 3 miles of shore. The spot prawn trap fishery quickly became a live fishery as traps allowed spot prawn to be caught in excellent condition and were then kept alive in holding tanks. In 1991 live spot prawns were sold for \$6–\$10 per pound and dead for \$4.50 to \$5.50 per pound. Between 1985 and 1991 the trap fishery made up 75 percent of landings and trawl made up only 25 percent (CDFG 2008) as interests increased in other trawl fisheries.

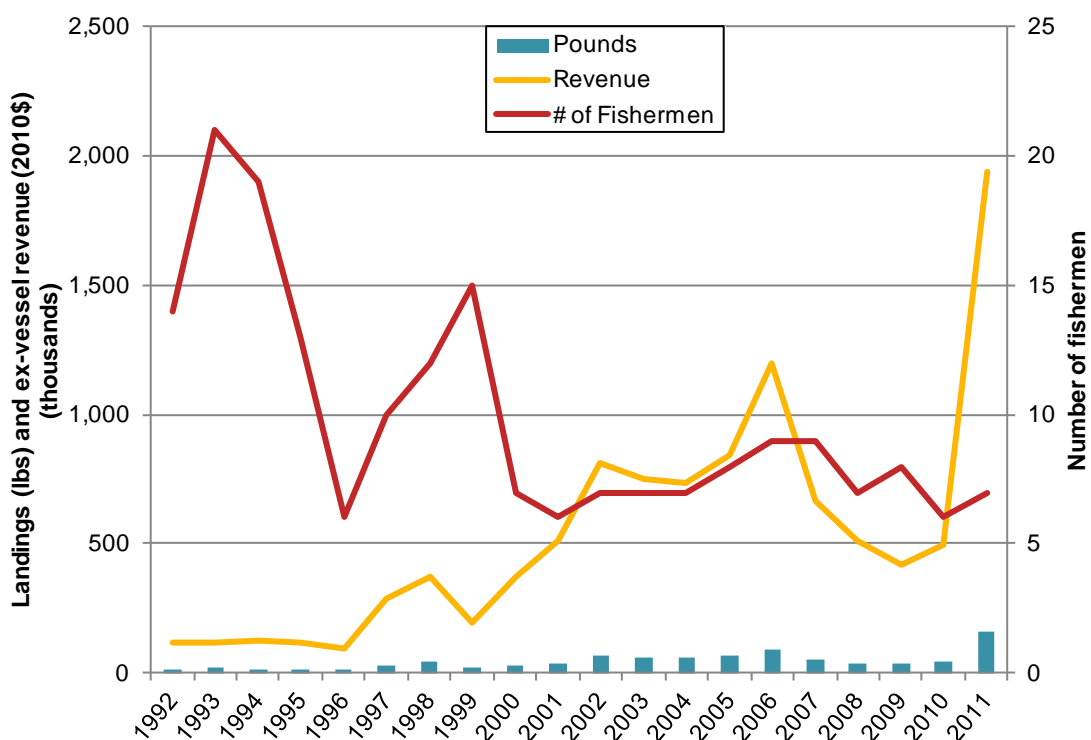
The spot prawn fishery remained an open access fishery and between 1994 and 1998 increased market demand, increased effort from trawl fishermen displaced from other trawl fisheries, the advent of rock hopper trawl gear which could fish previously inaccessible moderate-relief rocky habitat, and a strong abundance of spot prawn lead state-wide landings of the fishery to near double from 444,000 pounds to 780,000 pounds (CDFG 2004). This rise in participation and subsequent dramatic decline in statewide landings lead to the formation of a restricted access tiered permit trap fishery in which a limited number of permits are issued each year with varying harvest and trap limits. In 2003 the use of trawl gear was banned from the spot prawn fishery and thus traps are now the primary gear type used in this fishery.

Relatively few fishermen participate in the spot prawn-trap fishery but it has grown in significance over the study period in terms of landings and ex-vessel revenues, see Figure 53. From 1992 to 2011 landings volume increased by nine times and ex-vessel revenues increased fifteen times to 162,760 pounds and nearly \$2 million respectively in 2011. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

Though fisherman participation in the spot prawn–trap fishery was not relatively high in the Central Coast Region over the study period, a total of 21 fishermen at most in 1993, by 2011 the number had decreased to only seven fishermen in the Central Coast Region. Like the nearshore finfish–live–hook & line fishery, the spot prawn–trap fishery displays significant increases in average revenues to individual fishermen, see Figure 54. Fishermen on average in 2011 made 22 times the landings and 33 times the ex-vessel revenues as fishermen in 1992 made. While the count of landings per fisherman also increased over that time period (from 33 in 1992 to 54 per fisherman in 2011), the increase was not nearly as high because fishermen landed more and more per landing each year on average.

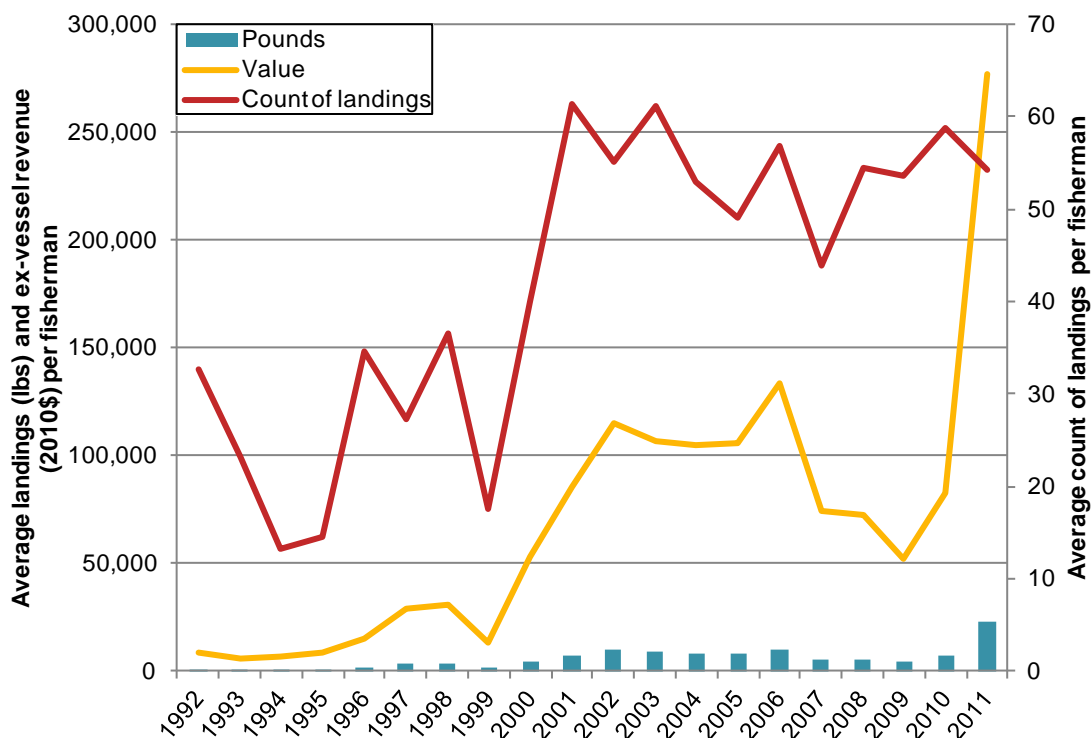
Figure 55 displays the average rising ex-vessel price per pound for this fishery, which is a high value fishery with ex-vessel prices of almost \$12 per pound in 2011.

Figure 53. Spot prawn–trap commercial landings, ex-vessel revenues, and number of fishermen in the Central Coast Region, 1992–2011



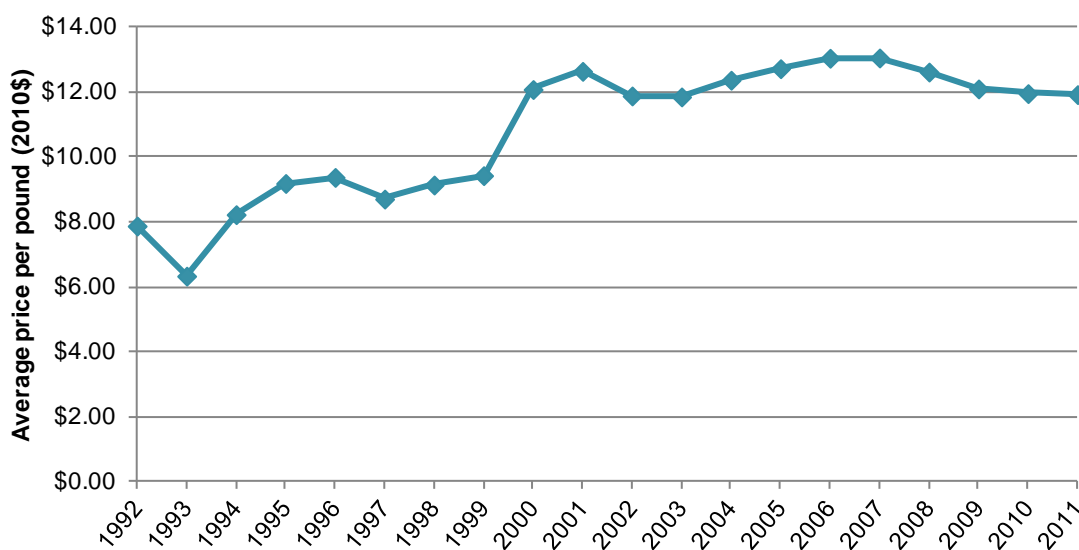
Source: Landings data from CDFG

Figure 54. Spot prawn-trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, 1992–2011



Source: Landings data from CDFG

Figure 55. Spot prawn-trap commercial fishery average ex-vessel price per pound in the Central Coast Region, 1992–2011



Source: Landings data from CDFG

Table 131 displays the percent change in ex-vessel revenues and average ex-vessel revenue per fisherman for the spot prawn-trap fishery over recent time periods categorized into both pre and post MPA implementation time periods. Changes are presented for the study region and compared with those observed in the fishery at the state level. In general, the trends in the spot prawn-trap fishery for ex-vessel revenues and for average ex-vessel revenues per fishermen remained relatively close to each other, especially in the Central Coast Region. This is likely because the number of fishermen did not change significantly since 1999. Increases in ex-vessel revenues were significant from 2000 to 2011 and increased by a total of 423.9 percent overall. While the state also saw impressive increases in spot prawn-trap ex-vessel revenues over the same time period, the increases were not to the same degree.

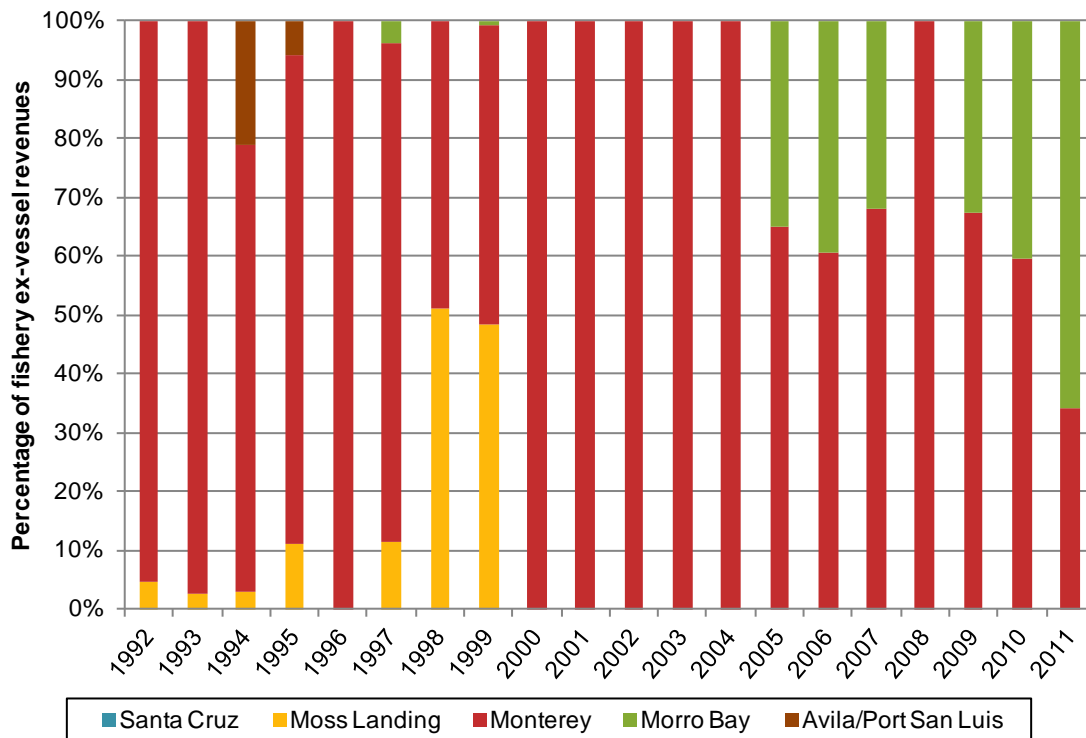
Figure 56 displays percentages of total spot prawn-trap ex-vessel revenues by Central Coast Region ports over 1992–2011. Monterey averaged 79.5 percent of total Central Coast Region ex-vessel revenues for this fishery over the study period, with average annual ex-vessel revenues of \$294,669. Morro Bay averaged approximately five percent of the Central Coast Regions' spot prawn-trap ex-vessel revenues per year prior to 2005, but from 2005 to 2011 its portion increased significantly to 35.1 percent as the fishery became more popular in that port.

Table 131. Spot prawn-trap: Percent change in commercial ex-vessel revenue and average ex-vessel revenue per fisherman, 2000-2011

Level	Ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
Central Coast Region	Total	101.8%	-8.8%	280.8%	423.9%
	Average per fisherman	101.8%	-29.1%	280.8%	423.9%
State	Total	-12.5%	18.8%	46.1%	133.2%
	Average per fisherman	74.9%	8.9%	46.1%	345.2%

Source: Landings data from CDFG

Figure 56. Spot prawn–trap commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Due to confidentiality constraints data collected for the spot prawn–trap fishery could only be shown at the region level. According to California Department of Fish and Game as of 2011 there are only 22 spot prawn–trap permits in the state of California and seven of them can be found in the Central Coast Region. The average respondent in the spot prawn–trap fishery is 40.7 years old and has 22 years of commercial fishing experience (Table 132).

Table 132. Average age and years experience commercial fishing, Spot prawn–trap

Ports	Individuals Interviewed	Age		Years experience	
		Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—
Moss Landing/Monterey	2	*	*	*	*
Morro Bay	1	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—
Central Coast Region	3	40.7	15.6	22.0	16.1

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

The spot prawn–trap fishery is the only target fishery where all of the respondents reported that 100 percent of their total income came from commercial fishing for the years 2006 and 2011.

Table 133. Percent change in income from overall commercial fishing from 2006–2011, Spot prawn–trap

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—	—
Moss Landing/Monterey	*	*	*	*	*	*
Morro Bay	*	*	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	100.0%	—	100.0%	—	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Respondents indicate that on average 50 percent of their gross revenue went back into operating costs. The spot prawn–trap fishery was the only target fishery that reported no change in operating costs over the study time period.

Table 134. Percent change in overall commercial fishing operating costs from 2006–2011, Spot prawn–trap

Ports	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—	—
Moss Landing/Monterey	*	*	*	*	*	*
Morro Bay	*	*	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—	—
Central Coast Region	50.0%	—	50.0%	—	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

All spot prawn–trap fishermen indicated they used one or two crew members per trip and that on average 23.0 percent of their overall gross revenue was given to the crew and 12.0 percent went towards fuel. Both of these were in the middle of the range of responses across all target fisheries. Additional statistics are shown below in Table 135.

Table 135. Additional commercial fishery specific data, Spot prawn-trap

Ports	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Santa Cruz	—	—	—	—	—	—	—	—
Moss Landing/Monterey	*	*	*	*	*	*	*	*
Morro Bay	*	*	*	*	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—	—	—	—
Central Coast Region	20.3	13.4	1.7	0.6	23.0%	2.6%	12.0%	7.1%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

One spot prawn-trap fishermen reported adding the fishery since 2006 while two respondents have been participating in this fishery since before 2006.

Table 136. Spot prawn-trap, added/dropped since 2006 or not fished in 2011

Ports	Number responding	Added	Dropped	Not fished in 2011
Santa Cruz	—	—	—	—
Moss Landing/Monterey	2	*	*	*
Morro Bay	1	*	*	*
Avila/ Port San Luis	—	—	—	—
Central Coast Region	3	33.3%	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked to compare his/her success in the spot prawn-trap fishery in 2011 to his/her success in this fishery in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse. Respondents were then asked what factors they felt had contributed to their level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

Table 137. Overall success in specific commercial fishery compared to previous five years, Spot prawn – trap

Ports	Number responding	Percent response					
		Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Santa Cruz	—	—	—	—	—	—	—
Moss Landing/Monterey	2	*	*	*	*	*	*
Morro Bay	1	*	*	*	*	*	*
Avila/ Port San Luis	—	—	—	—	—	—	—
Central Coast Region	3	—	66.7%	—	33.3%	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

All spot prawn–trap fishermen indicated that MPAs had an impact on the success of the fishery. At least one fisherman cited a variety of additional regulatory factors influence success in the fishery, which are shown below in Table 138.

Table 138. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Spot prawn–trap

Response	Number responding
MPA impacts	3
Insufficient monitoring/enforcement/communication of MPAs	1
Trawlers impacting nearshore fleet	—
Quota limit issues	—
Concentration of fishing effort into smaller areas/over-crowding	—
Less competition	1
Inefficiencies in bycatch regulations	1
Inefficiencies/inconsistencies in fishery regulations	1
Inequities in fishery regulations	1
Loss of historical fishery knowledge	—
Inadequate research for policy	1
Inequities in obtaining fishery permits	—
Insufficient regulation on land-based impacts to fisheries	—
Lack of influence on policy/regulation development	1
Insufficient communication of fishery regulations	—
Populations recovering from fishing gear ban	1
Distress around unintended infractions	—
Increased number of fishermen participating in the fishery	—
Increased personal fishing effort	1
Rockfish conservation area (RCA)	—
Total number responding	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Environmental factors were sparse but are listed below in Table 139, while there were no economic factors mentioned. Additionally, one spot prawn-trap fishermen indicated that he felt fishermen's knowledge is not being adequately valued (Table 140).

Table 139. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Spot prawn-trap

Response	Number responding
Increase in bait fish	—
Increase in fish abundance	1
Stable fish abundance	—
Increase in catch	—
Decrease in catch	1
Increase in predators	1
Good weather	—
Biomass of fish largely in MPAs	—
PG&E seismic testing impacts	—
Decrease in habitat or water quality	—
Decrease in fish abundance	—
Change in normal water temp	—
Fish population moved further offshore	—
Decrease in fish size	—
Farmed fish spreading disease	—
Protected species overpopulated	—
Total number responding	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 140. Other changes/factors influencing success in specific commercial fishery in previous five years, Spot prawn-trap

Response	Number responding
Increase in fishing experience	—
Loss of generational fishing knowledge	—
Fishing is a way of life	—
Fisherman's knowledge not valued	1
Lack of outreach to fishing community	—
Loss of cultural fishing heritage	—
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

4.5. Central Coast Region CPFV Initial Changes

4.5.1. Introduction/Methods

Commercial Passenger Fishing Vessels (CPFV) are often called party-boats or charter fishing boats and make a business in taking members of the public to recreationally fish and more recently to enjoy non-consumptive types trips such as whale watching or leisure cruises. In a study conducted by Responsive Management in 2007, the majority of Californian's (84.0 percent) agree that CPFV opportunities are important to maintain as they provide opportunities for people to experience coastal resources who otherwise would not be able to as they cannot afford a boat of their own.

This section provides a summary and analysis of California Department of Fish and Game (CDFG) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the Central Coast Region by CPFV operators from ports outside the Central Coast region were not included in the analyses provided. The following types of information listed below are generally the analyses presented in the initial change sections found at the region and port level throughout the report:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each species/fishery
6. Total number of trips for multiple species/fishery combo trips
7. Percent change in total number of vessels, trips, and anglers in pre and post MPA periods

CPFV operators are required to complete and submit a log to the CDFG for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Game Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish.

Total counts of trips and anglers were generated by port for select target species or species groups (fisheries). Although CPFV operators can mark one of the trip target types that are listed on the log, these trip targets cannot be used to identify all the specific fisheries of interest and so can not be used for this analysis. Instead, trips were assigned to a fishery if the catch included one or more individuals of that fishery's target species or species group. As a consequence, trips that targeted multiple fisheries (e.g., Chinook salmon and rockfish), or trips that caught and kept species from several fisheries (e.g., rockfish and California halibut), were assigned to two or more fisheries. The number of trips for some of the more common combinations of fisheries (e.g. Chinook salmon and rockfish) was also calculated to see how frequently such trips occurred within each of the ports.

The examined fisheries and their associated species were:

- Albacore tuna (albacore tuna)
- Salmon (Chinook salmon; pink salmon were included, but were rarely taken)
- Rockfish (all rockfish species; lingcod)
- California halibut (California halibut)
- Sanddabs (unidentified sanddab; longfin sanddab; Pacific sanddab; speckled sanddab)
- Dungeness crab (Dungeness crab; red rock crab; yellow rock crab; brown rock crab; rock crab unidentified)
- White seabass (white seabass)
- Humboldt squid (Humboldt squid, also known as the jumbo squid)

Trips that did not catch anything, did not keep any catch, or did not keep any of the target species or species groups were not assigned to a fishery. These trips made up less than 5 percent of the Central Coast Region's total trips and were not examined any further. Furthermore, the CPFV logbook data presented in this initial changes section only includes data on fishing trips as logbook data does include information on non-consumptive trips such as whale watching.

4.5.2. CPFV Initial Changes

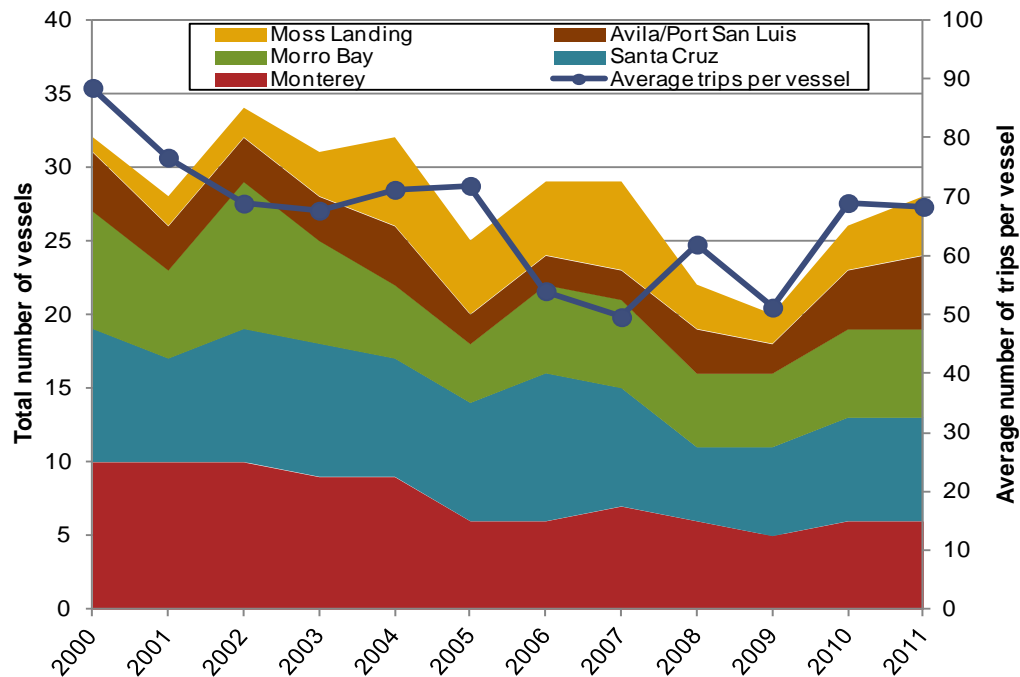
During the study period, 2000-2011, the ocean environment, the regulatory environment, and the socioeconomic environment experienced several changes. The California Current System at this time was transitioning from a warm to a cold regime which affected the availability of certain kinds of fish targeted by anglers. Furthermore, a deep recession, which began in December 2007, and higher gas prices impacted people's livelihoods and discretionary monies. Major changes in regulations occurred for rockfish (season closures initiated in 2000 with the addition of depth closures starting in 2001³) and salmon (in particular, closures in 2008 and 2009). In addition, the Central Coast Marine Protected Areas (MPAs) were implemented in September, 2007. All of these factors likely affected fishing in the study area to various degrees; three of these factors (recession, salmon season closures, and the implementation of the MPAs) occurred at essentially the same time.

The total number of vessels working out of Central California ports in 2011 was lower than that observed in 2000 by 13 percent (Figure 57 and Table 141). Decreases in vessels occurred between 2000 and 2009; increases then were observed at most ports between 2010 and 2011. The three ports with the largest CPFV fleets, Monterey, Santa Cruz, and Morro Bay, all decreased over the study period by a combined total of 8 vessels, but the two smaller ports together gained 4 vessels.

The average number of trips per vessel showed a generally decreasing trend between 2000 and 2007, followed by a generally increasing trend from 2008 through 2011 (Figure 57). However, this pattern of change was more indicative of what was observed in the northern ports while in the south, Morro Bay showed a general increasing trend with fluctuations throughout and Avila/Port San Luis showed a generally decreasing trend.

³ Rockfish regulations in 2004-2006 were more restrictive in the Central Coast area between Lopez Point and Pigeon Point than in the area between Point Conception and Lopez Point.

Figure 57. Total number of CPFV vessels and average number of trips per vessel, Central Coast Region, 2000-2011



Source: CDFG CPFV logbook data

The total number of trips decreased over most of the time period followed by an increase over the last several years of the study period, with this total number decreasing by 36 percent from 2000 to 2011 (Figure 58, Table 141). The lowest number of trips was observed in 2009 (second year of the salmon closure), although due to the unavailable values from confidentiality constraints for Moss Landing and Avila/Port San Luis, this low may have occurred one year prior in 2008. The decrease in trips within the initial 8-9 years reflects the decrease that occurred in the two larger northern ports (Santa Cruz and Monterey). The total number of trips in the southern ports (Morro Bay and Avila/Port San Luis) fluctuated over the entire time period, with the lowest total number of trips for Morro Bay (and probably also for Avila/Port San Luis) occurring in 2003. This low in 2003 coincided at the same time when rockfish regulations started to be modified. While the combined total number of trips increased slightly between 2010 and 2011, this is more reflective of the increases observed in Moss Landing and Avila/Port San Luis. (Due to unavailable data values, it is possible that these increases started earlier in 2009.) Increases in Santa Cruz and Monterey occurred earlier between 2009 and 2010.

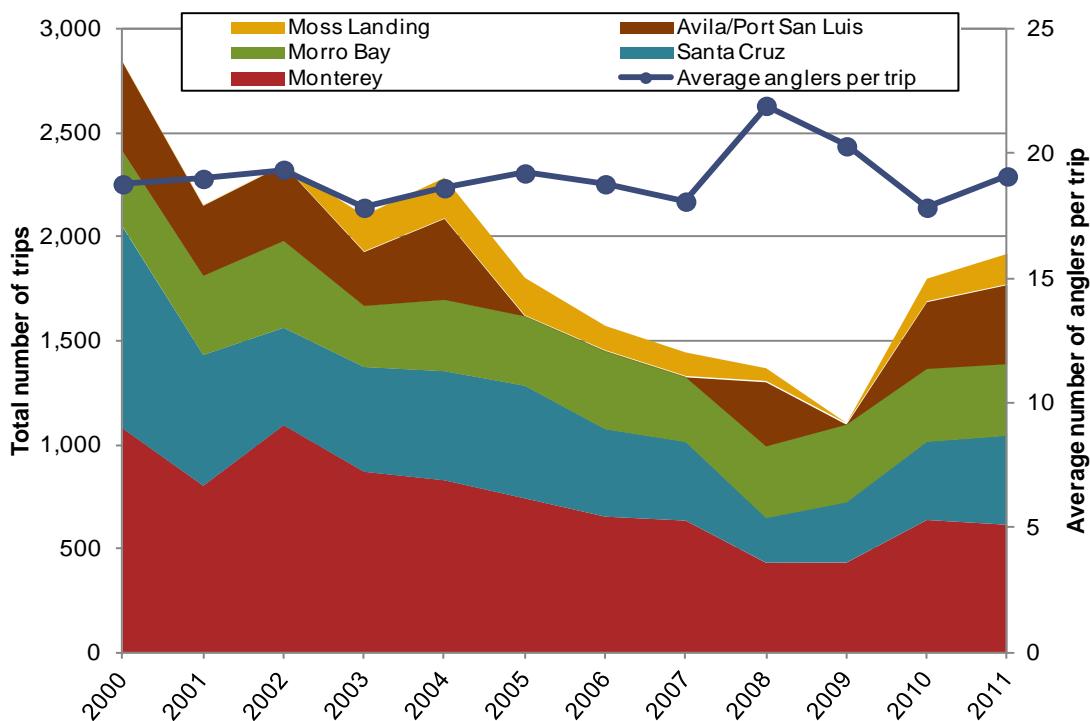
The greatest total number of trips by Central California CPFVs in 2000 were recorded from Monterey, followed by Santa Cruz, Avila/Port San Luis, and Morro Bay with this same order also observed in 2011. Moss Landing recorded the lowest number of trips for all years when values were available.

The average number of anglers per trip remained fairly stable throughout the entire study period except for 2008 and 2009 which showed a slightly higher average number of anglers per trip. This increase, particularly in 2008, occurred more in the northern ports than in the southern ports.

The changes noted for anglers were similar to those for the total number of trips; the total number of anglers for all ports combined was lower in 2011 than in 2000 by 35 percent (Figure 59, Table 141). This metric decreased over most of the time period followed by an increase at the end of the study period. Due to the unavailable values for anglers from Moss Landing and Avila/Port San Luis, the lowest total number of anglers seemed to have occurred in 2009. Certainly, the number of vessels dropped during this year in

both of these ports, so it is likely that the number of anglers also dropped to some extent. Consequently, what can be noted is that the total number of anglers generally decreased between 2000 and 2007 and may have dropped further in 2009. This decrease reflects the decreases observed in the northern ports; the total number of anglers in Morro Bay actually increased over this time period and remained somewhat the same in Avila/Port San Luis. The increase in total number of anglers between 2010 and 2011 was more reflective of the increases observed in Moss Landing and Avila/Port San Luis. Increases in Santa Cruz and Monterey occurred earlier between 2009 and 2010.

Figure 58. Total number of CPFV trips and average number of anglers per trip, Central Coast Region, 2000-2011

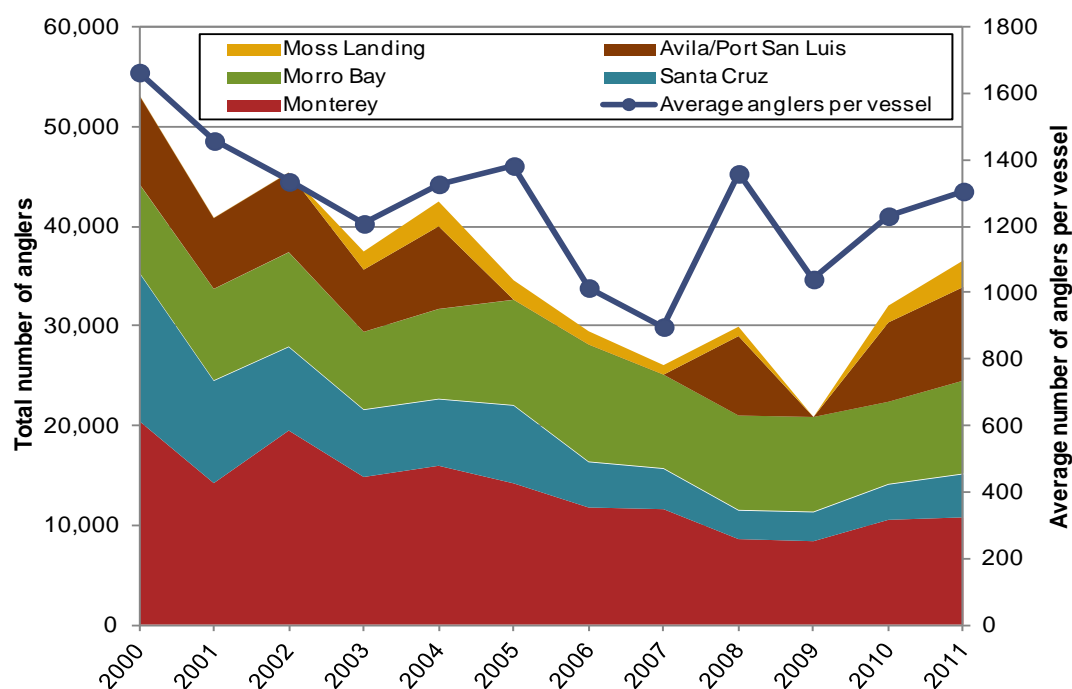


Source: CDFG CPFV logbook data

The greatest total number of anglers in 2000 was recorded in Monterey, followed by Santa Cruz, Avila/Port San Luis, and Morro Bay; in 2011, the order was similar, but Avila/Port San Luis and Morro Bay switched their ranking. Moss Landing recorded the lowest number of anglers for all years when values were available.

The average number of anglers per vessel showed a generally decreasing trend between 2000 and 2007, with a spike in 2008, and then generally increased from 2009 through 2011. The trends observed in this statistic for the five ports varied greatly, so this average for all ports is more a blending of patterns than a reflection of any one dominant pattern.

Figure 59. Total number of CPFV anglers and average number of anglers per vessel, Central Coast Region, 2000-2011



Source: CDFG CPFV logbook data

For the Central Coast ports combined, rockfish was the predominant species being caught by CPFV operators. Salmon, albacore tuna, and flounder also were taken at the beginning of the study period, but were replaced in later years by sanddabs, Pacific mackerel, Dungeness crab and Humboldt squid (Figure 60). Some lingcod was also taken throughout the study period. Decreases in the total number of anglers corresponded to decreases in catch in 2001 and 2003, but this number decreased during the period of time when catches were highest, and started increasing prior to when catches increased in 2010 and 2011. Both the total number of fish caught and the total number of anglers reflect more of what was observed in the northern ports than in the southern ports, and the overall trends generally mirror those seen in Monterey (Figure 60).

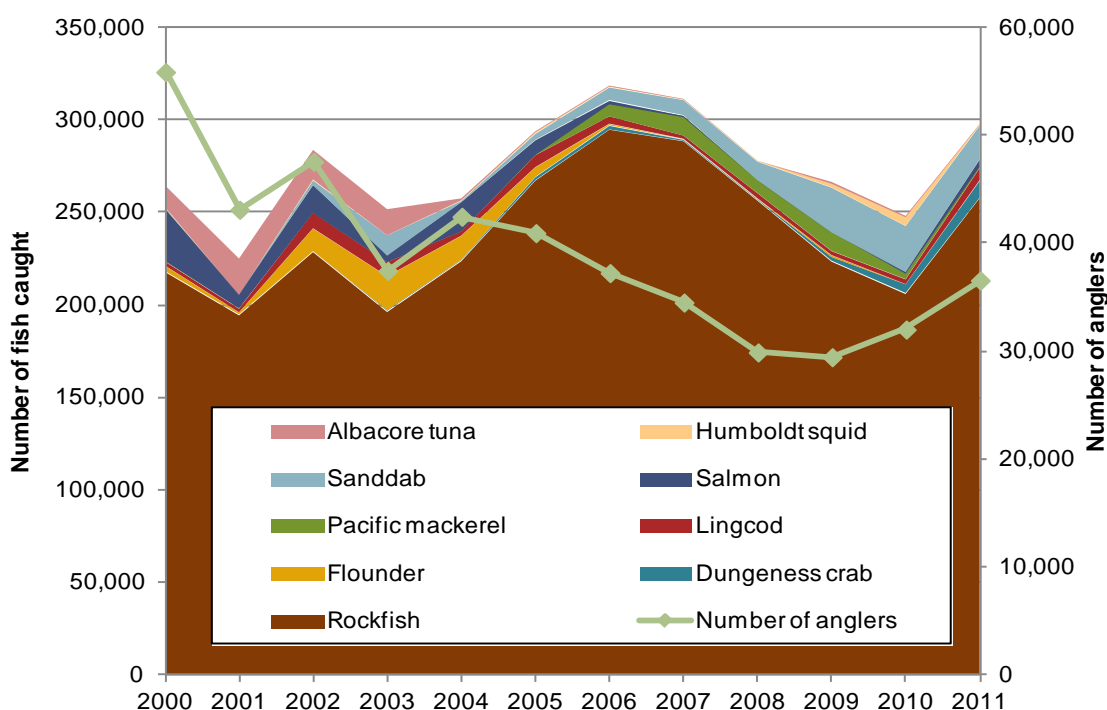
CPFVs from Monterey took the most fish in 2000, followed by Avila/Port San Luis, Morro Bay, and Santa Cruz. In 2011, the catch from Monterey still was the highest followed by Morro Bay, Avila/Port San Luis, Santa Cruz, and Moss Landing. (Moss Landing recorded the lowest catch for all years when values were available.) Differences between ports in the total number of fish caught can be partly attributed to the fisheries being targeted. Anglers over this study period were limited to two salmon per day (with restrictions sometimes imposed on the total number of fish taken in 7 days) while angler bag limits for rockfish were 10 fish for all rockfish combined (nearshore rockfish limited to 2 fish from 2003-2008). For all sanddabs except Pacific sanddabs (the sanddab most commonly encountered on charter vessels), anglers could take up to 20 fish in combination, with not more than 10 fish of any one species. Anglers could take as many Pacific sanddabs as they could catch.

The number of trips for all Central Coast ports combined decreased to a low in 2009, although the value in 2009 was most likely higher than illustrated, as the values for Moss Landing and Avila/Port San Luis were not included due to data confidentiality constraints. Rockfish trips remained fairly stable throughout the entire study period. Salmon, albacore tuna, and California halibut trips became less prevalent while sanddab, Dungeness crab, and Humboldt squid trips increased. Rockfish, salmon, and California halibut

trips all increased to varying degrees between 2009 and 2011 (Figure 61). These patterns reflect more of what was observed in Santa Cruz and Monterey than in the southern ports.

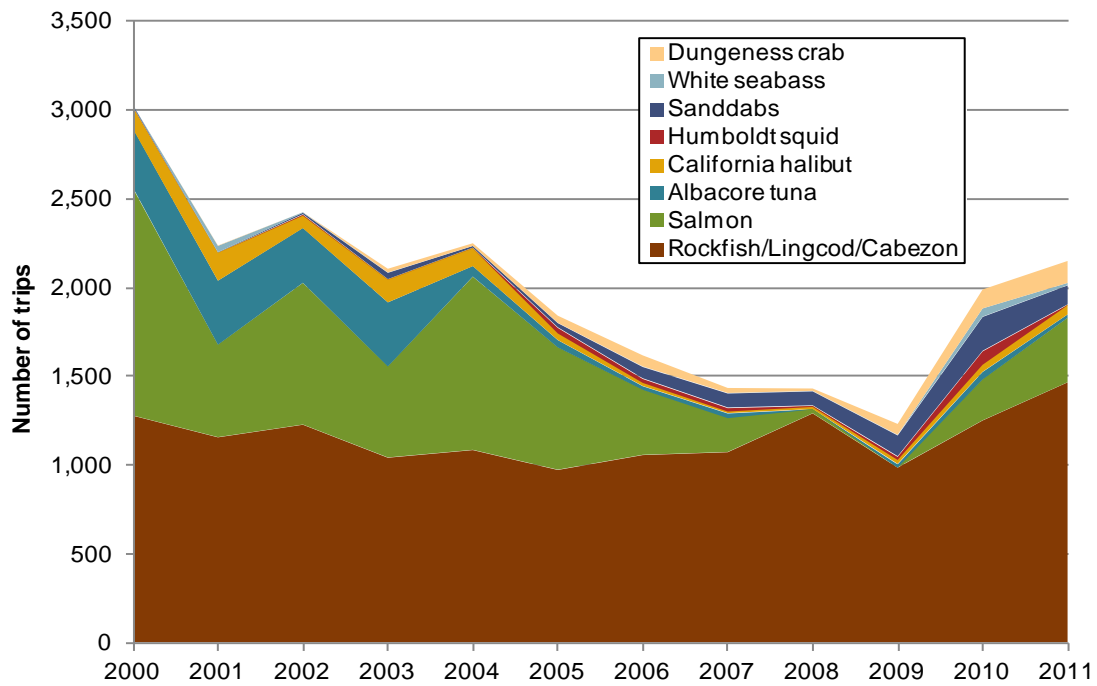
Salmon-rockfish trips for all ports combined generally decreased over the entire study period. Rockfish-halibut trips also decreased during the mid-2000s, but then increased again in the later part of the study period. Sanddab-rockfish, crab-rockfish, and crab-sanddab trips rarely occurred in the early 2000s, but became very important from the mid-2000s through the end of the study period. The institution of these new combination trips occurred to some degree throughout the Central Coast Region, although most of these combination trips occurred in the northern ports (crab-sanddab trips primarily occurred in Monterey) while sanddab-rockfish trips were the primary combination trip in Morro Bay and crab-rockfish trips were important in Avila/Port San Luis (Figure 62).

Figure 60. CPFV total number of fish caught for each fishery, Central Coast Region, 2000-2011



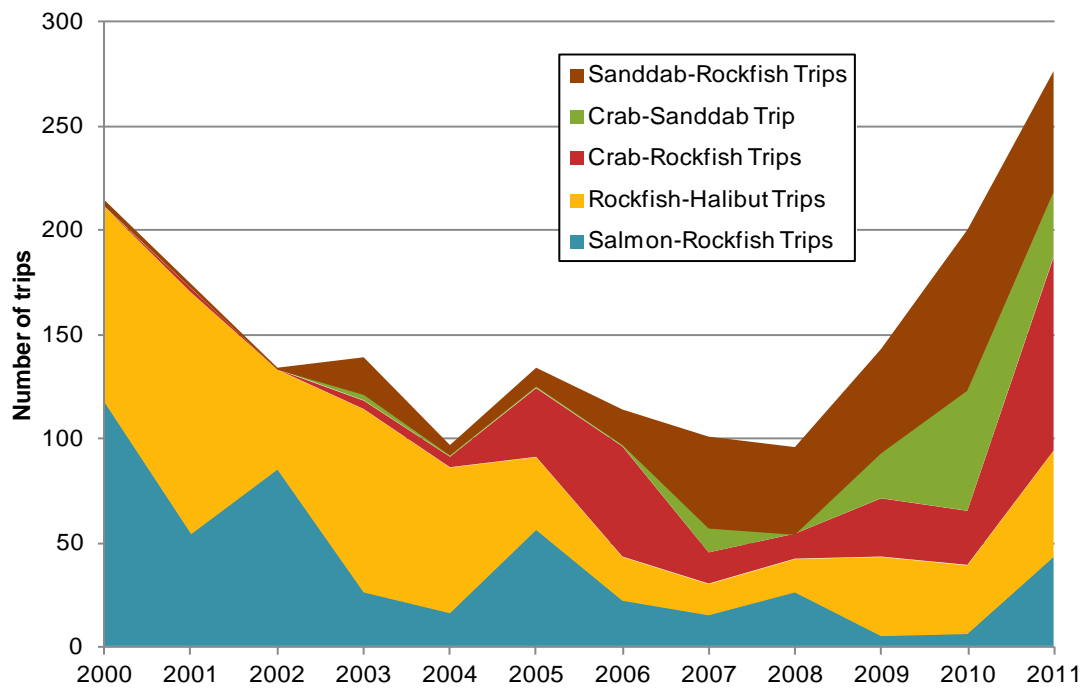
Source: CDFG CPFV logbook data

Figure 61. Total number of CPFV trips for each fishery, Central Coast Region, 2000-2011



Source: CDFG CPFV logbook data

Figure 62. Count of select multiple species CPFV trips, Central Coast Region, 2000-2011



Source: CDFG CPFV logbook data

Table 141. Percent change in CPFV vessels, trips, and anglers per port and region wide, 2000-2011

Ports/Region		Percent change			
		Pre MPA (2000-2004)	Pre MPA (2004-2007)	Post MPA (2008-2011)	2000-2011
Central Coast Region	Number of Vessels	-3%	-9%	27%	-13%
	Number of Trips	-30%	-23%	40%	-36%
	Number of Anglers	-33%	-19%	22%	-35%
Santa Cruz	Number of Vessels	0%	0%	40%	-22%
	Number of Trips	-48%	-28%	97%	-56%
	Number of Anglers	-55%	-39%	52%	-71%
Moss Landing	Number of Vessels	200%	0%	33%	33%
	Number of Trips	N/A	-42%	139%	-16%
	Number of Anglers	N/A	-61%	183%	46%
Monterey	Number of Vessels	-10%	-22%	0%	-40%
	Number of Trips	-19%	-24%	43%	-43%
	Number of Anglers	-28%	-27%	25%	-47%
Morro Bay	Number of Vessels	-13%	20%	20%	-25%
	Number of Trips	-18%	-9%	0%	-4%
	Number of Anglers	-12%	4%	-2%	5%
Avila/Port San Luis	Number of Vessels	-25%	-50%	67%	25%
	Number of Trips	-40%	N/A	23%	-11%
	Number of Anglers	-30%	N/A	18%	6%

Source: Current study

N/A indicates that data were suppressed to protect confidential data

Percents were calculate from the starting year to end year of each period

Red percentages were calculated from 2003-2011 as previous years data was suppressed to protect confidential data

From the analyses, it is clear that the northern and southern ports within the Central Coast are different. Rockfish is an important component of the catch in all ports, but in the southern ports rockfish is the primary target, while salmon is of more importance in the northern ports. The changes observed in the Central Coast Region during the study period of 2000-2011 reflect these preferences. New season and depth restrictions were placed on rockfish during the early 2000s while salmon catches decreased during the mid-2000s, likely due to reduced availability of fish. In Santa Cruz and Monterey, the number of trips and anglers decreased from 2000-2003, and again from 2004-2007 (Table 141). In contrast, the number of trips and anglers decreased in Morro Bay from 2000-2003, but showed only slight changes (decrease in trips, increase in anglers) from 2004-2007. After the implementation of the MPAs (2008-2011), all ports except for Morro Bay reported increases in the total number of trips and anglers. In Morro Bay, the total number of trips and anglers showed relatively no change. Notably, these increases primarily took place from 2009 through 2011. The post MPA time period included a two-year salmon closure as well as the continuation of season and depth closures for rockfish. After 2009, however, trips for salmon began to rebound with the renewed access to salmon and bag limit regulations changes in 2009 increased the number of nearshore rockfish that could be caught daily. Also, vessels that remained in the northern ports diversified their trips to include sanddabs, crabs, and Humboldt squid. Trips that included sanddabs and crabs also occurred in the southern ports, but not to the extent observed in the northern ports.

4.6. Central Coast Region CPFV Baseline Characterization

In the CPFV baseline characterization sections found throughout this report we summarized the primary data collected from CPFV operator interviews carried out in this project. Establishing a baseline characterization of the Central Coast Region CPFV fleet provides a benchmark of socioeconomic conditions and spatial fishing patterns in which future MPA impacts and benefits can be measured. Table 142 shows the number of CPFV operators/owners we interviewed. Across the study region eight of the 14 individuals we interviewed were both owners and operators, four were hired captains (operators only) and two were owners only. As indicated below no one from Avila/Port San Luis participated in an interview.

Table 142. Number of CPFV interviews completed, Central Coast Region

Port	Individuals interviewed
Santa Cruz	4
Monterey	6
Moss Landing	1
Morro Bay	3
Avila/Port San Luis	—
Central Coast Region	14

Source: Current study

Individuals interviewed includes operator, owners, and owner/operators

— indicates that the port/fishery was not sampled or a zero value data point

The average CPFV operator is 54.9 years old, has 20.2 years experience owning a CPFV boats (if applicable) and 21.2 years operating CPFV boat (if applicable). The average individual we interviewed makes 67.4 percent of his income from CPFV related operations. Ten of the individuals we interviewed were in the CPFV business in 2006 and at that time 90 percent of their income came from CPFV operations (Table 143).

Table 143. CPFV survey response statistics, Central Coast Region

	Response	Standard deviation
Individuals interviewed	14	-
Hired captain	4	-
Owner and captain	8	-
Owner only	2	-
Average age	54.9	12.3
Average number of years owning CPFV boat/s	20.2	20.0
Average number of years operating CPFV boat/s	21.2	17.1
Average percent income from CPFV operations in 2011	67.4%	39.7%
Number of those interviewed who were operating in 2006	10	-
Average percent income from CPFV operations in 2006	90.0%	18.9%

Source: Current study

The remaining data presented in this section will include 12 respondents who are CPFV captains as we also interviewed two CPFV owners but their information was merged with the data collected from their CPFV captains. Furthermore, in the report, there are several survey summary tables which report out on characteristics of fishing activities/income from the year 2006. As limited non-spatial survey data was collected during the 2005 study by Ecotrust, we included these questions in our survey to provide some estimates as to possible socioeconomic change. Furthermore, asking questions about activities in 2006

as well as 2011 together allowed us to gather important qualitative information on the major factors driving any reported/perceived changes between the two years. We chose the year 2006 to serve as a pre-MPA year in which to gauge subsequent change as it was the last full year before the Central Coast MPA network was implemented.

Respondents were asked to indicate the percent of their total income that was from CPFV operation for 2006 and 2011. If different percentages were reported for the two years, fishermen were asked an open-ended question to describe factors to which they attributed the change in the percent of total income from CPFV operation. Fisherman responses were later coded and organized into several categories which are shown below in Table 144. Of those responding a third were not in operation in 2006, another third cited general economic decline, decrease in the number of clients, and an increase in regulation as having an impact on their income.

Table 144. Cause of change in percent income from CPFV operations from 2006 - 2011, Central Coast Region

Response	Number responding
Began business after 2006/wasn't participating	3
Economic decline	4
Increase in regulation	4
Increase in operation cost	2
Decrease in clients	4
Negative public impression of fishing	1
Inability to provide consistent employment	1
Total number responding	12

Source: Current study

Participants were allowed to give multiples responses

Over the study region the respondents reported an average gross economic revenue (GER) of \$106,000 in 2011, a \$62,000 decrease from 2006. Respondents reported that 16.9 percent of their 2011 GER went to crew, 23.0 percent to fuel, and 43.5 went to other operating costs. Some individuals indicated that all of their gross revenue went back into operating costs in 2011.

Table 145. Average CPFV gross economic revenue (GER) to operating costs, Central Coast Region

	Average response	Standard deviation
Total GER 2011	\$106,000	\$112,120
% GER to crew	16.9%	12.4%
% GER to fuel	23.0%	10.1%
% GER to other operating costs	43.5%	31.4%
Total GER 2006	\$168,667	\$133,322

Source: Current study

Across the region the most frequently reported reasons for changes in GER were economic decline, increases in regulation, and a decrease in the number of clients. Additional reasons are cited below in Table 146.

Table 146. Cause of change in CPFV gross economic revenue (GER) from 2006 to 2011, Central Coast Region

Response	Number responding
Began business after 2006	3
Economic decline	4
Increase in regulation	4
Decrease in quality of fish	2
Fishing effort condensed	2
Increase in operation cost	2
Decrease in clients	4
Didn't participate in 2006	1
Traveling farther distances	2
Negative public impression of fishing	1
Total number responding	12

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

In Table 147 eleven respondents conducted consumptive (fishing) trips in 2011 and six conducted non consumptive trips. Non consumptive trips are non-fishing trips such as whale watching, leisure cruises, nature cruises, etc. Consumptive trips were operated more frequently and passengers were charged a higher price than for non consumptive trips. Non consumptive trips averaged more passengers per trip. All individuals reported either zero or one crew members on consumptive trips and up to three crew members on non consumptive trips.

Table 147. CPFV trip statistics, Central Coast Region

	Consumptive trips		Non consumptive trips	
	Response	Standard deviation	Response	Standard deviation
Number of people reporting trips	11	—	6	—
Average number of trips per vessel	97.3	80.8	89.5	59.8
Average number of passengers(per trip)	10.5	7.6	21.1	10.0
Average price per passengers (per trip)	\$125	\$82	\$49	\$45
Average number of crew (per trip)	0.8	0.8	1.3	1.0

Source: Current study

Across the study region respondents reported spending more days fishing (an average of 76.4 days) and making a larger portion of their income (an average of 44.1 percent) from the rockfish/lingcod fishery than any other fishery. Overall, respondents reported spending the most days whale watching (an average of 91.7) but made less of their income from this activity (an average of 32.5 percent) than they did from fishing for rockfish/lingcod. The number of days spent fishing or conducting an activity and the percent of GER generated from each fishery/activity are found below in Table 148.

Table 148. CPFV fishery/activity specific data, Central Coast Region

	Fishery/activity	Individuals interviewed	Number of days targeting species (2011)		Percent of GER from fishery/activity (2011)	
			Average	Standard deviation	Average	Standard deviation
Fishery	Albacore tuna	6	3.83	3.37	5.4%	4.6%
	California halibut	6	21.17	38.98	13.8%	10.0%
	Dungeness crab	2	*	*	*	*
	Humboldt squid	1	*	*	*	*
	Rockfish/lingcod	11	76.50	65.61	44.1%	21.4%
	Salmon	11	40.09	37.89	21.8%	13.2%
	Sanddab	5	22.40	33.14	4.0%	5.2%
	White sea bass	5	5.50	4.36	18.7%	27.2%
Activity	Whale watching	6	91.17	59.93	32.5%	22.9%
	^Other	7	15.00	15.92	23.8%	35.8%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

Fishermen were asked for each fishery/activity separately to compare the success of his/her fishery/activity in 2011 to that in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse.

The percent of those interviewed responding in each of the above categories can be found below in Table 149. Responses varied but across all fisheries and activities most respondents indicated ‘the same’ (25.9 percent), followed by ‘somewhat better’ (24.1 percent).

Table 149. Overall success of CPFV fishery/activity compared to past five years, Central Coast Region

		Number responding						
		Number responding	Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	Albacore tuna	6	—	—	—	66.7%	16.7%	16.7%
	California halibut	6	—	16.7%	16.7%	50.0%	16.7%	—
	Dungeness crab	2	*	*	*	*	*	*
	Humboldt squid	1	*	*	*	*	*	*
	Rockfish/lingcod	9	—	—	44.4%	11.1%	11.1%	33.3%
	Salmon	9	—	22.2%	33.3%	—	22.2%	22.2%
	Sanddab	4	50.0%	—	25.0%	25.0%	—	—
	White sea bass	4	—	50.0%	25.0%	—	25.0%	—
Activity	Whale watching	7	14.3%	14.3%	14.3%	42.9%	—	14.3%
	^Other	6	—	16.7%	16.7%	33.3%	33.3%	—
All target fisheries/ activities		54	5.6%	14.8%	24.1%	25.9%	14.8%	14.8%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were then asked what factors they felt had contributed to their level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

MPA impacts were cited as impacting the California halibut, Dungeness crab, and rockfish/ lingcod fisheries (Table 150). Those that fish for rockfish/lingcod mentioned that due to areas being closed for MPAs other areas have become overcrowded/overfished. Additionally, they felt that the size of the rockfish was decreasing. Additionally rockfish fishermen expressed that there were many inequities in fisheries regulation and a lack of monitoring and research being conducted around MPAs.

Table 150. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region

Response	Number responding				
	California halibut	Dungeness crab	Rockfish/ lingcod	Salmon	Sanddabs
MPA impacts	2	2	3	—	1
Insufficient monitoring/enforcement/communication of MPAs	1	*	2	—	—
Concentration of fishing effort into smaller areas/over-crowding	—	*	3	—	—
Inefficiencies in bycatch regulations	—	*	1	—	—
Inefficiencies/inconsistencies in fishery regulations	1	*	—	—	—
Inequities in fishery regulations	1	*	3	3	—
Inadequate research for policy	1	*	1	—	—
Distress around unintended infractions	—	*	2	3	—
Rockfish Conservation Area (RCA)	—	*	2	—	—
Total number responding	2	*	7	3	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The most frequently reported environmental factors influencing success was an increase in whale populations. One fishermen hypothesized this was due to an increase in bait fish in the area. Other responses were varied and are shown below in (Table 151).

Table 151. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region

Response	Number responding						Activity	
	Fishery							
	California Halibut	Rockfish/lingcod	Salmon	Sanddab	White seabass	Whale watching	^Other	
Increase in bait fish	1	—	—	1	3	1	—	
Increase in fish/whale abundance	1	—	—	—	—	4	—	
Stable fish abundance	1	2	—	1	—	—	1	
Increase in catch	—	1	—	—	1	—	—	
Decrease in catch	—	—	1	—	—	—	—	
Increase in fish size	1	1	—	—	—	—	—	
Decrease in fish abundance	1	2	—	—	—	—	—	
Decrease in fish size	—	—	1	—	—	—	—	
Protected species overpopulated	—	1	—	—	—	—	—	
Total number responding	4	6	1	1	3	4	1	

Source: Current study

Participants were allowed to give multiples responses

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

— indicates that the port/fishery was not sampled or a zero value data point

Some respondent indicated an increase in the number of fishermen pursuing the California halibut fishery noting it was due to the decline in the salmon fishery. Additional economic factors influencing success are below in Table 152.

Table 152. Economic changes/factors influencing success in specific commercial fishery in previous five years, Central Coast Region

Response	Number responding			
	Fishery			Activity
	California Halibut	Rockfish/lingcod	Salmon	Whale watching
Increased regulation forced fishery/activity diversification	1	—	—	1
Increase in clients	—	1	1	—
Decrease in clients	—	—	—	1
Increase in concentrated fishing effort affecting catch size/rate	—	1	—	—
General economic decline	—	—	—	2
Increased number of fishermen participating in the fishery	2	—	—	—
Increase dependence on walk-in business	—	—	—	1
Total number responding	2	2	1	5

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 153 indicates the spatial data sets or maps that are available for CPFV fisheries at the region and port level. Due to the limited number of fishing maps available at the port level all CPFV fishing maps can be found in this section of the report following this table. It should be noted that the ports of Moss Landing and Monterey were merged together to develop a rockfish/lingcod CPFV fishing map as the fishing grounds for both ports are very similar and combining the ports allows us to present the information without confidentiality constraints.

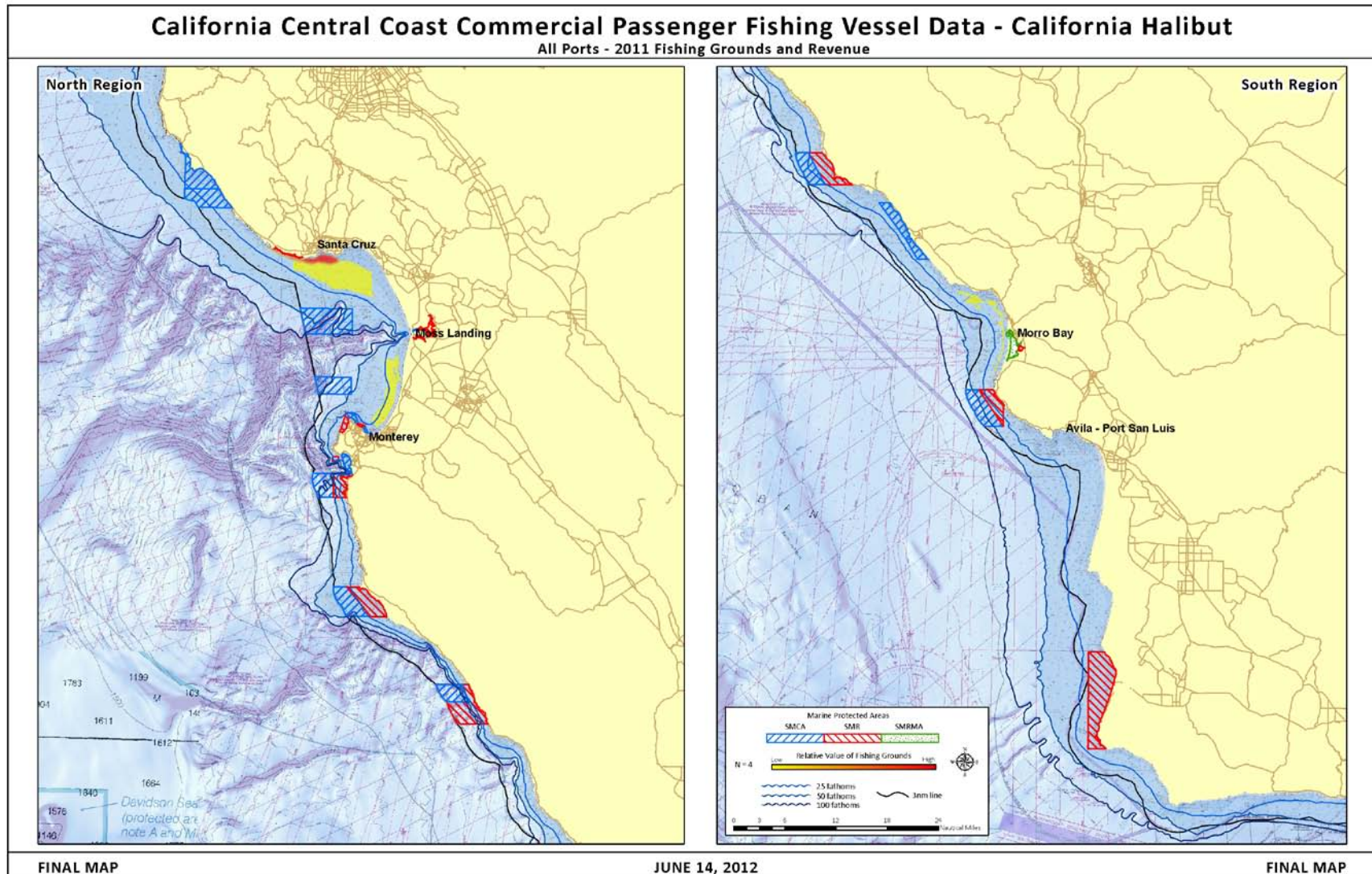
Table 153. Spatial data sets available for the CPFV sector, post MPA

Fishery	Santa Cruz	Moss Landing	Moss Landing/Monterey	Monterey	Morro Bay	Central Coast Region
California halibut	Conf	Conf	-	Conf	Conf	Yes
Dungeness crab	-	-	-	Conf	-	Conf
Humboldt squid	-	-	-	Conf	-	Conf
Rockfish/Lingcod	Yes	Conf	Yes	Conf	Conf	Yes
Salmon	Conf	-	-	Conf	-	Yes
Sanddab	Conf	-	-	Conf	-	Conf
White sea bass	-	-	-	Conf	-	Conf

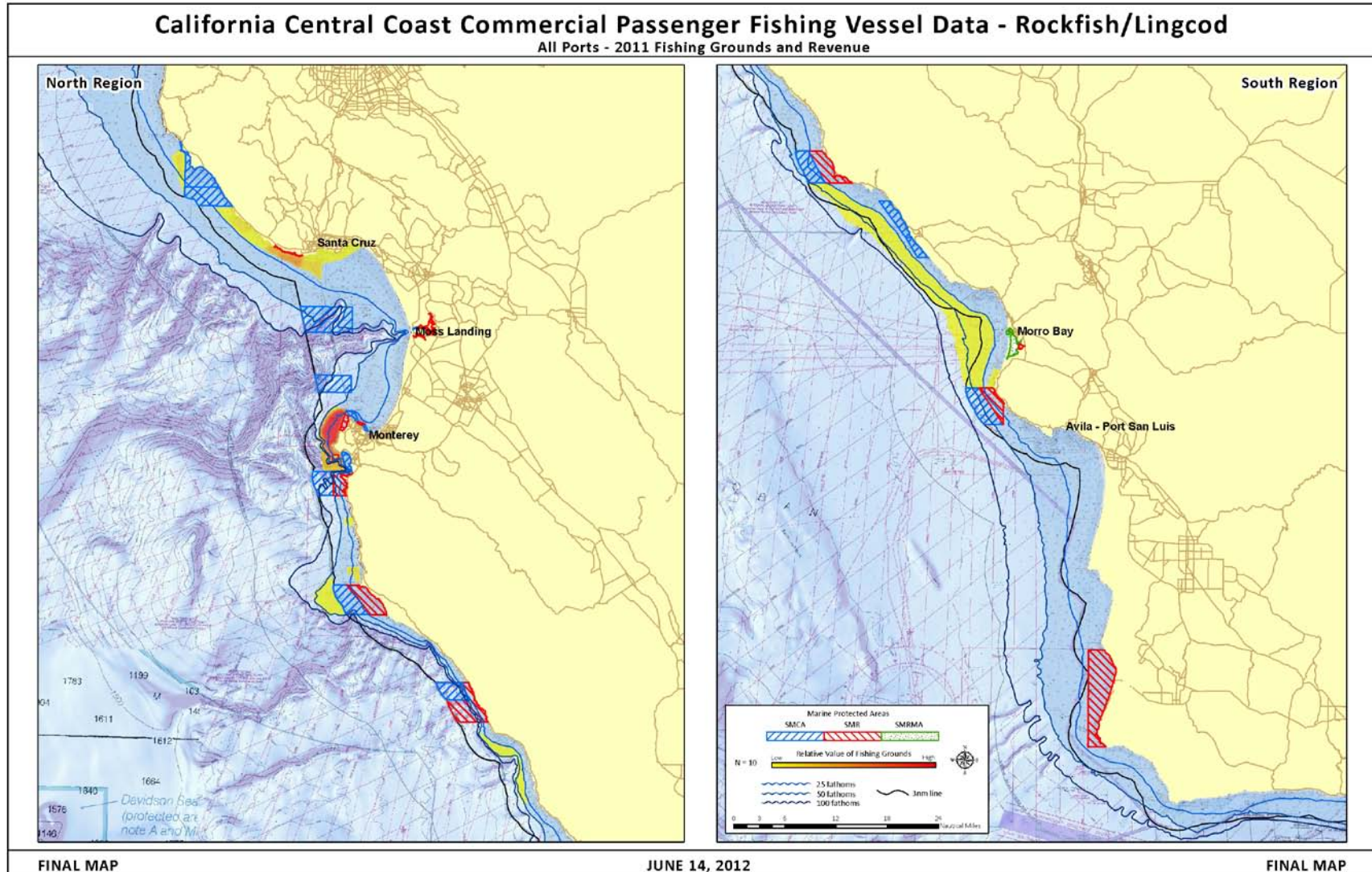
Source: Current study

'Conf' indicates data were collected but are not available due to confidentiality constraints

Map 15. California halibut 2011 CPFV fishing value map, Central Coast Region



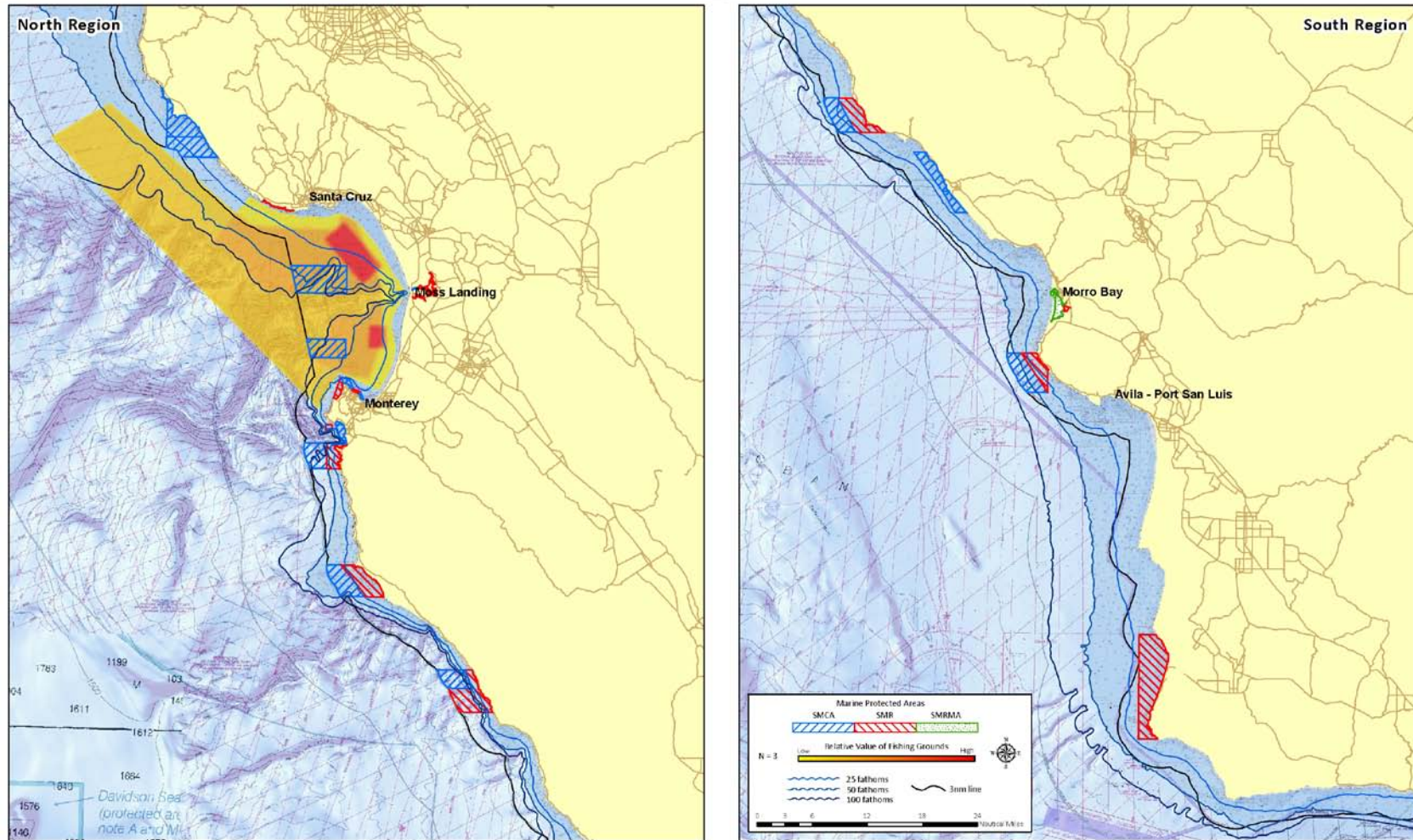
Map 16. Rockfish/Lingcod 2011 CPFV fishing value value map, Central Coast Region



Map 17. Salmon 2011 CPFV fishing value map, Central Coast Region

California Central Coast Commercial Passenger Fishing Vessel Data - Salmon

All Ports - 2011 Fishing Grounds and Revenue

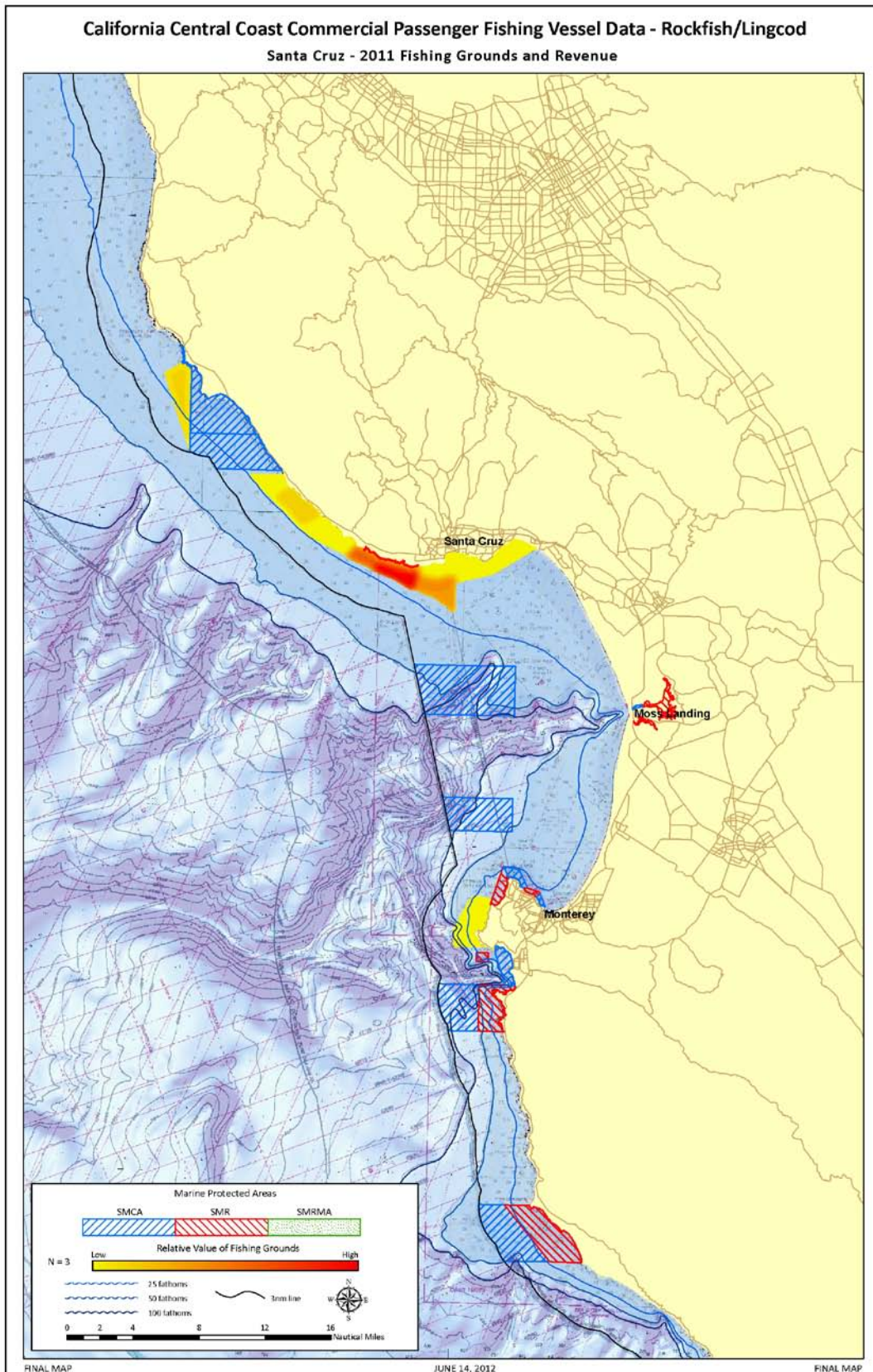


FINAL MAP

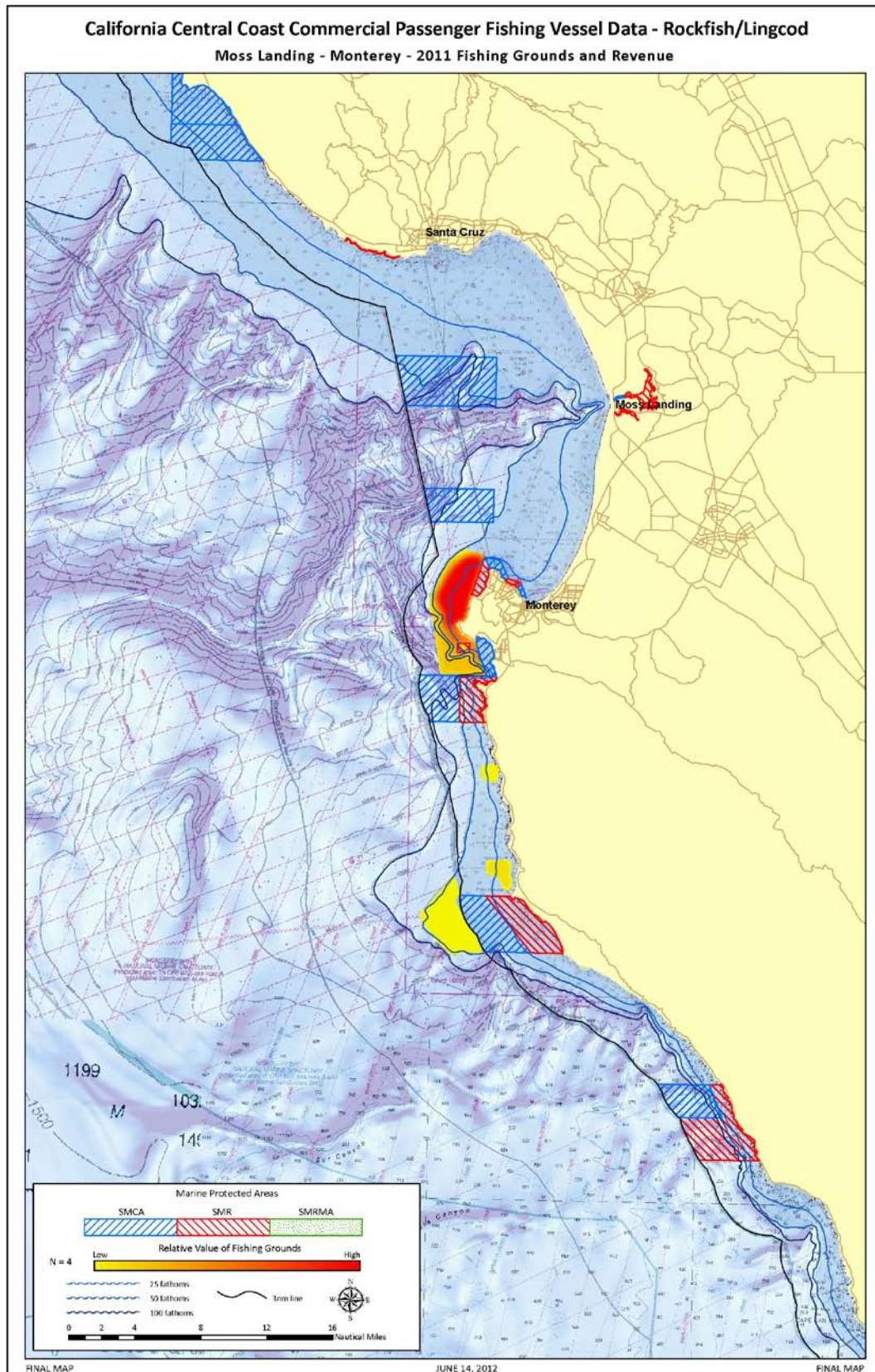
JUNE 14, 2012

FINAL MAP

Map 18. Rockfish/Lingcod 2011 CPFV fishing value map, Santa Cruz



Map 19. Rockfish/Lingcod 2011 CPFV fishing value map, Moss Landing/Monterey



4.7. Central Coast Region MPAs and CPFV Operations

Determining and measuring the impact of MPAs upon CPFV activities is challenging to quantify and unravel from the multitude of environmental, regulatory, and economic factors operating in systems of fishing and tourism. Despite this, we sought to capture information from CPFV operators as to how they perceive they have been impacted by MPAs and the specific MPAs which are impacting their fisheries/activities.

This section provides information at the region and port levels and summarizes the response from the following three questions which were asked during interviews for each fishery/activity the individual participates in:

- 1) Has your fishery/activity been directly impacted by the recently established MPAs?;
- 2) If so, how have you been impacted?; and
- 3) What MPAs have impacted your specific fishery/activity?

Question one was posed as a simple yes or no response and questions two and three were open-ended questions in which responses were later coded and categorized into the tables below.

Across the entire Central Coast Region, 40.0 percent of responses indicated that their CPFV fishing/activities had been impacted in some way by MPAs. The fishery with the fewest number of CPFV operators reporting impacts from MPAs was the salmon fishery (18.2 percent) and the most was the rockfish/lingcod fisheries (100.0 percent). Responses in the Albacore tuna, Humboldt squid, and white sea bass fisheries all reported no impacts from MPAs. One CPFV operator had indicated being positively impacted by or benefitted from MPAs in their whale watching activities. This operator had mentioned that whales have been transiting through the MPAs and felt this was perhaps due to the increased bait fish or biomass in the MPAs. All of the rockfish/lingcod CPFV operators who reported they were impacted also indicated they had lost traditional fishing areas to MPAs. Additionally, 45.5 percent of the Rockfish/lingcod CPFV operators interviewed reported having to travel longer distances at times to fish and 36.4 percent are fishing in areas with worse or less predictable weather. 42.9 percent of respondents who conduct other CPFV activities such as government charters, research charters, and recreational diving trips indicated they were impacted by MPAs, however, these were generally positive impacts in that MPAs have generated research and diving interests.

Table 154. Percent of individuals indicating direct impact from MPAs for each fishery, CPFV fishermen, Central Coast Region

Fisheries	Number responding	Percent of respondents indicating direct impacts by MPAs	Type of impact				
			Moved homeport	Fishing at borders	Traveling longer distances	Shifted efforts to areas with less predictable/worse weather	Loss of traditional fishing grounds
Fishery	Albacore tuna	6	—	—	—	—	—
	California halibut	6	66.7%	16.7%	16.7%	50.0%	33.3%
	Dungeness crab	2	50.0%	—	50.0%	50.0%	50.0%
	Humboldt squid	1	—	—	—	—	—
	Rockfish/lingcod	11	100.0%	—	18.2%	45.5%	36.4%
	Salmon	11	18.2%	—	—	—	9.1%
	Sanddab	5	40.0%	—	—	—	20.0%
	White sea bass	5	—	—	—	—	—
Activity	Whale watching	6	16.7%	—	—	—	—
	^Other	7	42.9%	—	—	14.3%	—
All target fisheries/activities		60	40.0%	1.7%	6.7%	16.7%	11.7%
							28.3%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

In addition to the impacts from MPAs displayed in the table above, Table 155 provides additional perceived impacts from MPAs that CPFV operators discussed during interviews. Several operators indicated that MPA boundaries were hard to identify and follow which was also causing distress over unintended MPA infractions such as drifting into MPAs. CPFV operators also reported that MPAs have caused operators to fish in areas that are further from port which raises safety concerns as the rescue response times have doubled. This is further exacerbated by increased operating costs which have lead to some reduction in the number of crew.

Table 155. Other ways MPAs have impacted specific CPFV fisheries, Central Coast Region

Response	Number responding		
	California halibut	Rockfish/lingcod	Sanddabs
Decrease in available fishing grounds	1	—	—
Fishing less productive areas	1	—	—
Loss of fishing opportunities	—	—	—
Distress around unintended infractions	—	1	—
Increased operating costs	1	—	—
MPA boundaries hard to identify and follow	1	1	1
Greater risk due to distance and lack of crew	1	1	—
Total number responding	3	3	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The 20 MPAs listed in Table 156 were reported to have impacted at least one person in a specific port-fishery combination. The largest number of fisheries/activities that a single MPA impacted was three fisheries/activities (not including 'other' activities) - these MPAs are Asilomar SMR, Carmel Pinnacles SMR, Point Buchon SMR, Portuguese Ledge SMCA, and Soquel Canyon SMCA. Across the region, operators conducting rockfish/lingcod and California halibut trips reported being impacted by the largest number of MPAs (20 and 12 MPAs respectively). The last column in the table sums the number of responses across each fishery/activity and divides by the number of responses across all fisheries/activities (60 responses) to show which MPAs were most commonly reported as having the most impact on CPFV operators. Across the region and across all fisheries/activities, these MPAs are Asilomar SMR, Carmel Pinnacles SMR, Point Lobos SMR, Point Sur SMR and SMCA, and Soquel Canyon SMCA. It should be noted that for the Carmel Pinnacles SMR, Carmel Bay SMCA, and Point Buchon SMR one respondent indicated he/she conducted non-consumptive activities such as research charters or recreational diving in this MPA and thus the MPA had a positive impact on their operation of these types of activities.

Table 156. MPAs impacting specific CPFV fisheries/activities, Central Coast Region

MPA	Fishery								Activity		All target fisheries/activities
	Albacore tuna	California halibut	Dungeness crab	Humboldt squid	Rockfish/lingcod	Salmon	Sanddab	White sea bass	Whale watching	^Other	
Number responding	6	6	2	1	11	11	5	5	6	7	60
Año Nuevo SMCA	—	16.7%	—	—	27.3%	—	—	—	—	—	6.7%
Asilomar SMR	—	16.7%	—	—	36.4%	9.1%	—	—	—	—	10.0%
Carmel Bay SMCA	—	—	—	—	27.3%	—	—	—	—	14.3%	6.7%
Carmel Pinnacles SMR	—	16.7%	—	—	36.4%	—	—	—	—	14.3%	10.0%
Edward F Ricketts SMCA	—	—	—	—	27.3%	—	—	—	—	—	5.0%
Greyhound Rock SMCA	—	16.7%	—	—	27.3%	—	—	—	—	—	6.7%
Lovers Point SMR	—	16.7%	—	—	27.3%	—	—	—	—	—	6.7%
Natural Bridges SMR	—	16.7%	—	—	9.1%	—	—	—	—	—	3.3%
Pacific Grove Marine Gardens SMCA	—	16.7%	—	—	27.3%	—	—	—	—	—	6.7%
Piedras Blancas SMCA	—	16.7%	—	—	9.1%	—	—	—	—	—	3.3%
Piedras Blancas SMR	—	16.7%	—	—	18.2%	—	—	—	—	—	5.0%
Point Buchon SMCA	—	16.7%	—	—	18.2%	—	—	—	—	—	5.0%
Point Buchon SMR	—	16.7%	—	—	27.3%	—	—	—	—	14.3%	8.3%
Point Lobos SMCA	—	—	—	—	45.5%	—	—	—	—	—	8.3%
Point Lobos SMR	—	—	—	—	45.5%	9.1%	—	—	—	—	10.0%
Point Sur SMCA	—	—	—	—	54.5%	—	—	—	—	—	10.0%
Point Sur SMR	—	—	—	—	54.5%	—	—	—	—	—	10.0%
Portuguese Ledge SMCA	—	—	50.0%	—	18.2%	—	20.0%	—	—	—	6.7%
Soquel Canyon SMCA	—	—	—	—	27.3%	9.1%	40.0%	—	—	—	10.0%
White Rock-Cambria SMCA	—	16.7%	—	—	9.1%	—	—	—	—	—	3.3%
Number of MPAs impacting fishery	—	12	1	—	20	3	2	—	—	3	20

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

Across the CPFV port of Santa Cruz, 41.2 percent of responses indicated that their CPFV fishing/activities had been impacted in some way by MPAs. The fishery with the fewest number of CPFV operators reporting impacts from MPAs was salmon (25.0 percent) and the most was rockfish/lingcod (100.0 percent) and then California halibut (66.7 percent). All of the rockfish/lingcod CPFV operators who reported they were impacted also indicated they had lost traditional fishing areas to MPAs. Of note is that one California halibut CPFV operator reported that because of MPAs they had moved their homeport of operation.

Table 157. Percent of individuals indicating direct impact from MPAs for each fishery, CPFV fishermen, Santa Cruz

Fisheries		Number responding	Percent of respondents indicating direct impacts by MPAs	Type of impact				
				Moved homeport	Fishing at borders	Traveling longer distances	Shifted efforts to areas with less predictable/ worse weather	Loss of traditional fishing grounds
Fishery	Albacore tuna	2	*	*	*	*	*	*
	California halibut	3	66.7%	33.3%	—	33.3%	33.3%	66.7%
	Dungeness crab	—	—	—	—	—	—	—
	Humboldt squid	—	—	—	—	—	—	—
	Rockfish/lingcod	3	100.0%	—	33.3%	33.3%	—	100.0%
	Salmon	4	25.0%	—	—	—	—	—
	Sanddab	2	*	*	*	*	*	*
	White sea bass	2	*	*	*	*	*	*
Activity	Whale watching	1	*	*	*	*	*	*
	^Other	—	—	—	—	—	—	—
All target fisheries/ activities		17	41.2%	5.9%	5.9%	11.8%	5.9%	29.4%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

The 14 MPAs listed in Figure 35 were reported to have impacted at least one person in a specific port-fishery combination. The largest number of fisheries/activities that a single MPA impacted was at least two fisheries/activities - these MPAs are Año Nuevo SMCA, Greyhound Rock SMCA, Natural Bridges SMR, and Soquel Canyon SMCA. Across the region, operators conducting rockfish/lingcod trips reported being impacted by the largest number of MPAs (14 MPAs). The last column in the table sums the number of responses across each fishery/activity and divides by the number of responses across all fisheries/activities (17 responses) to show which MPAs were most commonly reported as having the most impact on CPFV operators. Across the region and across all fisheries/activities, these MPAs are Año Nuevo SMCA, Greyhound Rock SMCA, and Soquel Canyon SMCA.

Table 158.MPAs impacting specific CPFV fisheries/activities, Santa Cruz

MPA	Fishery								Activity		All target fisheries/activities
	Albacore tuna	California halibut	Dungeness crab	Humboldt squid	Rockfish/lingcod	Salmon	Sanddab	White sea bass	Whale watching	^Other	
Number responding	2	3	—	—	3	4	2	1	2	—	17
Año Nuevo SMCA	*	33.3%	—	—	66.7%	—	*	*	*	—	17.6%
Asilomar SMR	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Carmel Bay SMCA	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Carmel Pinnacles SMR	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Edward F Ricketts SMCA	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Greyhound Rock SMCA	*	33.3%	—	—	66.7%	—	*	*	*	—	17.6%
Lovers Point SMR	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Natural Bridges SMR	*	33.3%	—	—	33.3%	—	*	*	*	—	11.8%
Pacific Grove Marine Gardens SMCA	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Point Lobos SMCA	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Point Lobos SMR	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Point Sur SMCA	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Point Sur SMR	*	—	—	—	33.3%	—	*	*	*	—	5.9%
Soquel Canyon SMCA	*	—	—	—	33.3%	25.0%	*	*	*	—	17.6%
Number of MPAs impacting fishery	*	3	—	—	14	1	*	*	*	—	14

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

As reiterated throughout the report, the ports of Moss Landing and Monterey were combined so that data collected could be shown as much of the data if presented separately would need to be suppressed for confidentiality purposes.

Across the CPFV ports of Moss Landing and Monterey 37.9 percent of responses indicated that their CPFV fishing/activities had been impacted in some way by MPAs. The fishery with the fewest number of CPFV operators reporting impacts from MPAs was salmon (20.0 percent) and the most was rockfish/lingcod (100.0 percent). One CPFV operator had indicated being positively impacted by or benefitted from MPAs in their whale watching activities. This operator had mentioned that whales have been transiting through the MPAs and felt this was perhaps due to the increased bait fish or biomass in the MPAs. All of the rockfish/lingcod CPFV operators who reported they were impacted also indicated they had lost traditional fishing areas to MPAs. Additionally, 40.0 percent of the rockfish/lingcod CPFV operators interviewed reported having to travel longer distances at times to fish and 60.0 percent are fishing in areas with worse of less predictable weather. 33.3 percent of respondents who conduct other CPFV activities such as government charters, research charters, and recreational diving trips indicated they were impacted by MPAs, however, these were positive impacts in that MPAs have generated research and diving interests.

Table 159. Percent of individuals indicating direct impact from MPAs for each fishery, CPFV fishermen, Moss Landing/Monterey

Fisheries		Number responding	Percent of respondents indicating direct impacts by MPAs	Type of impact				
				Moved homeport	Fishing at borders	Traveling longer distances	Shifted efforts to areas with less predictable /worse weather	Loss of traditional fishing grounds
Fishery	Albacore tuna	1	*	*	*	*	*	*
	California halibut	2	*	*	*	*	*	*
	Dungeness crab	2	*	*	*	*	*	*
	Humboldt squid	1	*	*	*	*	*	*
	Rockfish/lingcod	5	100.0%	—	—	40.0%	60.0%	100.0%
	Salmon	5	20.0%	—	—	—	—	20.0%
	Sanddab	3	33.3%	—	—	—	—	33.3%
	White sea bass	3	—	—	—	—	—	—
Activity	Whale watching	4	25.0%	—	—	—	—	—
	^Other	3	33.3%	—	—	—	—	—
All target fisheries/ activities		29	37.9%	—	6.9%	13.8%	17.2%	31.0%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

The 14 MPAs listed in Table 160 were reported to have impacted at least one person in a specific port-fishery combination. The largest number of fisheries/activities that a single MPA impacted was at least two fisheries/activities (not including 'other' activities), these MPAs are Asilomar SMR, Point Lobos SMR, Portuguese Ledge SMCA, and Soquel Canyon SMCA. Across the port, operators conducting rockfish/lingcod trips reported being impacted by the largest number of MPAs (14 MPAs). The last column in the table sums the number of responses across each fishery/activity and divides by the number of responses across all fisheries/activities (29 responses) to show which MPAs were most commonly reported as having the most impact on CPFV operators. Across the region and across all fisheries/activities, these MPAs are Asilomar SMR, Carmel Pinnacles SMR, Point Lobos SMR, and Point Sur SMR and SMCA. Of note is that for the Carmel Pinnacles SMR and Carmel Bay SMCA, one respondent indicated he/she conducted non-consumptive activities such as research charters or recreational diving in this MPA and thus the MPA had a positive impact on their operation of these types of activities.

Table 160. MPAs impacting specific CPFV fisheries/activities, Moss Landing/Monterey

MPA	Fishery								Activity		All target fisheries/activities
	Albacore tuna	California halibut	Dungeness crab	Humboldt squid	Rockfish/lingcod	Salmon	Sanddab	White sea bass	Whale watching	^Other	
Number responding	1	2	2	1	5	5	3	3	4	3	29
Año Nuevo SMCA	*	*	*	*	20.0%	—	—	—	—	—	3.4%
Asilomar SMR	*	*	*	*	60.0%	20.0%	—	—	—	—	17.2%
Carmel Bay SMCA	*	*	*	*	40.0%	—	—	—	—	33.3%	10.3%
Carmel Pinnacles SMR	*	*	*	*	60.0%	—	—	—	—	33.3%	17.2%
Edward F Ricketts SMCA	*	*	*	*	40.0%	—	—	—	—	—	6.9%
Greyhound Rock SMCA	*	*	*	*	20.0%	—	—	—	—	—	3.4%
Lovers Point SMR	*	*	*	*	40.0%	—	—	—	—	—	10.3%
Pacific Grove Marine Gardens SMCA	*	*	*	*	40.0%	—	—	—	—	—	10.3%
Point Lobos SMCA	*	*	*	*	80.0%	—	—	—	—	—	13.8%
Point Lobos SMR	*	*	*	*	80.0%	20.0%	—	—	—	—	17.2%
Point Sur SMCA	*	*	*	*	100.0%	—	—	—	—	—	17.2%
Point Sur SMR	*	*	*	*	100.0%	—	—	—	—	—	17.2%
Portuguese Ledge SMCA	*	*	*	*	40.0%	—	33.3%	—	—	—	13.8%
Soquel Canyon SMCA	*	*	*	*	40.0%	—	33.3%	—	—	—	10.3%
Number of MPAs impacting fishery	*	*	*	*	14	2	2	—	—	2	14

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

Across the CPFV port of Morro Bay 42.9 percent of responses indicated that their CPFV fishing/activities had been impacted in some way by MPAs. The fisheries/activities with no CPFV operators reporting impacts from MPAs were Albacore tuna, salmon, and whale watching. However all respondents in the California halibut and rockfish/lingcod fishery indicated there were impacted by MPAs. All respondents in the rockfish/lingcod fishery indicated they have lost traditional fishing grounds and 66.7 percent of respondents have to travel longer distances to fish. 50.0 percent of respondents who conduct other CPFV activities such as government charters, research charters, and recreational diving trips indicated they were impacted by MPAs, however, these were generally positive impacts in that MPAs have generated research and diving interests.

Table 161. Percent of individuals indicating direct impact from MPAs for each fishery, CPFV fishermen, Morro Bay

Fisheries		Number responding	Percent of respondents indicating direct impacts by MPAs	Type of impact				
				Moved homeport	Fishing at borders	Traveling longer distances	Shifted efforts to areas with less predictable/worse weather	Loss of traditional fishing grounds
Fishery	Albacore tuna	3	—	—	—	—	—	—
	California halibut	1	100.0%	—	—	100.0%	—	—
	Dungeness crab	—	—	—	—	—	—	—
	Humboldt squid	—	—	—	—	—	—	—
	Rockfish/lingcod	3	100.0%	—	33.3%	66.7%	33.3%	100.0%
	Salmon	2	—	—	—	—	—	—
	Sanddab	—	—	—	—	—	—	—
	White sea bass	—	—	—	—	—	—	—
Activity	Whale watching	1	—	—	—	—	—	—
	^Other	4	50.0%	—	—	25.0%	—	—
All target fisheries/ activities		14	42.9%	—	7.1%	28.6%	7.1%	21.4%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

— indicates that the port/fishery was not sampled or a zero value data point

The 5 MPAs listed in Table 162 were reported to have impacted at least one person in a specific port-fishery combination. Across the port, operators conducting rockfish/lingcod trips reported being impacted by the largest number of MPAs (5 MPAs). The MPA which impacted the most CPFV operators in this port was Point Buchon SMR. 100.0 percent of rockfish/lingcod respondents and 35.7 percent of all responses indicated that Point Buchon SMR was directly impacting their CPFV fishing (100.0% of Rockfish/lingcod respondents and 35.7% of all responses). Of note is that for the Point Buchon SMR, one respondent indicated he/she conducted non-consumptive activities such as research charters or recreational diving in this MPA and thus the MPA had a positive impact on their operation of these types of activities.

Table 162. MPAs impacting specific CPFV fisheries/activities, Morro Bay

MPA	Fishery								Activity		All target fisheries/activities
	Albacore tuna	California halibut	Dungeness crab	Humboldt squid	Rockfish/lingcod	Salmon	Sanddab	White sea bass	Whale watching	^Other	
Number responding	3	1	—	—	3	2	—	—	1	4	14
Piedras Blancas SMCA	—	*	—	—	33.3%	*	—	—	*	—	14.3%
Piedras Blancas SMR	—	*	—	—	66.7%	*	—	—	*	—	21.4%
Point Buchon SMCA	—	*	—	—	66.7%	*	—	—	*	—	21.4%
Point Buchon SMR	—	*	—	—	100.0%	*	—	—	*	25.0%	35.7%
White Rock-Cambria SMCA	—	*	—	—	33.0%	*	—	—	*	—	14.3%
Number of MPAs impacting fishery	—	*	—	—	4	*	—	—	*	1	4

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

We did not interview any CPFV operators in the port of Avila/Port San Luis and thus no data is presented for that port in this section of the report.

5. CENTRAL COAST PORT PROFILES

The following port profiles detail commercial fishery trends on a port level for the five main ports in the Central Coast Region, including the landings (in pounds) and ex-vessel revenues over time for each fishery of interest (in 2010\$). Furthermore, each port profile summarizes CDFG CPFV logbook data from 2000-2011. The port profiles also summarize the survey data collected during interviews for both the commercial and CPFV sectors. We summarized information derived from the CDFG commercial landings and CPFV logbook data for the following ports in the Central Coast Region, listed north to south:

1. Santa Cruz
2. Moss Landing/Monterey
3. Morro Bay
4. Avila/Port San Luis

Though landings have varied over the study period, most ports experienced an overall decline in total landings from 1992–2011, with possible upswings occurring towards the end of study period. Most ports, Moss Landing and Monterey most noticeably, capitalized on the market squid fishery when it was available, which provided significant ex-vessel revenues in market squid abundant years. Throughout the state of California, the overall number of fishermen has been on the decline. The Central Coast Region and each port specifically were also in decline over the study period.

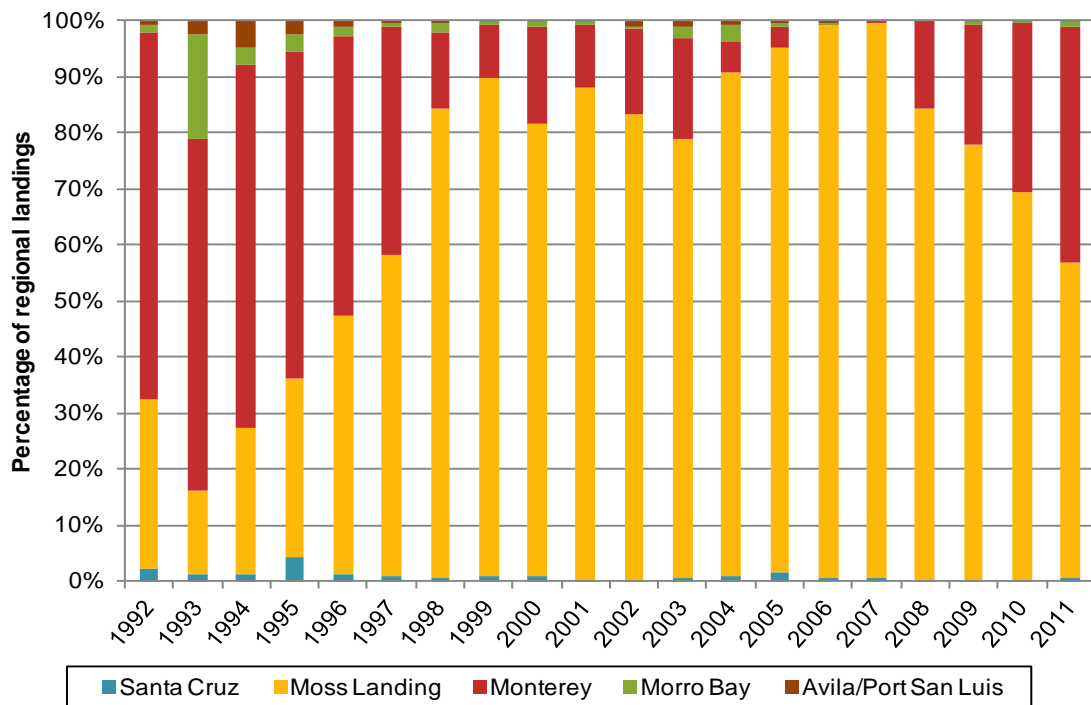
Due to confidentiality constraints much of the primary data collected for Moss Landing could not be presented on its own. However, similarities in fishing grounds and fisheries pursued across the commercial and CPFV sector led us to combine the ports of Moss Landing and Monterey when presenting non-spatial and spatial data collected. Landings data and CPFV logbook data provided by CDFG are still presented separate for each port.

As displayed in Figure 63, Monterey contributed the highest percentage of landings to the Central Coast Region initially, averaging almost two thirds of total landings for the eleven commercial fisheries of interest from 1992 to 1996. From 1997 to 2011, Monterey was surpassed by Moss Landing, which averaged just over 80 percent of total landings over that time. In 2007, Moss Landing alone was responsible for 99 percent of total landings made in the Central Coast Region from fisheries of interest. This was likely due to Moss Landing's focus on the high volume coastal pelagic fishery. By 2011, Moss Landing's percentage of total landings fell to 56.3 percent, but overall, the other ports all contributed less in 2011 than they did in 1992. Close to the end of the study period, landings increased in most ports, except in Moss Landing.

Ex-vessel revenues from the commercial fisheries of interest were somewhat more dispersed among individual ports than were pounds landed, see Figure 64. The top three contributing ports to total Central Coast Region ex-vessel revenues from 1992–2011 were Moss Landing (46.8 percent), Monterey (20.3 percent) and Morro Bay (15.6 percent). The highest percentage of any single port during this study period was 63.8 percent of total Central Coast Region ex-vessel revenues, made by Moss Landing in 2002.

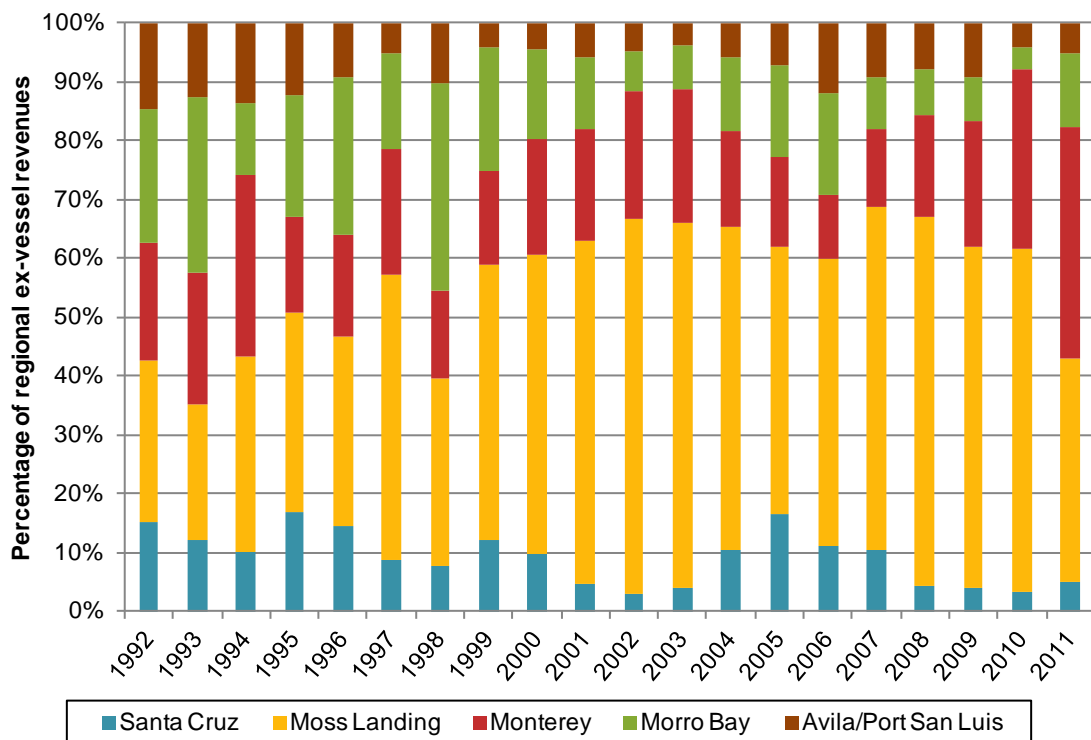
The differences between the top contributing ports in terms of landings as compared to ex-vessel revenues indicates that different ports specialize in different, higher or lower valued fisheries. The remainder of this section will illuminate trends specific to individual port fishery combinations. In the sections below, we present the overall landings and ex-vessel revenues trends for each port, as well as the count of participating fishermen over the study period.

Figure 63. Fisheries of interest commercial landings by Central Coast region ports, 1992–2011



Source: Landings data from CDFG

Figure 64. Fisheries of interest commercial ex-vessel revenues by Central Coast region ports, 1992–2011



Source: Landings data from CDFG

5.1. Santa Cruz

The county of Santa Cruz first documented commercial fishing in the 1850s and the industry soon after grew rapidly with the establishment of a railroad line in the early 1880s. With this ability to efficiently transport their catch there were nearly 100 fishing boats unloading in the area by the early 1900s (Pomeroy et al. 2008). In 1964, the fishing community of Santa Cruz organized to officially form the Santa Cruz harbor (Pomeroy et al., 2008). Infrastructure to support the commercial fishing port such as unloading facilities, a commercial ice machine, and chilled storage were installed with grant funds awarded to the Santa Cruz harbor district starting in 1984 (Petterson et al. 2010). Santa Cruz harbor is a small boat harbor, and many fisherman and buyers operate within a port network, landing and buying catch in Santa Cruz and other ports in the region (Pomeroy et al. 2008). The Santa Cruz Commercial Fishermen's Marketing Association (SCCFMA) was formed in the 1960s by the local commercial fisherman to organize the fishing community's voice when negotiating with the Santa Cruz Port District Commission. Although the SCCFMA's membership has fluctuated over the years; to date it retains over 60 members and continues to represent SCH's commercial fishing interests.

Santa Cruz is known primarily as a salmon fishing port, in which salmon was responsible for the majority of the historical landings. The groundfish-trawl fishery was also an important contributor to historical landings; however this fishery has declined significantly in Santa Cruz yielding less than \$50,000 in ex-vessel revenue each year since 2000 and with zero landings in Santa Cruz since 2008. Figure 68 shows that Dungeness crab gained importance as a port revenue source in 2004 and by 2010 comprised 66.5% of the port's total ex-vessel revenue. However, Figure 65 shows the Santa Cruz harbor has been in overall decline with ex-vessel revenue and the number of fisherman in fisheries of interest since peak values in 1995-1996. The harbor's ex-vessel revenue levels for fisheries of interest have increased since 2009 but have not reached ex-vessel revenue levels seen during the last prominent salmon year in 2005 as seen in

Figure 68. Figure 69 illustrates the rising dependence on the Dungeness crab—trap and California halibut—hook & line fisheries. The California halibut—hook & line fishery has consistently been a part of the individual fisherman's income since the beginning of the study period, but had not served as a major portion of fisherman ex-vessel revenue until the salmon closures of 2008 and 2009. CPFV operations have historically had a widespread presence in the Santa Cruz harbor (Petterson et al. 2010). Once an industry most heavily reliant on rockfish and salmon fishing, CPFV operators are now diversifying to sanddabs and whale watching to bolster their income in the presence of increasing regulations and economic downturn.

5.1.1. Santa Cruz Commercial Fisheries Initial Change

Santa Cruz, the northernmost port in the Central Coast Region, contributed 1.4 percent of total landings and 6.7 percent of total ex-vessel revenues to the Central Coast Region on average over 1992–2011. Landings and ex-vessel revenues, respectively peaking at 1.9 million pounds in 1997 and \$2.4 million in 1995, declined overall from 1992–2011, see Figure 65. The number of fishermen decreased 61.1 percent from 1992 to 2011. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

Figure 66 displays the percentage the eleven fisheries of interest represented of total landings and ex-vessel revenues made in the port over the study period. Other fisheries landed in Santa Cruz over the study period included groundfish—bottom trawl (averaging \$71,739 annually), sablefish—longline (averaging \$43,475 annually), and albacore tuna—troll (averaging \$28,432 annually). In 1998, groundfish—bottom trawl constituted 22.1 percent of total ex-vessel revenues in Santa Cruz, additionally swordfish, and rock crab were landed that year. In 2011, ex-vessel revenues from white seabass and rock crab were made in the port.

Figure 67 and Figure 68 display the composition of landings and ex-vessel revenues for select fisheries of interest over 1992 to 2011⁴. Of the fisheries of interest, the salmon—troll fishery contributed the highest

⁴ Fisheries of interest were selected for display for compositional landings and ex-vessel revenue figures only if they constituted the top 95 percent of combined landings and ex-vessel revenues for all eleven fisheries of interest in the port over the study period on

average annual landings, 21.5 percent of total landings in Santa Cruz, followed by the Dungeness crab-trap fishery (18.9 percent). The Dungeness crab-trap fishery grew in significance in this port over the study period due to the decline in ex-vessel revenue from other fisheries and the recent high abundance of Dungeness crab—contributing only 2.8 percent of total landings on average for the first half of the study period, to 34.9 percent by 2011. In 2010 the Dungeness crab-trap fishery landings represented 69.2 percent of total landings from all fisheries in Santa Cruz. The coastal pelagic species-seine/net fishery's landings have gradually declined throughout the study period, with occasional instances of significance such as in 2007 and 2009.

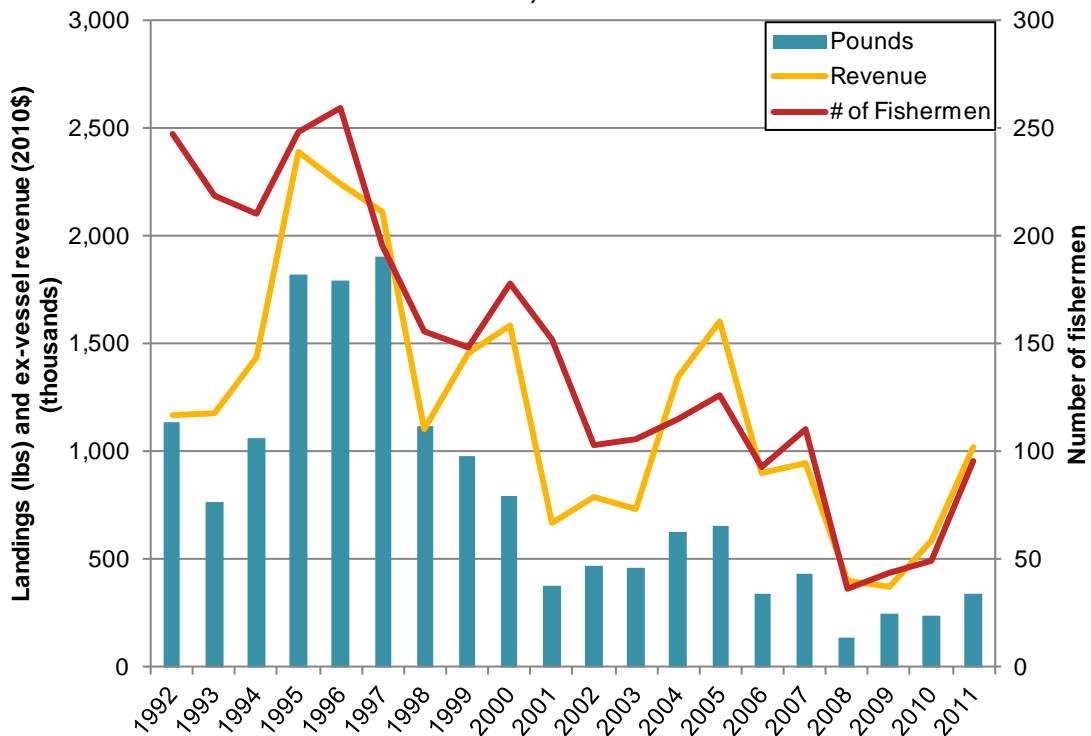
In terms of ex-vessel revenues from the fisheries of interest in Santa Cruz, see Figure 68. Trends were similar to those found for pounds landed, in which declining contributions of the salmon-troll fishery and increasing significance of the Dungeness crab-trap fishery are observed.

Figure 69 displays the average percent contribution to fishing income from fisheries of interest in Santa Cruz. This figure displays changes in how much fishermen rely upon ex-vessel revenue from specific fisheries of interests relative to other fisheries of interest. Figure 69 again illustrates the decline of the salmon-troll fishery and rise of the Dungeness crab-trap fishery in this port, but brings to light the quickly increasing significance of the California halibut-hook & line fishery to fishing incomes in this port.

The California halibut—hook & line fishery averaged only 5.3 percent of total fishing incomes among the fisheries of interest for the first half of the study period, however, from 2001–2011 this had increased to 22.5 percent. In 2009, when salmon fishing was closed, 58.5 percent of average commercial fishing income from fisheries of interest were supported by the California halibut-hook & line fishery. While only 14.0 percent of fishermen in Santa Cruz participated in the California halibut-hook & line fishery on average, the majority of fisherman who did participate fished that fishery exclusively receiving 100 percent of their total fishing income (among the eleven fisheries of interest only) from those landings.

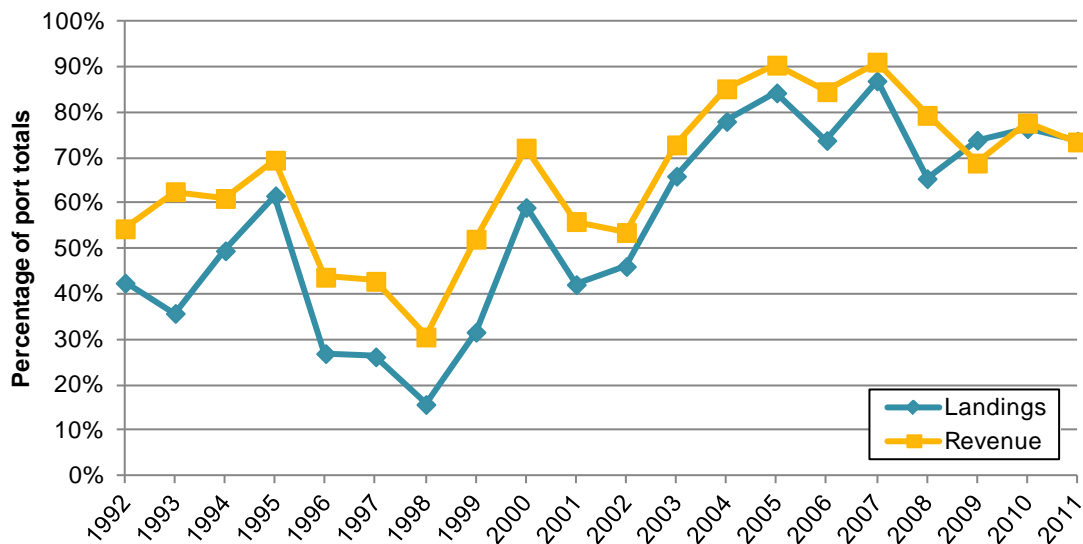
average. The remaining fisheries that were not selected for display likely wouldn't be visible on the compositional figures had they been included.

Figure 65. Santa Cruz total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011



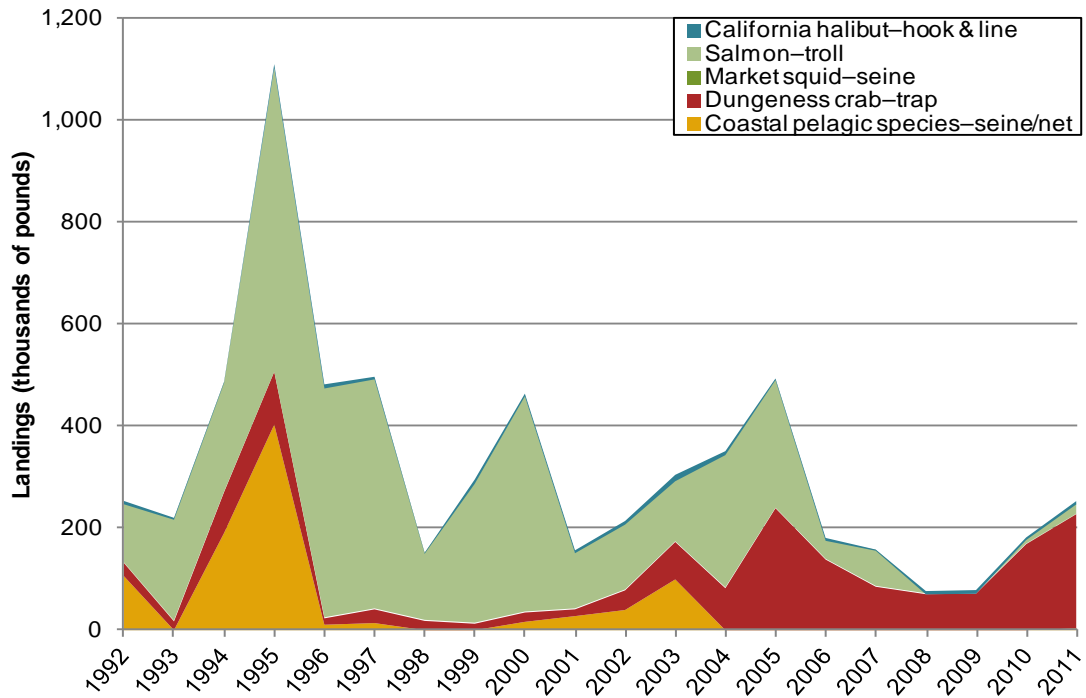
Source: Landings data from CDFG

Figure 66. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Santa Cruz, 1992–2011



Source: Landings data from CDFG

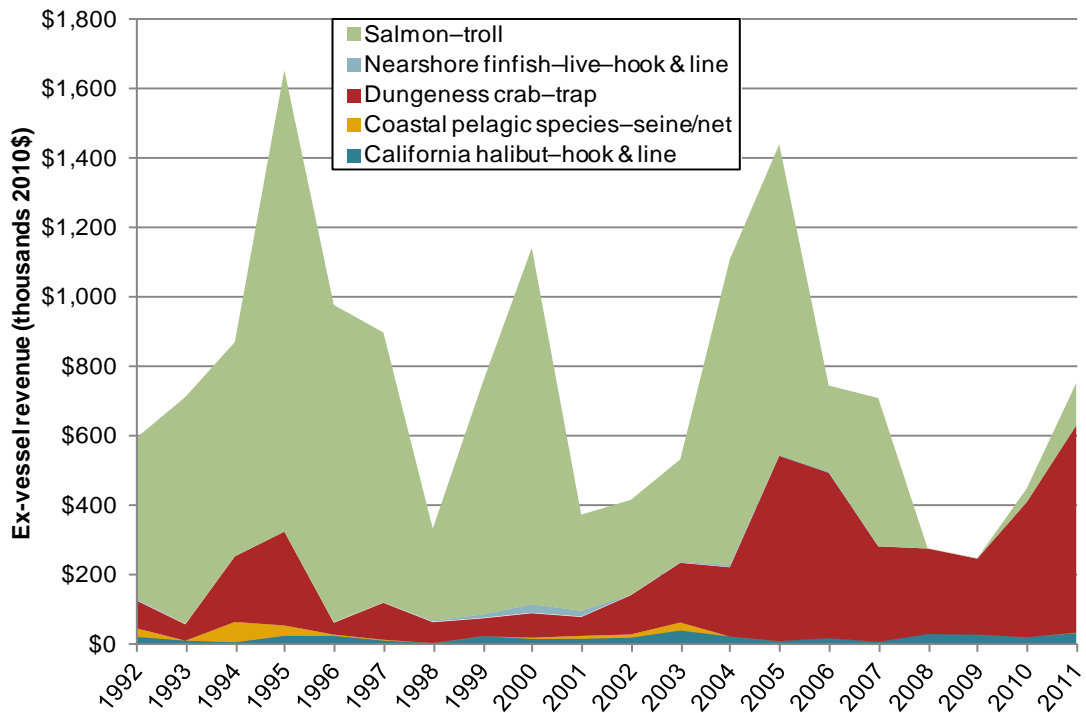
Figure 67. Santa Cruz commercial landings for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

Figure 68. Santa Cruz commercial ex-vessel revenues for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

Figure 69. Average percent of individual fishing income from commercial fisheries of interest, Santa Cruz, 1992–2011

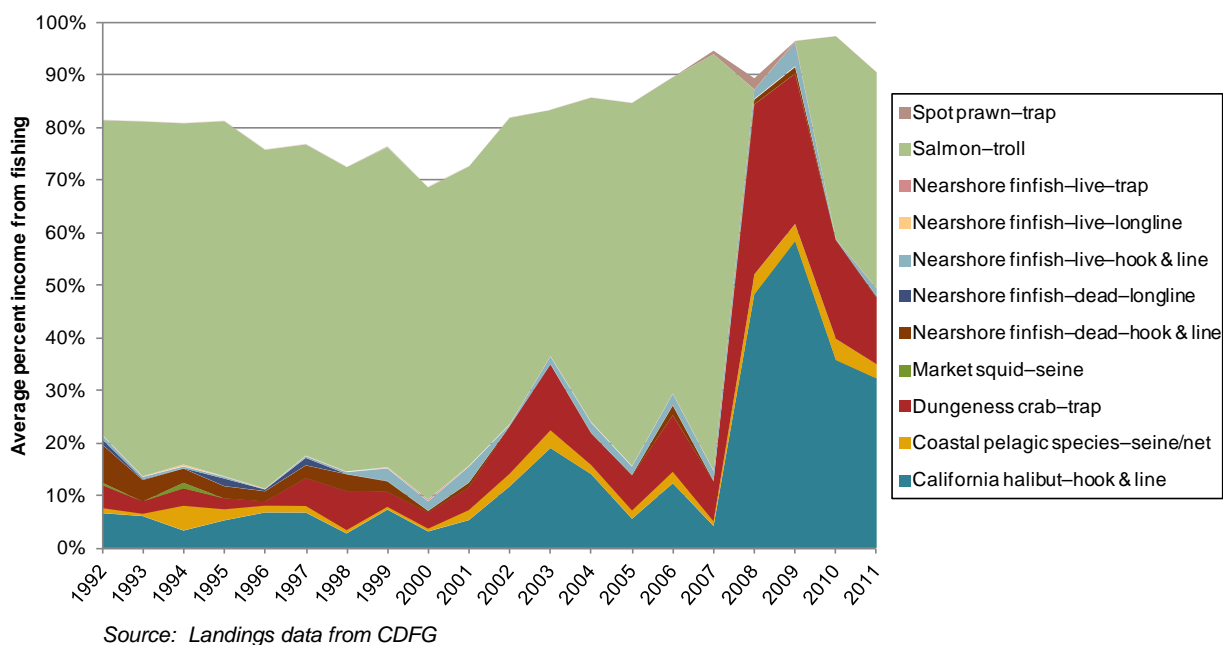


Table 163 displays the percent change in total and average per fishermen ex-vessel revenues for each fishery in the port of Santa Cruz as compared with the respective changes in the Central Coast Region over the study period. Overall, the most significant fisheries in this port were the salmon–troll, Dungeness crab–trap, and California halibut–hook & line fisheries.

Total and average ex-vessel revenues for the salmon–troll fishery in Santa Cruz decreased in each time period examined, and overall by 88.1 percent and 61.8 percent respectively from 2000 to 2011. Conversely, the Dungeness crab–trap fishery in Santa Cruz increased consistently over the study period.

Total Dungeness crab–trap ex-vessel revenues in 2011 were up 749.6 percent from 2000 in Santa Cruz, although this increase was less than observed for the fishery did at the Central Coast Region level over the same time period (864.0 percent). Average Dungeness crab–trap ex-vessel revenues per fishermen in Santa Cruz increased even more (891.2 percent) over the same time period (2000 to 2011) and increased more than observed in Central Coast Region as a whole (623 percent).

In the Santa Cruz California halibut–hook & line fishery, total ex-vessel revenues trends mostly followed Central Coast Region trends, though increased at a slower pace than Central Coast Region ex-vessel revenues did towards the latter part of the study period. Individual ex-vessel revenues per fisherman rose and fell as the number of fishermen participating in the fishery varied in Santa Cruz, however overall the fishery is gaining in ex-vessel revenue over the 2000-2011 study period (see Figure 72 below).

Table 163. Santa Cruz: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011

Percent change

Fishery	Commercial ex-vessel revenue	Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	2000-2011
California halibut–hook & line	Santa Cruz total	133.0%	-61.5%	7.8%	91.8%
	Santa Cruz average per fisherman	29.5%	66.8%	-52.4%	-15.4%
	Central Coast Region total	85.6%	-66.6%	205.2%	103.9%
	Central Coast Region average per fisherman	33.2%	-9.8%	17.8%	23.1%
Coastal pelagic species–seine/net	Santa Cruz total	530.2%	*	*	-55.6%
	Santa Cruz average per fisherman	372.6%	*	*	-55.6%
	Central Coast Region total	-58.8%	139.7%	-59.2%	4.0%
	Central Coast Region average per fisherman	-45.0%	314.0%	-75.0%	-6.0%
Dungeness crab–trap	Santa Cruz total	144.4%	38.0%	142.6%	749.6%
	Santa Cruz average per fisherman	144.4%	49.6%	81.9%	891.2%
	Central Coast Region total	313.7%	189.7%	165.3%	864.0%
	Central Coast Region average per fisherman	175.8%	189.7%	107.3%	623.0%
Nearshore finfish–live–hook & line	Santa Cruz total	-90.0%	*	*	-93.6%
	Santa Cruz average per fisherman	-75.0%	*	*	-78.7%
	Central Coast Region total	-11.3%	24.8%	15.0%	111.4%
	Central Coast Region average per fisherman	14.0%	40.8%	29.8%	298.8%
Salmon–troll	Santa Cruz total	-71.2%	-51.6%	—	-88.1%
	Santa Cruz average per fisherman	-29.0%	-53.7%	—	-61.8%
	Central Coast Region total	-77.9%	-66.4%	—	-88.7%
	Central Coast Region average per fisherman	-51.7%	-57.8%	—	-71.0%

Source: Landings data from CDFG

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates a zero value data point in one of the sample years

Figure 70 displays the average ex-vessel prices over time for the California halibut–hook & line and Dungeness crab–trap fisheries in Santa Cruz over the 1992–2011 study period. The California halibut–hook & line ex-vessel price was \$3.64 per pound on average from 1992–2011, increasing 45 percent from 1992 to 2011. For Dungeness crab–trap, the average ex-vessel price per pound was \$3.03 over the study period, declining 15 percent from 1992 to 2011.

Figure 71 displays landings, ex-vessel revenues, and number of fishermen for the California halibut–hook & line fishery in Santa Cruz over the study period. Landings and ex-vessel revenues rose and fell across 1992–2011, though remained largely consistent, only three pounds less were landed in 2011 than in 1992. The year of 2003 had the greatest landings with 12,600 pounds and \$42,145 in ex-vessel revenues. Although pounds landed were nearly identical in 1992 and 2011, ex-vessel revenues increased by 44.7 percent to \$34,693 in 2011 due to increases in price. The changing number of fishermen largely followed the landings and ex-vessel revenues trends for this fishery.

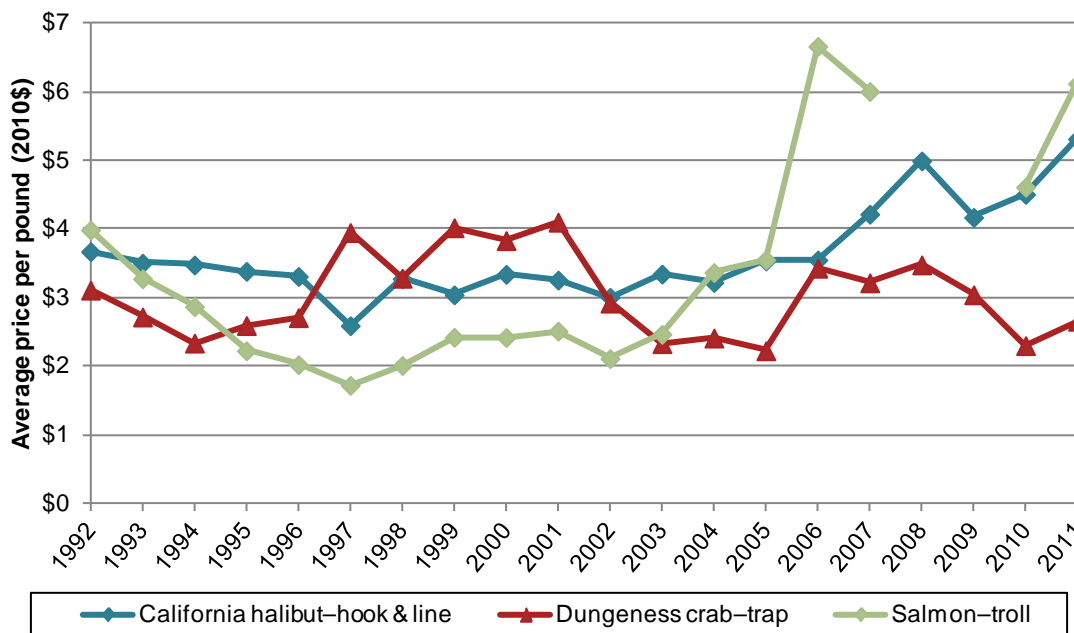
Trends for individual fishermen are presented as averages in Figure 72. The average California halibut–hook & line fisherman in Santa Cruz made five landings over which he landed an annual total of 314 pounds for \$1,137 on average. Although fishermen in 2011 were landing only 2.9 percent more than those in 1992, they were making 49 percent more on average in ex-vessel revenues. Landings per fishermen increased by almost three percent over the study period for this fishery.

Figure 73 displays landings, ex-vessel revenues, and number of fishermen for the Dungeness crab–trap fishery in Santa Cruz over 1992–2011. Landings and ex-vessel revenues rose significantly from 1992–2011, with 25,612 pounds landed and \$79,701 in ex-vessel revenues made in 1992 to 223,217 pounds landed and \$593,384 in ex-vessel revenues made in 2011. Ex-vessel revenues for 2011 were the highest in the study period, despite a 15 percent ex-vessel price decrease per pound since 1992. Even with substantial growth in landings and ex-vessel revenues over the study period, the number of fishermen

declined by 52 percent, which resulted in individual fishermen making approximately 15 times more on average in 2011 than in 1992, see

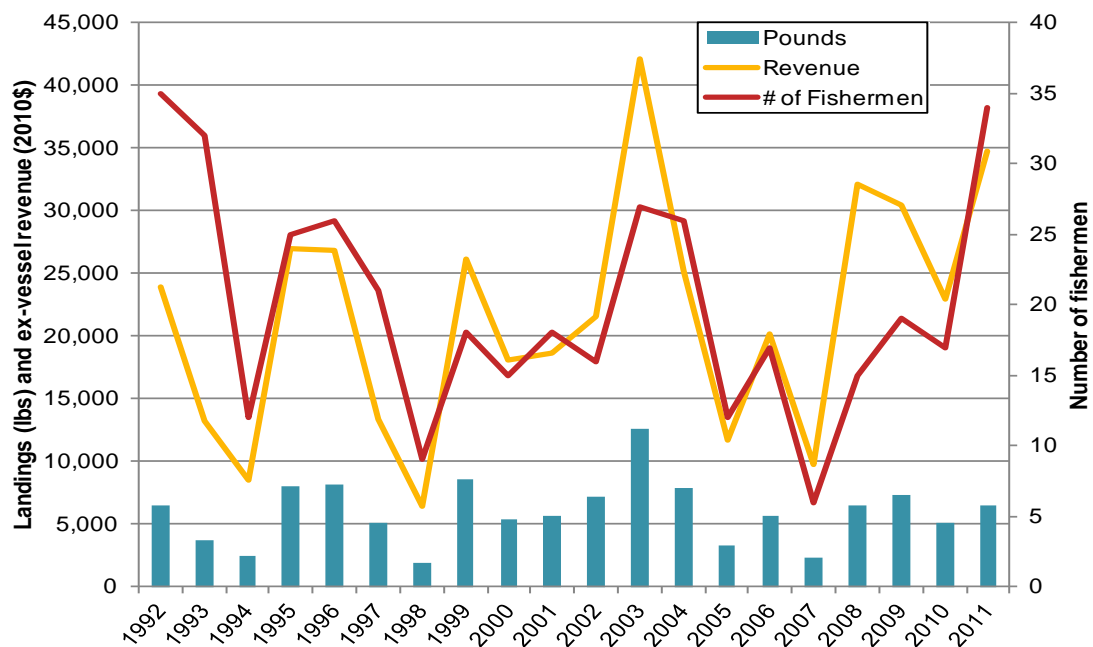
Figure 74. The average Dungeness crab-trap fisherman in Santa Cruz made 14 landings with an annual total of 6,253 pounds landed for \$17,261 in ex-vessel revenue.

Figure 70. Average ex-vessel prices over time, target commercial fisheries, Santa Cruz, 1992–2011



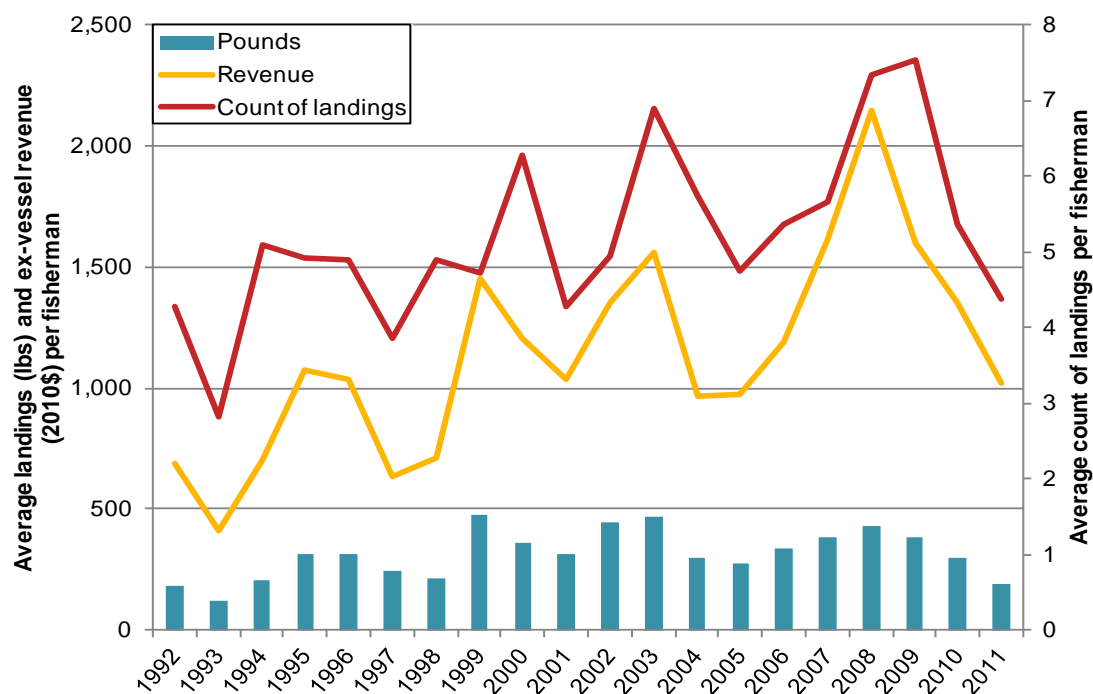
Source: Landings data from CDFG

Figure 71. California halibut–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Santa Cruz, 1992–2011



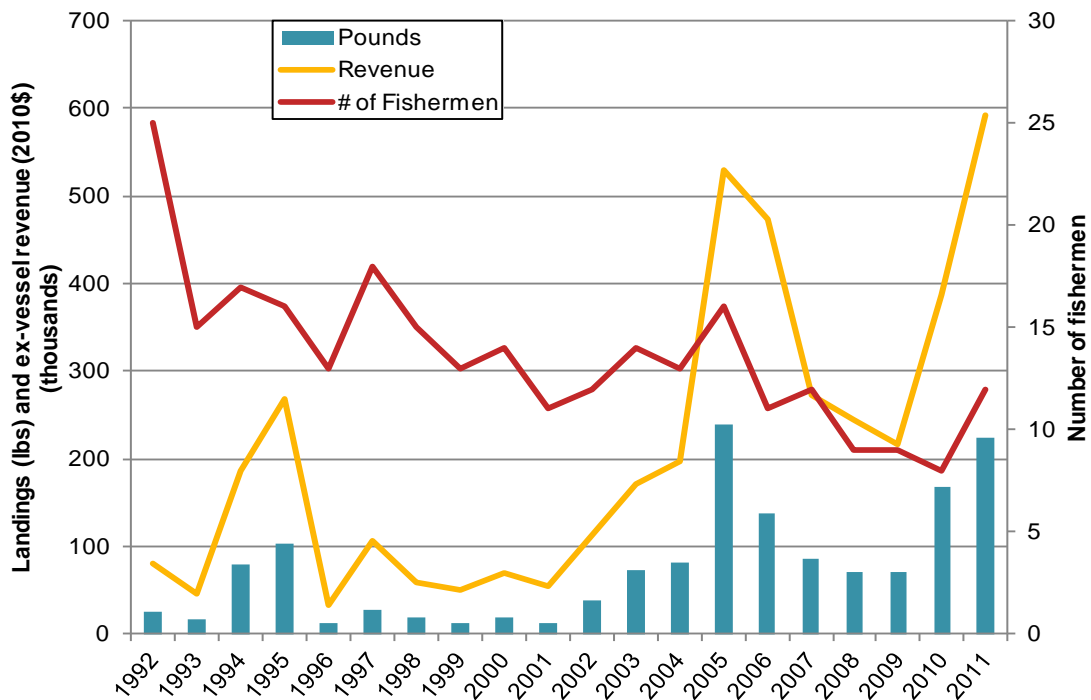
Source: Landings data from CDFG

Figure 72. California halibut–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Santa Cruz, 1992–2011



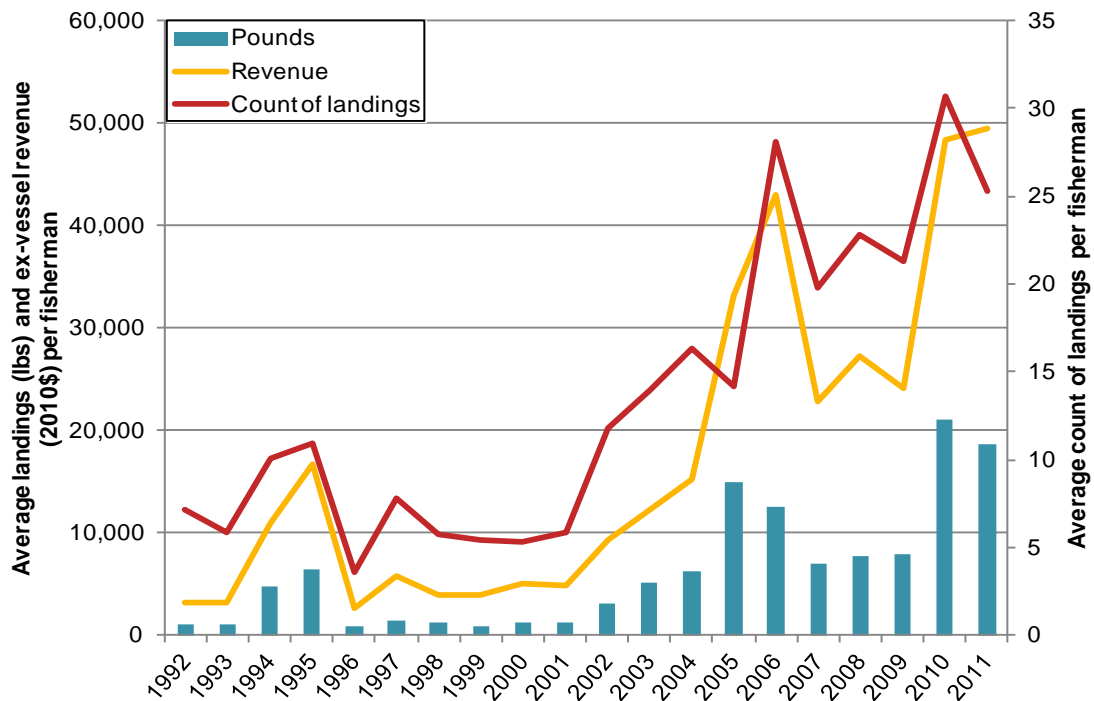
Source: Landings data from CDFG

Figure 73. Dungeness crab-trap: Commercial landings, ex-vessel revenues, and number of fishermen, Santa Cruz, 1992–2011



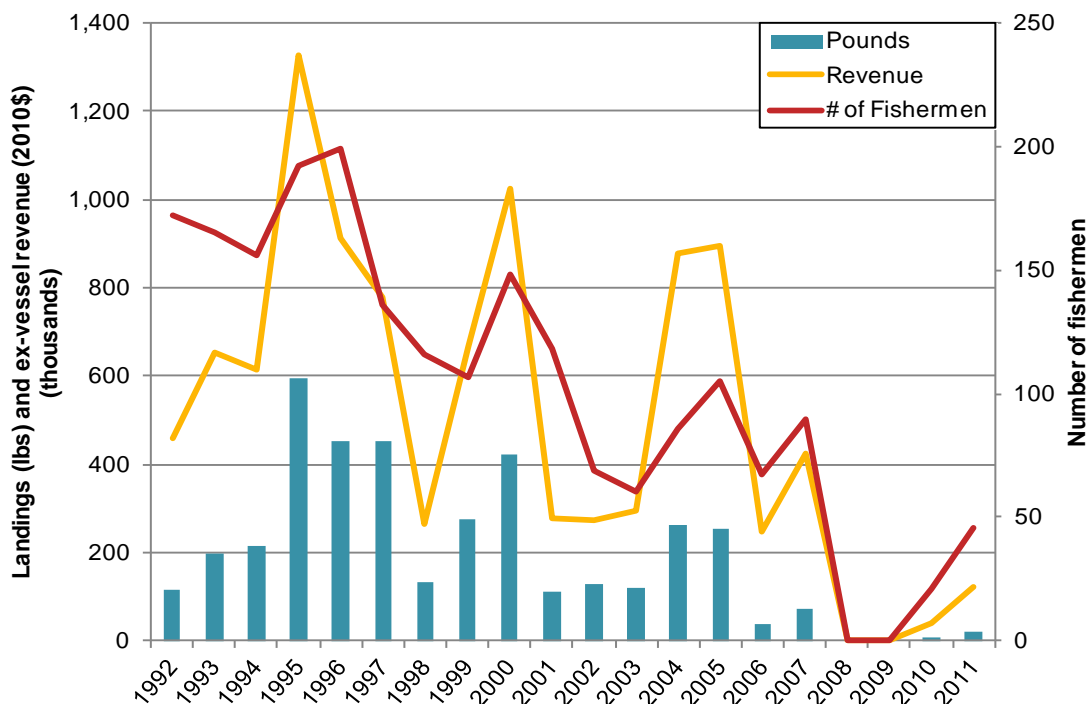
Source: Landings data from CDFG

Figure 74. Dungeness crab-trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Santa Cruz, 1992–2011



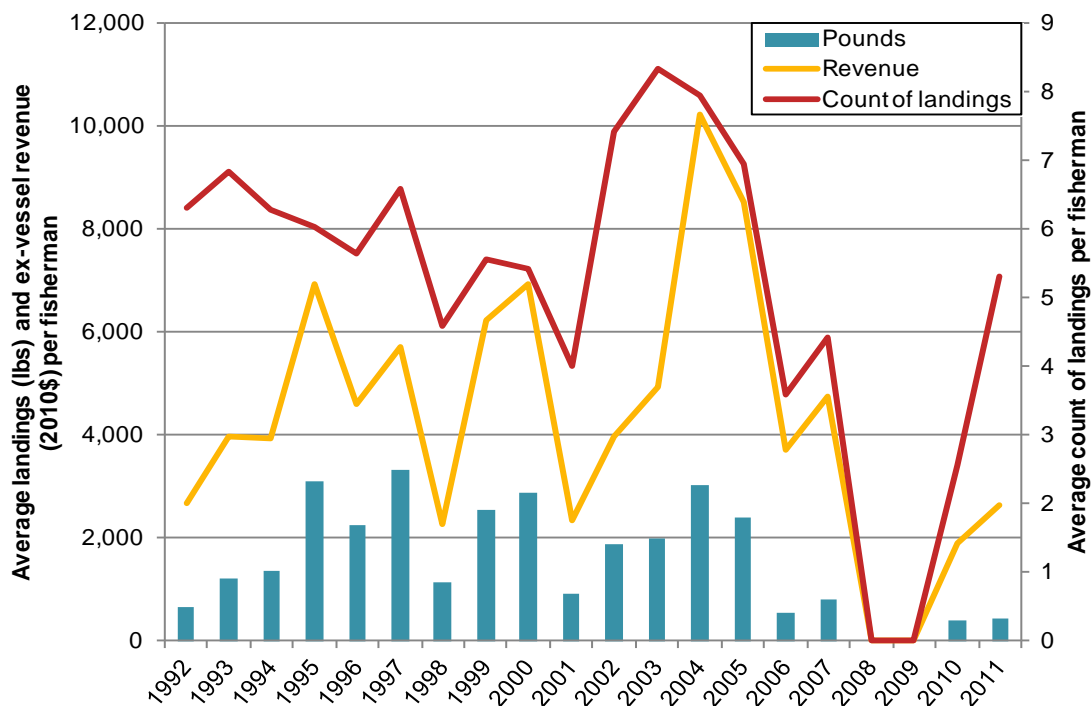
Source: Landings data from CDFG

Figure 75. Salmon–troll: Commercial landings, ex-vessel revenues, and number of fishermen, Santa Cruz, 1992–2011



Source: Landings data from CDFG

Figure 76. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Santa Cruz, 1992–2011



Source: Landings data from CDFG

5.1.2. Santa Cruz Commercial Fisheries Baseline Characterization

In 2011 the Dungeness crab–trap and salmon–troll fisheries had the highest ex-vessel revenue levels of all target fisheries. There are 79 fishermen making landings in Santa Cruz, over half of which land salmon (46 fishermen).

Table 164. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Santa Cruz

Fishery	2011 Landings revenue (2010\$)	Total number of individuals in 2011 landings revenue	Number interviewed
California halibut–hook & line	\$34,693	34	3
Coastal pelagic species–seine/net	\$1,616	3	—
Dungeness crab–trap	\$593,384	12	3
Market squid–seine	—	—	—
Nearshore finfish–live–hook & line	\$1,579	3	1
Nearshore finfish–live – longline	—	—	—
Nearshore finfish–live–trap	—	—	—
Nearshore finfish–live	\$1,579	3	1
Salmon–troll	\$121,982	46	6
Spot prawn–trap	—	—	—
All target fisheries		79	6

Source: California Department of Fish and Game, Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

All six of the individuals we interviewed from Santa Cruz participated in the salmon–troll fishery, making Santa Cruz the highest responding port for that fishery. Many individuals indicated in conversations that Santa Cruz is primarily a salmon and Dungeness crab port. The average fisherman that we interviewed in Santa Cruz is 56.7 years old and has 27.5 years of fishing experience. On average the California halibut–hook & line fishermen were younger than both the Dungeness crab–trap and salmon–troll fishermen.

Table 165. Average age and years experience commercial fishing, Santa Cruz

Fisheries	Individuals interviewed	Age		Years experience	
		Average	Standard deviation	Average	Standard deviation
California halibut–hook & line	3	47.7	7.1	25.7	13.1
Coastal pelagic species–seine/net	—	—	—	—	—
Dungeness crab–trap	3	58.7	11.9	26.0	9.6
Market squid–seine	—	—	—	—	—
Nearshore finfish–live	1	*	*	*	*
Salmon–troll	6	56.7	12.3	27.5	11.8
Spot prawn–trap	—	—	—	—	—
All target fisheries (unique individuals)	6	56.7	12.3	27.5	11.8

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked to estimate the percent of their personal income that came from commercial fishing for the years 2006 and 2011. In the table below (Table 166), percent change was calculated after the interview was completed. Most fishermen in Santa Cruz reported a decrease in percent of total income derived from commercial over between 2006 and 2011. The decrease was most significant in the salmon–troll fishery. Dungeness crab–trap was the only fishery that did not report a decrease, and instead averages in percent of total income from commercial fishing stayed the same.

Table 166. Percent change in income from overall commercial fishing, from 2006 – 2011, Santa Cruz

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut–hook & line	70.0%	26.5%	66.7%	28.9%	-5.6%	9.6%
Coastal pelagic species–seine/net	—	—	—	—	—	—
Dungeness crab–trap	91.7%	14.4%	91.7%	14.4%	—	—
Market squid–seine	—	—	—	—	—	—
Nearshore finfish–live	*	*	*	*	*	*
Salmon–troll	69.2%	28.0%	64.2%	34.7%	-13.9%	26.7%
Spot prawn–trap	—	—	—	—	—	—
All target fisheries (unique individuals)	69.2%	28.0%	64.2%	34.7%	-13.9%	26.7%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

After reporting the percent of their income from commercial fishing for 2006 and 2011, fishermen who reported a change were asked to describe factors to which they attributed this change. This was posed as an open-ended question and respondents were encouraged to speak freely as the interviewer took notes on key aspects that were mentioned. After the interview, the notes were coded and summarized into the categories which are shown below. In Santa Cruz respondents indicated that the percent of total income from commercial fishing had decreased since 2011 due to finding an additional job, intensifying fishing efforts, and increased regulation.

Table 167. Cause of change in percent income from commercial fishing from 2006–2011, Santa Cruz

Response	Number responding	
	California halibut – hook & line	Salmon – troll
Increased regulation	1	1
Intensified fishing efforts	1	1
Had additional job or source of income	—	—
Found additional job or source of income	—	1
Change in fish abundance	—	—
Total number responding	1	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Skilled labor such as construction was the primary source of additional income for fishermen in both the California halibut–hook & line and salmon–troll fisheries in Santa Cruz.

Table 168. Other sources of income other than commercial fishing in 2011, Santa Cruz

Response	California halibut–hook & line	Salmon–troll
Skilled labor	2	2
Investments/retirement/social security	—	1
Business/office work	1	1
Other maritime occupation	—	—
Total number responding	2	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Across all fisheries respondents reported an increase in operating costs between 2006 and 2011. Respondents were asked what percent of their total gross economic revenue (GER) from commercial fishing was spent on their overall operating costs across all his/her fisheries. Percent change between 2006 and 2011 was calculated after the interview.

Operating costs for fishermen in the California halibut–hook & line and Dungeness crab–trap fisheries increased more than in the salmon–troll fishery. However, these increases in overall commercial fishing operating costs were lower than the average increase reported for fishermen in same fisheries across the region. These percent changes in overall operating costs at the region level are: California halibut–hook & line (23.8 percent), Dungeness crab–trap (13.3 percent), and salmon–troll (16.8 percent).

Table 169. Percent change in overall commercial fishing operating costs from 2006–2011, Santa Cruz

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut – hook & line	43.3%	40.4%	46.7%	37.9%	11.1%	15.7%
Coastal pelagic species – seine/net	—	—	—	—	—	—
Dungeness crab – trap	46.7%	25.2%	50.0%	20.0%	11.1%	15.7%
Market squid – seine	—	—	—	—	—	—
Nearshore finfish – live	*	*	*	*	*	*
Salmon – troll	44.2%	31.1%	45.8%	29.7%	5.5%	12.4%
Spot prawn – trap	—	—	—	—	—	—
All target fisheries (unique individuals)	52.1%	30.3%	54.7%	27.7%	8.6%	14.8%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

The most commonly cited reason for changes in operating costs was that overall fishing income had decreased, followed by an increase in fishing expenses. Individuals mentioned that fuel and slip costs had increased and having to transit through closed MPAs often caused them to expend more fuel (Table 170).

Table 170. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Santa Cruz

Response	Number responding			
	California halibut–hook & line	Dungeness crab–trap	Nearshore finfish–live	Salmon–troll
Large capital investment	—	—	—	—
Decrease in fishing income	1	1	1	1
Decrease in fishing grounds	—	—	—	—
Increase in fishing expenses	—	1	—	1
Fishing less in 2006	—	—	—	—
Fishing less in 2011	—	—	—	—
Total number responding	1	2	1	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

California halibut–hook & line fishermen interviewed in Santa Cruz have an average of 28.7 years experience in the California halibut–hook & line fishery, nearly ten years more than the average California halibut–hook & line fishermen interviewed across the region (19.2 years). All three target fisheries in the table below indicated percentages more than Central Coast Region averages of percent gross economic revenue (GER) that goes towards fuel. These average percentages of GER used for fuel are: California halibut–hook & line (12.4 percent), Dungeness crab–trap (23.6 percent), and salmon–troll (18.6 percent).

Table 171. Additional commercial fishery specific data, Santa Cruz

Fisheries	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut–hook & line	28.7	11.8	—	—	—	—	15.0%	5.0
Coastal pelagic species–seine/net	—	—	—	—	—	—	—	—
Dungeness crab–trap	15.7	21.2	1.3	1.2	23.3%	25.2	33.0%	n/a
Market squid–seine	—	—	—	—	—	—	—	—
Nearshore finfish–live	*	*	*	*	*	*	*	*
Salmon–troll	25.5	15.0	0.3	0.5	2.5%	6.1	24.4%	17.5
Spot prawn–trap	—	—	—	—	—	—	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

n/a indicates standard deviation could not be calculated because only person responded to the question

Additionally, for each fishery they participated in fishermen were asked if they had added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. If they had answered yes to any of these questions, they were additionally asked an open-ended question as to why added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. These questions were asked to investigate if fishermen have entered fisheries to diversify their fishing portfolio or if they had left fisheries and the factors driving those decisions. Furthermore, some fishermen may not drop a fishery entirely and

participate in the fishery on and off across the years. If this was the case we also sought to investigate the reasoning behind this situation such as fishery closures or regulatory complications. Most fishermen fell into the 'none of the above' category, which is not shown in the table below, but makes up the remainder of the reported percentages.

Two salmon-troll and one Dungeness crab-trap fishermen did not fish their respective fisheries in 2011 and one additional Dungeness crab-trap fishermen reported adding this fishery since 2006 (Table 172). The individual who added Dungeness crab-trap noted that he did so in order to diversify his fishing portfolio (Table 173).

Table 172. Commercial fisheries added/dropped since 2006 or not fished in 2011, Santa Cruz

Fisheries	Number responding	Added	Dropped	Not fished in 2011
California halibut-hook & line	3	—	—	—
Coastal pelagic species-seine/net	—	—	—	—
Dungeness crab-trap	3	33.3%	—	33.3%
Market squid-seine	—	—	—	—
Nearshore finfish-live	1	*	*	*
Salmon-troll	6	—	—	33.3%
Spot prawn-trap	—	—	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Table 173. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Santa Cruz

Responses	Dungeness crab-trap
Started commercial fishing	—
Change in fish population	—
Diversify fisheries	1
Was able to obtain permit	—
High costs	—
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked for each fishery separately to compare the success of his/her fishery in 2011 to the success of his/her fishery in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 4) somewhat worse; and 5) significantly worse.

Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

Both of the fishermen who had fished Dungeness crab–trap prior to 2011 indicated that the fishery was doing significantly better than years before (as did all Dungeness crab–trap fishermen in the region). As indicated in the table below (Table 174) for California halibut–hook & line and salmon–troll a third of respondents responded in each of the following three categories; somewhat better, the same, and somewhat worse.

Table 174. Overall success in specific commercial fishery compared to previous five years, Santa Cruz

Fisheries	Number responding	Percent response					
		Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
California halibut–hook & line	3	—	—	33.3%	33.3%	33.3%	—
Coastal pelagic species–seine/net	—	—	—	—	—	—	—
Dungeness crab–trap	3	33.3%	66.7%	—	—	—	—
Market squid–seine	—	—	—	—	—	—	—
Nearshore finfish–live	1	*	*	*	*	*	*
Salmon–troll	6	—	—	33.3%	33.3%	33.3%	—
Spot prawn–trap	—	—	—	—	—	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Two of the three California halibut–hook & line fishermen from Santa Cruz mentioned the ban on gill nets and the reduction of the trawl fleet as factors that influenced success in the fishery. Fishermen felt these were helping the fishery and that the gill net ban would help the population recover. Additional regulatory factors influencing success are listed below in Table 175.

Table 175. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz

Response	Number responding			
	California halibut–hook & line	Dungeness crab–trap	Nearshore finfish–live	Salmon–troll
MPA impacts	1	—	*	—
Insufficient monitoring/enforcement/communication of MPAs	—	—	*	—
Trawlers impacting nearshore fleet	1	—	*	—
Quota limit issues	1	—	*	1
Concentration of fishing effort into smaller areas/over-crowding	—	—	*	—
Less competition	—	—	*	—
Inefficiencies in bycatch regulations	—	—	*	—
Inefficiencies/inconsistencies in fishery regulations	1	—	*	—
Inequities in fishery regulations	—	1	*	1
Loss of historical fishery knowledge	—	—	*	—
Inadequate research for policy	—	—	*	—
Inequities in obtaining fishery permits	—	—	*	—
Insufficient regulation on land-based impacts to fisheries	—	—	*	—
Lack of influence on policy/regulation development	—	—	*	—
Insufficient communication of fishery regulations	—	—	*	1
Populations recovering from fishing gear ban	2	—	*	—
Distress around unintended infractions	—	—	*	—
Increased number of fishermen participating in the fishery	—	—	*	—
Increased personal fishing effort	—	—	*	—
Rockfish conservation area (RCA)	1	—	*	1
Total number responding	3	1	*	3

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

In regards to environmental factors that influence the success in specific fisheries, salmon–troll fishermen responded that the port had historically relied on the salmon fishery and that environmental impacts where of great concern. Specifically, erosion and pollutants from agriculture uses in salmon spawning grounds were mentioned. Two respondents commented on the high number of undersized salmon caught last year and the general decline in salmon populations and opportunities to fish salmon in the past five years. Dungeness crab–trap fishermen reported that in 2011 they experienced good weather and an increase in crab abundance and subsequently an increase in catch. They emphasized fishery’s cycle of productivity and that 2011 was one of the highest years of productivity they had seen.

Table 176. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz

Response	Number responding			
	California halibut–hook & line	Dungeness crab– trap	Nearshore finfish–live	Salmon–troll
Increase in bait fish	—	—	—	—
Increase in fish abundance	—	1	—	—
Stable fish abundance	2	—	—	—
Increase in catch	—	1	—	—
Decrease in catch	—	—	—	2
Increase in predators	—	—	—	—
Good weather	—	1	—	—
Biomass of fish largely in MPAs	—	—	—	—
PG&E seismic testing impacts	—	—	—	—
Decrease in habitat or water quality	—	—	—	2
Decrease in fish abundance	—	—	—	—
Change in normal water temp	—	—	—	1
Fish population moved further offshore	—	—	—	1
Decrease in fish size	—	—	—	2
Farmed fish spreading disease	—	—	—	1
Protected species overpopulated	—	—	1	—
Total number responding	2	2	1	3

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Some respondents provided details on economic factors influencing success in their fishery. One individual in the salmon–troll fishery noted that although the price has increase for wild salmon, the market has been flooded with cheaper farmed fish. Other economic factors are shown below in Table 177.

Table 177. Economic changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz

Response	Number responding	
	Dungeness crab–trap	Salmon–troll
Increased number of fishermen participating in the fishery	—	—
Increase in operating costs	—	1
Increase in fish price	—	—
Decrease in fish price	—	—
Market flooded	—	1
Longer season allowed increase in catch	—	—
Increased demand for fish	1	1
Decrease in demand for fish	—	—
Increased personal fishing effort	—	—
Increased number of outside vessels fishing in local grounds	—	—
Lack of port infrastructure	—	—
Increase in travel distance	—	—
Total number responding	1	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

In Table 178 we list additional factors fishermen mentioned that influence success in specific fisheries. These include a general loss of generational fishing knowledge, a lack of value towards fishermen experiential knowledge, and a loss in cultural fishing heritage.

Table 178. Other changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz

Response	Number responding
	California halibut–hook & line
Increase in fishing experience	—
Loss of generational fishing knowledge	1
Fisherman's knowledge not valued	1
Lack of outreach to fishing community	—
Loss of cultural fishing heritage	1
Total number responding	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

5.1.3. Santa Cruz CPFV Fisheries Initial Changes

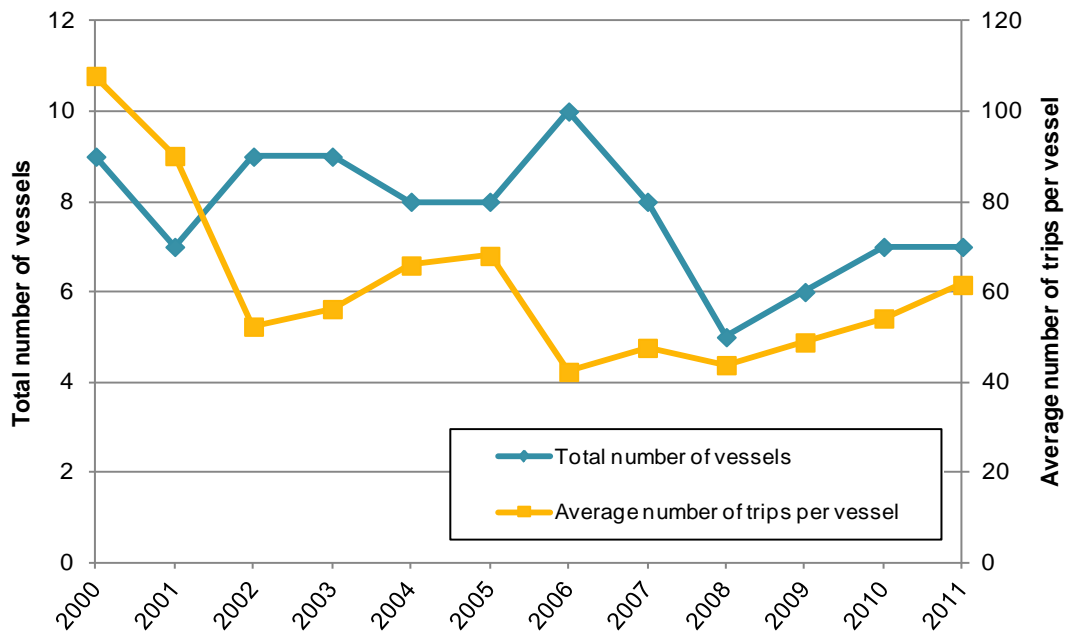
This section provides a summary and analysis of California Department of Fish and Game (CDFG) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the Central Coast Region by CPFV operators from ports outside the Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each species/fishery
6. Total number of trips for multiple species/fishery combo trips
7. Percent change in total number of vessels, trips, and anglers in pre and post MPA periods

CPFV operators are required to complete and submit a log to the CDFG for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Game Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish. For a more detailed description of how CPFV logbook data was utilized in this analysis please see section 4.5.

The number of vessels operating out of Santa Cruz remained relatively stable from 2000 through 2007, and then dropped from 10 vessels to 5 vessels in 2008 (Figure 77). During this same time period, the average number of trips per vessel, the total number of trips (Figure 78), the average number of anglers per vessel (Figure 79) and the total number of anglers dropped sharply twice, resulting in a 77 percent decrease in trips and a 81 percent decrease in anglers over these nine years. During the last three years (2009-2011), all five of these metrics slowly increased, so that the decreases in trips and anglers between 2000 and 2011 were 56 percent and 71 percent, respectively. A slightly different pattern was noted for the average number of anglers per trip (Figure 78). Although this statistic fluctuated, it generally showed a decreasing trend throughout the study period.

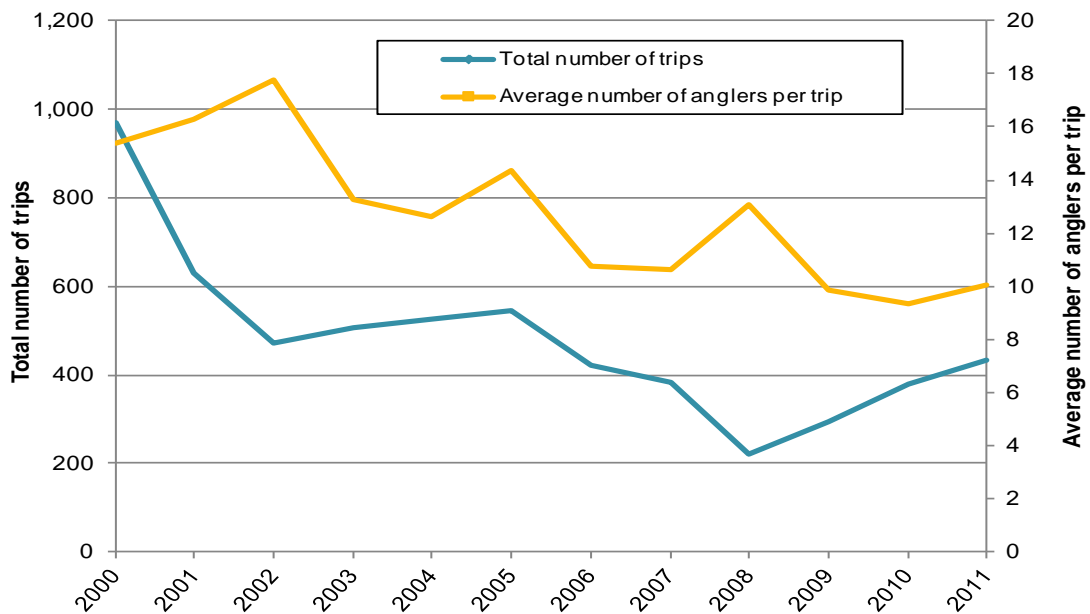
Figure 77. Total number of CPFV vessels and average number of trips per vessel, Santa Cruz, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

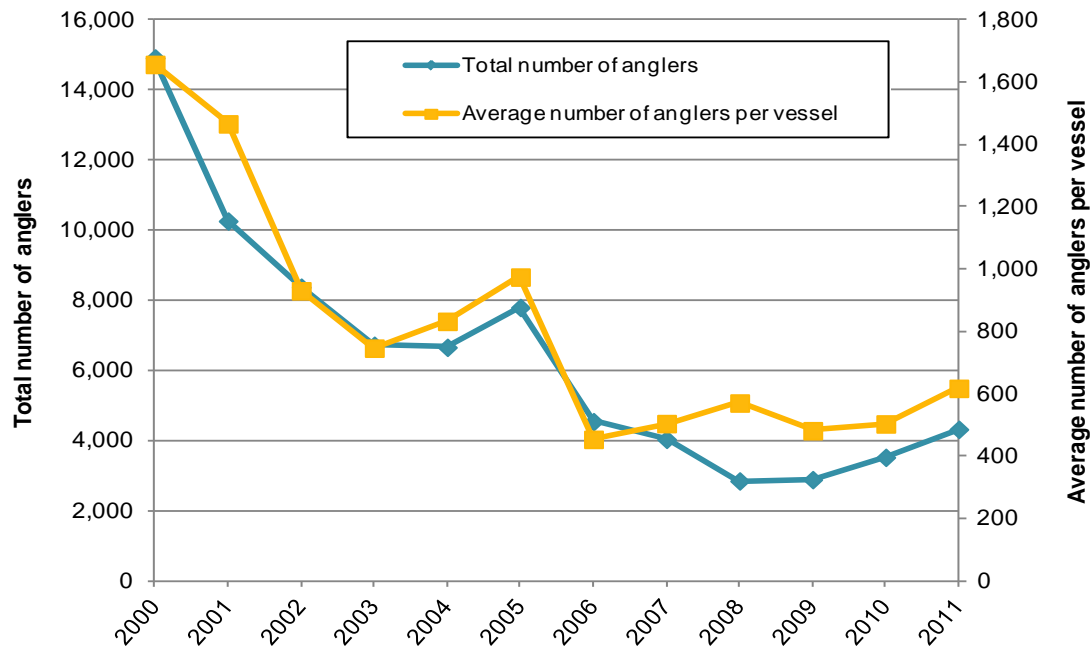
Figure 78. Total number of CPFV trips and average number of anglers per trip, Santa Cruz, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 79. Total number of CPFV anglers and average number of anglers per vessel, Santa Cruz, 2000-2011



Source: CDFG CPFV logbook data

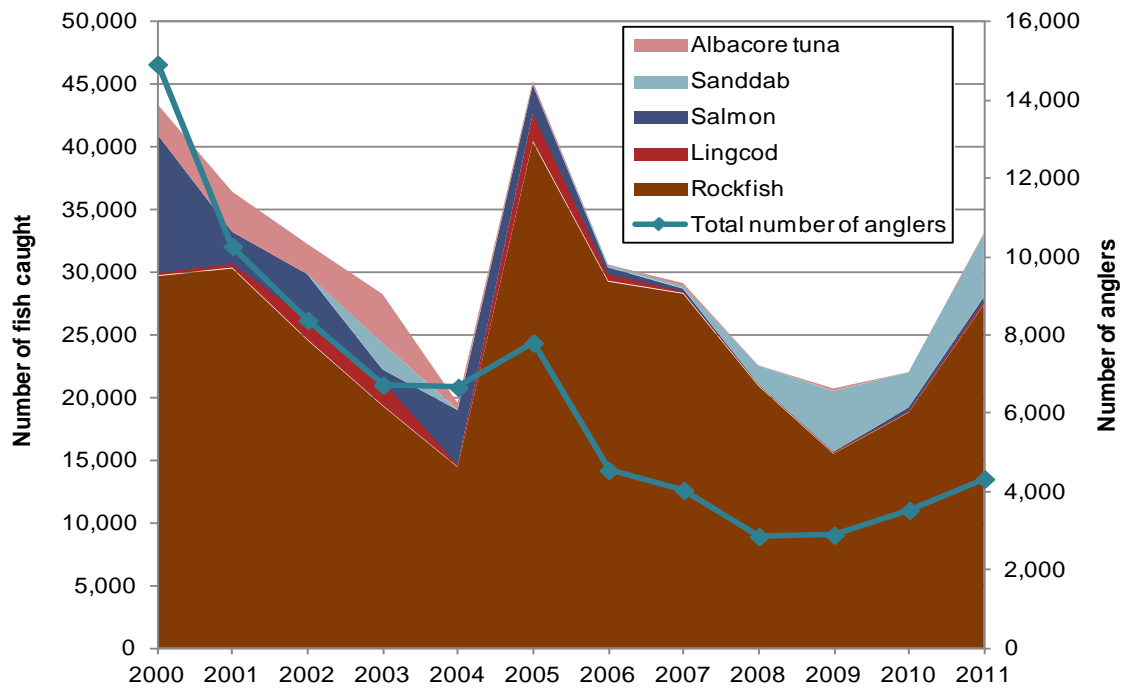
Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Rockfish was consistently the most important component of the catch throughout the entire time period (Figure 80). Other important components of the catch shifted between the earlier and later years. Albacore tuna and salmon were valuable components of the catch in the early part of the 2000s. During the later part of the study period, sanddabs, which showed over a 2000 percent increase in catch between 2007 and 2011, became more predominant. A similar shift was also reflected in the number of trips that kept these species (Figure 81). The number of trips taking albacore tuna decreased to a very low number after 2007. Salmon trips ramped down in the later part of the 2000s with only a small number of these trips observed during the 2008 salmon closures (see discussion below on multiple fisheries). Rockfish trips, and the corresponding rockfish catch, both showed decreases in the early 2000s during a time when major changes were made in rockfish regulations (including time and depth closures). The lowest number of rockfish trips and catch in 2004 was coincident with the most restrictive rockfish regulations during the entire study period (7-month closure with the remaining five months under a depth restriction).

Although the total catch of California halibut represented less than 1 percent of the combined catch from all years, trips with California halibut were a steady component of the overall trips from Santa Cruz. Over 84 percent of the total number of California halibut trips, however, also caught rockfish, and rockfish-halibut trips occurred throughout the entire time period (Figure 82), suggesting that anglers fishing for either of these species/species group (California halibut or rockfish) at times encountered the other species/species group.

Not surprisingly, the number of salmon-rockfish trips showed a decreasing trend through the 2000s (Figure 82). All the “salmon trips” in 2008 also caught rockfish, indicating that these salmon were likely incidental take during rockfish trips. Starting in about 2005, the number of sanddab-rockfish and crab-rockfish trips became much more important. About 47 percent of the sanddab trips between 2005 and 2011 were also sanddab-rockfish trips, and around 80 percent of the crab trips were crab-rockfish trips, suggesting that some rockfish trips also targeted other species such as crab and sanddabs.

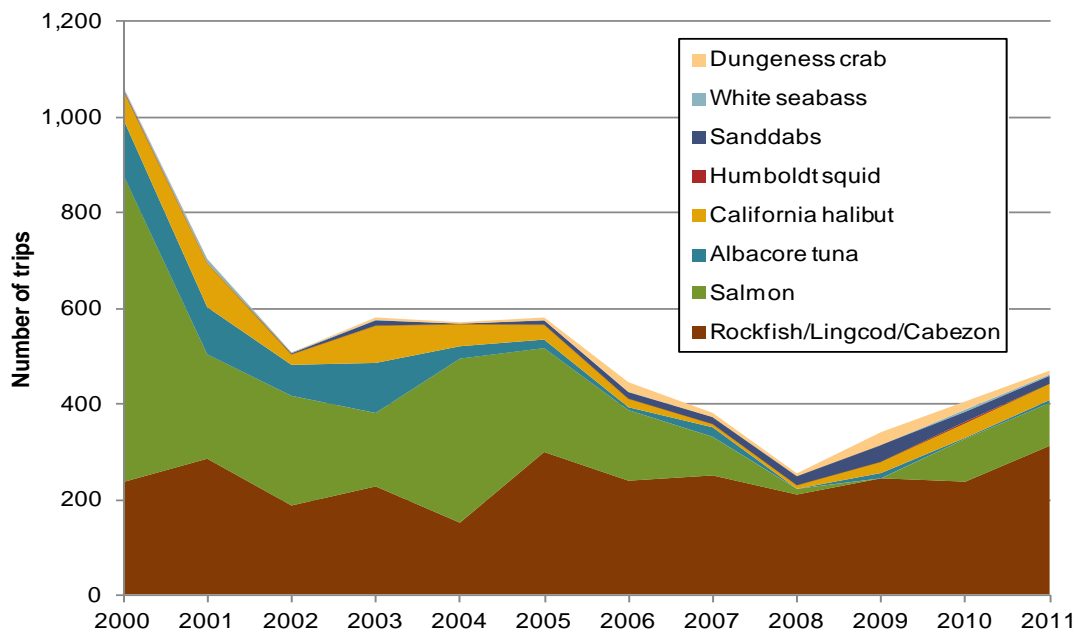
Figure 80. CPFV total number of fish caught for each fishery, Santa Cruz, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

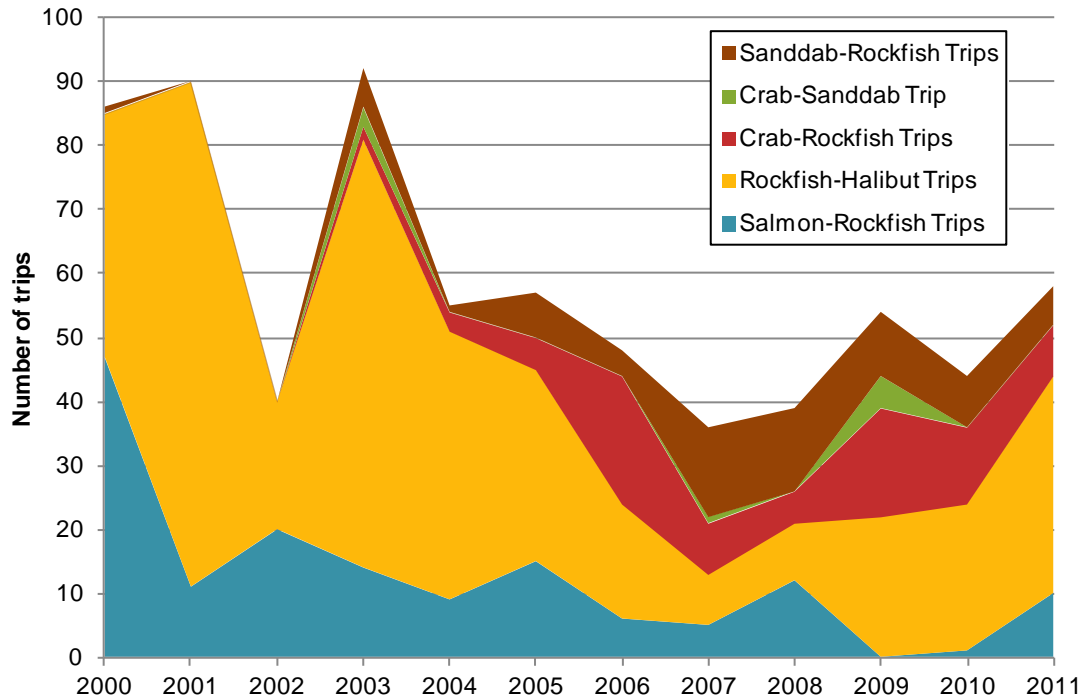
Figure 81. Total number of CPFV trips for each fishery, Santa Cruz, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 82. Count of select multiple species CPFV trips, Santa Cruz, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

5.1.4. Santa Cruz CPFV Fisheries Baseline Characterization

We interviewed four CPFV operators in Santa Cruz, all of which were both owner and operators. These individuals reported having fewer years experience both operating and owning CPFV boats than the overall average in the Central Coast Region. On average respondents experienced a decrease in their average percent income from CPFV operation from 83.3 percent in 2006 to 62.0 percent in 2011. One of the individuals we interviewed was not in operation in 2006.

Table 179. CPFV survey response statistics, Santa Cruz

	Response	Standard deviation
Individuals interviewed	4	—
Hired captain	—	—
Owner and captain	4	—
Owner only	—	—
Average age	46.8	12.2
Average number of years owning CPFV boat/s	12.0	8.9
Average number of years operating CPFV boat/s	14.5	12.6
Average percent income from CPFV operations in 2011	62.0%	42.0%
Number of those interviewed who were operating in 2006	3	—
Average percent income from CPFV operations in 2006	83.3%	20.8%

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

If different percent income from CPFV operations were reported for 2006 and 2011, fishermen were asked an open-ended question to describe factors to which they attributed the change in the percent of total income from CPFV operation. One individual commented that he felt the MPAs led to a negative public opinion of fishing, mentioning that clients believe fish populations are in danger and are either afraid they will harm populations by fishing or are not sure if a trip would yield fish. Some additional factors that influenced income are noted in Table 180.

Table 180. Cause of change in percent income from CPFV operations from 2006 - 2011, Santa Cruz

Response	Number responding
Began business after 2006/wasn't participating	1
Economic decline	—
Increase in regulation	—
Increase in operation cost	—
Decrease in clients	1
Negative public impression of fishing	1
Inability to provide consistent employment	—
Total number responding	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Santa Cruz reported a slightly lower gross economic revenue level than the Central Coast Region average in both 2006 and 2011. Respondents also reported spending a smaller percentage of their gross economic revenue (GER) on crew, fuel, and other costs.

Table 181. Average CPFV gross economic revenue (GER) to operating costs, Santa Cruz

	Average response	Standard deviation
Total GER 2011	\$102,750	\$133,680
% GER to crew	13.3%	6.9%
% GER to fuel	12.0%	2.4%
% GER to other operating costs	30.3%	22.1%
Total GER 2006	\$142,333	\$139,486

Source: Current study

Reasons for changes in the percent of GER used for operating costs between 2006 and 2011 are noted below in Table 182. Again, respondents mentioned the public's negative impressions around fishing and a subsequent decrease in clientele.

Table 182. Cause of change in CPFV gross economic revenue (GER) from 2006 to 2011, Santa Cruz

Response	Number responding
Began business after 2006	1
Economic decline	—
Increase in regulation	—
Decrease in quality of fish	—
Fishing effort condensed	—
Increase in operation cost	—
Decrease in clients	1
Didn't participate in 2006	—
Traveling farther distances	—
Negative public impression of fishing	1
Total number responding	3

Source: Current Study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

As seen in Table 183 consumptive fishing trips in Santa Cruz were slightly more expensive than the Central Coast Region average (\$125) and had slightly fewer passengers per trip (Central Coast Region average was 10.5 passengers), and slightly more trips (Central Coast Region average was 97.3 trips).

Table 183. CPFV trip statistics, Santa Cruz

	Consumptive trips		Non consumptive trips	
	Response	Standard deviation	Response	Standard deviation
Number of people reporting trips	4	—	1	—
Average number of trips per vessel	100.0	60.8	*	*
Average number of passengers(per trip)	8.5	9.0	*	*
Average price per passengers (per trip)	\$164	\$129	*	*
Average number of crew (per trip)	0.5	0.6	*	*

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

CPFV operators in Santa Cruz reported deriving 38.3 percent of their CPFV GER from the rockfish/lingcod fishery, 30.8 percent from salmon, and 19.7 percent from California halibut.

Table 184. CPFV fishery/activity specific data, Santa Cruz

	Fishery/activity	Individuals interviewed	Number of days targeting species (2011)		Percent of GER from fishery/activity (2011)	
			Average	Standard deviation	Average	Standard deviation
Fishery	Albacore tuna	1	*	*	*	*
	California halibut	3	40.0	52.2	19.7%	8.4%
	Dungeness crab	—	—	—	—	—
	Humboldt squid	—	—	—	—	—
	Rockfish/lingcod	3	68.3	27.5	38.3%	10.4%
	Salmon	4	40.8	40.6	30.8%	12.9%
	Sanddab	2	*	*	*	*
	White sea bass	1	*	*	*	*
Activity	Whale watching	1	*	*	*	*
	^Other	—	—	—	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

Fishermen were asked for each fishery/activity separately to compare the success of his/her fishery/activity in 2011 to that in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse.

Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery/activity. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

Fishermen reported that the California halibut fishery was the same or somewhat worse than previous years. For both the rockfish/lingcod and salmon fishery individuals responded somewhat better and somewhat worse (Table 185).

Table 185. Overall success of CPFV fishery/activity compared to past five years, Santa Cruz

		Number responding						
		Number responding	Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	Albacore tuna	2	*	*	*	*	*	*
	California halibut	3	—	—	—	66.7%	33.3%	—
	Dungeness crab	—	—	—	—	—	—	—
	Humboldt squid	—	—	—	—	—	—	—
	Rockfish/lingcod	3	—	—	66.7%	—	33.3%	—
	Salmon	3	—	—	33.3%	—	66.7%	—
	Sanddab	1	*	*	*	*	*	*
	White sea bass	1	*	*	*	*	*	*
Activity	Whale watching	1	*	*	*	*	*	*
	^Other	—	—	—	—	—	—	—
All target fisheries/ activities		14	7.1%	7.1%	28.6%	21.4%	35.7%	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

— indicates that the port/fishery was not sampled or a zero value data point

Respondents listed a variety of regulatory (Table 186), environmental (Table 187), and economic factors that influenced the success of their operation in Santa Cruz (Table 188).

Table 186. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz

Response	Number responding	
	Rockfish/lingcod	Salmon
MPA impacts	—	—
Insufficient monitoring/enforcement/communication of MPAs	1	—
Concentration of fishing effort into smaller areas/over-crowding	—	—
Inefficiencies in bycatch regulations	—	—
Inefficiencies/inconsistencies in fishery regulations	—	—
Inequities in fishery regulations	1	1
Inadequate research for policy	—	—
Distress around unintended infractions	1	1
Rockfish Conservation Area (RCA)	—	—
Total number responding	1	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 187. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz

Number responding

Response	Salmon	Rockfish/ lingcod
Increase in bait fish	—	—
Increase in fish/whale abundance	—	—
Stable fish abundance	—	—
Increase in catch	—	1
Decrease in catch	1	—
Increase in fish size	—	1
Decrease in habitat or water quality	—	—
Decrease in fish size	1	—
Protected species overpopulated	—	1
Total number responding	1	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 188. Economic changes/factors influencing success in specific commercial fishery in previous five years, Santa Cruz

Response	Rockfish/ lingcod	Salmon
Increased regulation forced fishery/activity diversification	—	—
Increase in clients	1	1
Decrease in clients	—	—
Increase in concentrated fishing effort affecting catch size/rate	1	—
General economic decline	—	—
Increased number of fishermen participating in the fishery	—	—
Increase dependence on walk-in business	—	—
Total number responding	2	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

5.2. Moss Landing/Monterey

During the mid 1800s the harbor of Moss Landing was a small scale seaport and whaling station. It wasn't until the 1930s when the sardine fishery gained momentum that Moss Landing was dredged, allowing for larger vessels to enter the harbor. The harbor grew into a processing port, and by 1947 the area had been recognized by the State as Moss Landing Harbor District (Pomeroy et al. 2003). Today, Moss Landing accounts for the largest percentage of landings and revenue out of any other port in the study region. According to fishermen interviewed, coastal pelagic species—seine/net and market squid—seine fishermen will often land their catch in Moss Landing due to the ease of off loading and transport as opposed to the crowded and tourist friendly Monterey area. Many small businesses around the harbor attribute much of their revenue as coming from the commercial fishing industry (Pomeroy. et al., 2003).

Coastal pelagic species—seine/net and market squid—seine are the primary fisheries in the port and ex-vessel revenue from California halibut –hook & line and nearshore finfish—live fisheries are minimal in comparison (see Figure 86). However, Figure 87 depicts how those fisheries, although smaller in overall ex-vessel revenue, are important contributors to the average income profile of an individual fisherman. Indeed, in contrast to its smaller contribution to the port's total ex-vessel revenue (12.6 percent on average from 1992-2011), salmon still comprises the vast majority of the average fisherman's income as seen in Figure 87. Prior to the 1990s CPFV operators in Moss Landing were focused on the rockfish fishery until increasing regulation lead CPFV operators to turn their efforts toward the salmon fishery (Petterson et al. 2010).

Figure 117 shows that the majority of CPFV trips taken between 2002 and 2007 were for salmon. However, Figure 116 shows that rockfish comprise the majority of number of fish caught since 2004. This is in part due to the smaller number of salmon fishermen are allowed to keep in comparison to rockfish (typically ten fish for rockfish and two fish for salmon). Furthermore, as salmon is a migratory fish, chances are higher that some fishing trips do not catch any or few salmon. With the rockfish and salmon fisheries still serving as the foundation for CPFV business (comprising on average 18.3 and 44.3 percent of gross economic revenue respectively) the fleet is increasing their efficiency by taking more anglers per trip as seen in Figure 114. However, as seen in Table 211 to expand income sources CPFV operations in Moss Landing/Monterey are now conducting whale watching trips which account for on average 49.5 percent of CPFV gross economic revenue in Moss Landing and Monterey.

The commercial fishing industry in Monterey was established in the 1800s and grew quickly around the introduction of the railroad to the area in 1880. The area known as The Fisherman's Wharf was bought by the city of Monterey from a private company in 1916. The Municipal Wharf II was constructed by the city in 1926 to accommodate the commercial fishing industry's growth (Petterson et al. 2010). By 1945 Monterey had been established as the sardine capital of the world. At its peak there were 25 canneries in operation, however, in the 1950s sardine fish stocks collapsed and many processors were forced to focus on other wetfish (Petterson et al. 2010). With the continued decline, the last cannery on the infamous Cannery Row closed in 1973. Today, the canneries and the Fisherman's Wharf have been converted to attract tourists. Figure 97 shows that as a whole Monterey is currently landing more pounds than it has since 1997, and is generating more ex-vessel revenue than previously seen in the study period. This current surge in ex-vessel revenue and landings is largely due to the dramatic increase in market squid—seine landings in 2010 and 2011 as seen in Figure 99. The market squid—seine and coastal pelagic species—seine/net fisheries have dominated Monterey landings and ex-vessel revenue profile from 2007 to 2011. The salmon – troll fishery comprises a small portion of Monterey's commercial ex-vessel revenue as shown in Figure 100, however, on average individual fishermen in Monterey have historically depended on salmon for a large portion of their income. Due to salmon fishery closures and shortened seasons over the past 4 years, fishermen have increased their reliance on a variety of other fisheries as seen in Figure 101.

CPFV operators in Monterey have also diversified their sources of income. The rockfish/lingcod fishery were the primary focus of CPFV operators in Monterey, but with increased regulation trips now tend to focus on more than one fishery (Petterson et al. 2010). Figure 122 shows that sanddabs have become the second largest focus of the CPFV fleets in this port over the past 3 years with an average of 15,148

sanddabs caught each year from 2009-2011. As with many other ports, Monterey CPFV operations are also offering whale watching trips. Table 211 illustrates how whale watching trips in Moss Landing/Monterey contributes an average of 49.5 percent of CPFV revenue in 2011. As shown in Figure 120, during the salmon closures in 2008 and 2009 the average number of angler per trip remained relatively consistent, while the number of trips decreased. The number of trips has increased significantly between 2009 and 2010 with a slight decrease in 2011. Figure 121 shows a decrease in total number of anglers since 2004 with a slight increase over the past 2 years. The port of Monterey had 4 CPFV businesses in 1997, running a total of 16 vessels (Pettersen et al. 2010). In 2011 there were 2 CPFV businesses in Monterey that operated a total of 6 vessels.

Due to confidentiality constraints much of the primary data collected for Moss Landing could not be displayed on its own. However, similarities in fishing grounds and fisheries pursued across the commercial and CPFV sectors lead us to combine the ports of Moss Landing and Monterey when presenting non-spatial and spatial data collected. Landings data and CPFV logbook data provided by CDFG are still presented separately for each port.

5.2.1. Moss Landing/Monterey Commercial Fisheries Initial Changes

Moss Landing

Of all study ports, Moss Landing contributed the largest portion of total landings and ex-vessel revenue to the Central Coast Region over the study period, an average of 65.1 and 41.3 percent respectively. Unlike most other ports, Moss Landing's landings increased overall in the beginning part of the study period, and later decreased consistently beginning in 2007. Landings peaked in 2007 at 96.2 million pounds; ex-vessel revenues peaked ten years earlier in 1997 at \$11.8 million. The number of fishermen decreased by 62.5 percent from 1992 to 2011, though began increasing at the end of the study period. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

Figure 84 displays what percentage the eleven fisheries of interest represented of total landings and ex-vessel revenues made in the port over the study period. For every year except 1993, the fisheries of interest constituted over 50 percent of total landings, reaching 97.1 percent in 2011. In Moss Landing, the groundfish–bottom trawl and sablefish–longline fisheries both contributed approximately 7.4 percent of total ex-vessel revenues in the port. Groundfish–bottom trawl ex-vessel revenues peaked in 1995 in Moss Landing at \$1.3 million, or 15.5 percent of total ex-vessel revenues. In 1996, the sablefish-longline fishery alone constituted 20.5 percent of total ex-vessel revenues in Moss Landing, at \$1.4 million. Additionally, the Albacore tuna–troll fishery constituted 19.5 percent of total ex-vessel revenues in Moss Landing at \$2.3 million in 1997; over the entire study period, this fishery averaged 3.4 percent of total ex-vessel revenues. The swordfish fishery additionally contributed sizeable ex-vessel revenues in this port in both 1992 and 1998.

Figure 85 and Figure 86 display the composition of landings and ex-vessel revenues for select fisheries of interest over 1992 to 2011⁵. For both figures, the coastal pelagic species–seine/net, market squid–seine, and salmon–troll fisheries dominated total landings and ex-vessel revenues over the study period. The coastal pelagic species–seine/net fishery constituted 60.9 percent of total landings and 22.1 percent of total ex-vessel revenues in Moss Landing over the study period. In years where market squid–seine was available, fishermen capitalized on it, for example in 1994 when landings were 66.4 percent of total landings, and again in 2010 when that fishery's ex-vessel revenues were 73.3 percent of total fishery of interest ex-vessel revenues for Moss Landing.

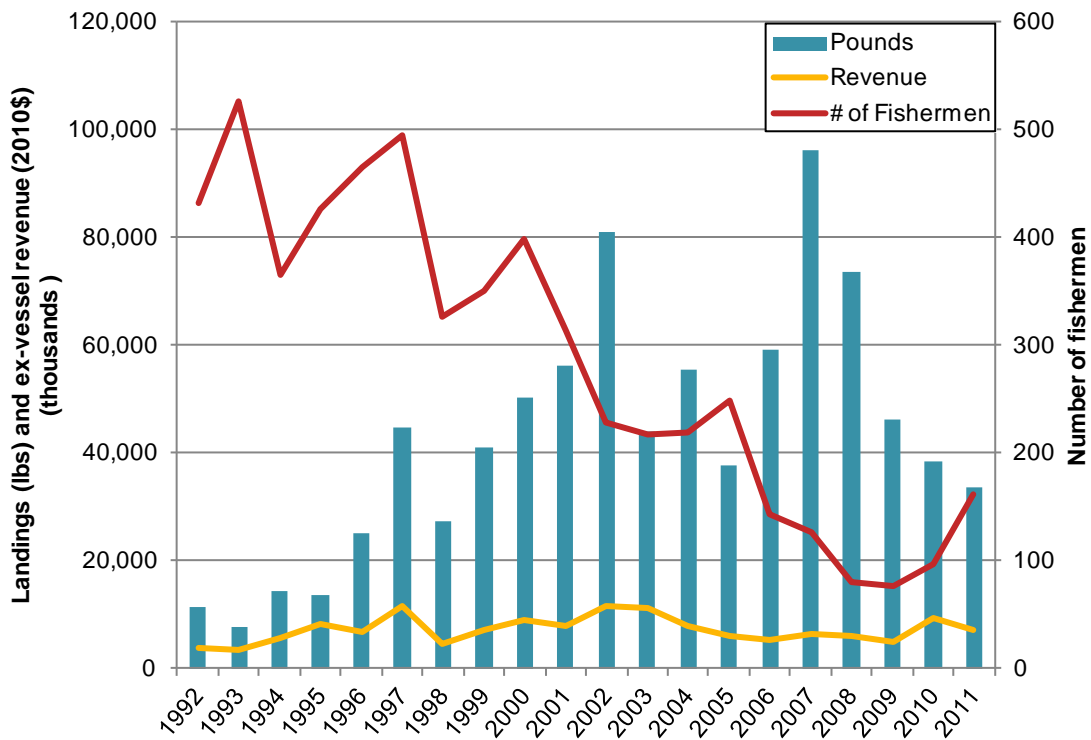
Figure 87 displays the average percent fishing income by fishery in Moss Landing for the eleven fisheries of interest. This figure displays changes in how much fishermen rely upon ex-vessel revenue from specific fisheries of interests relative to other fisheries of interest.⁶ For Moss Landing, Figure 87 illustrates the

⁵ Fisheries of interest were selected for display for compositional landings and ex-vessel revenue figures only if they constituted the top 95 percent of combined landings and ex-vessel revenues for all eleven fisheries of interest in the port over the study period on average. The remaining fisheries that were not selected for display likely wouldn't be visible on the compositional figures had they been included.

⁶ For more information on this figure, please see section 4.1.1.

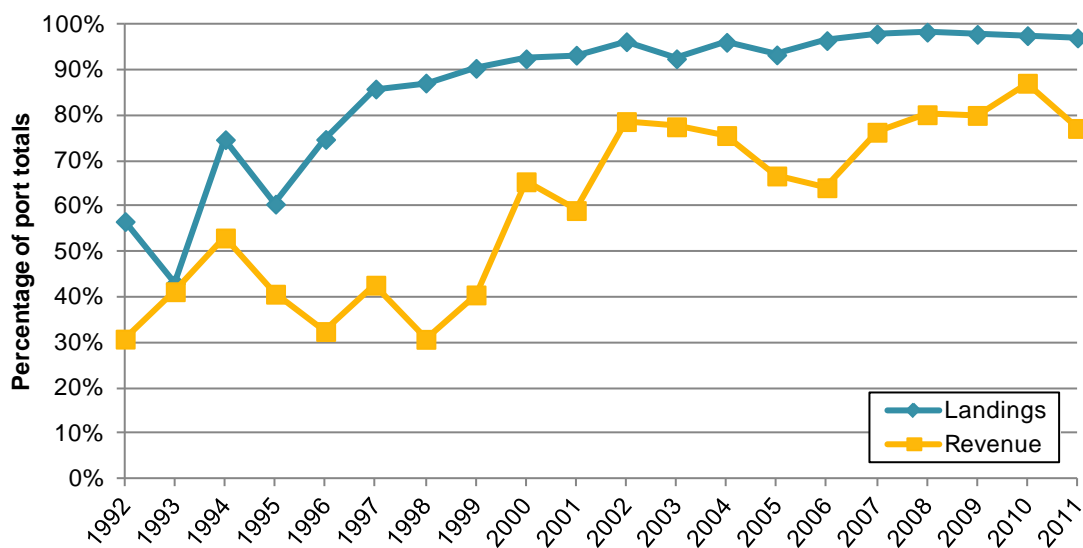
adaptability of fishermen to substitute income from other fisheries during the closed salmon fishery seasons of 2008 and 2009.

Figure 83. Moss Landing total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011



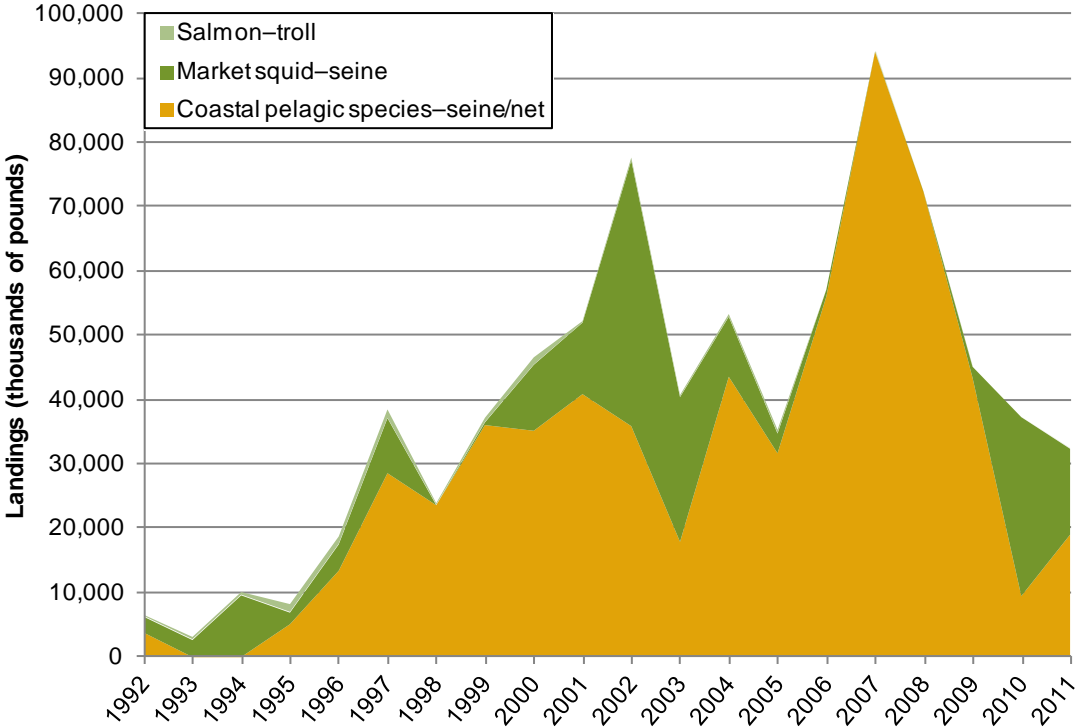
Source: Landings data from CDFG

Figure 84. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Moss Landing, 1992–2011



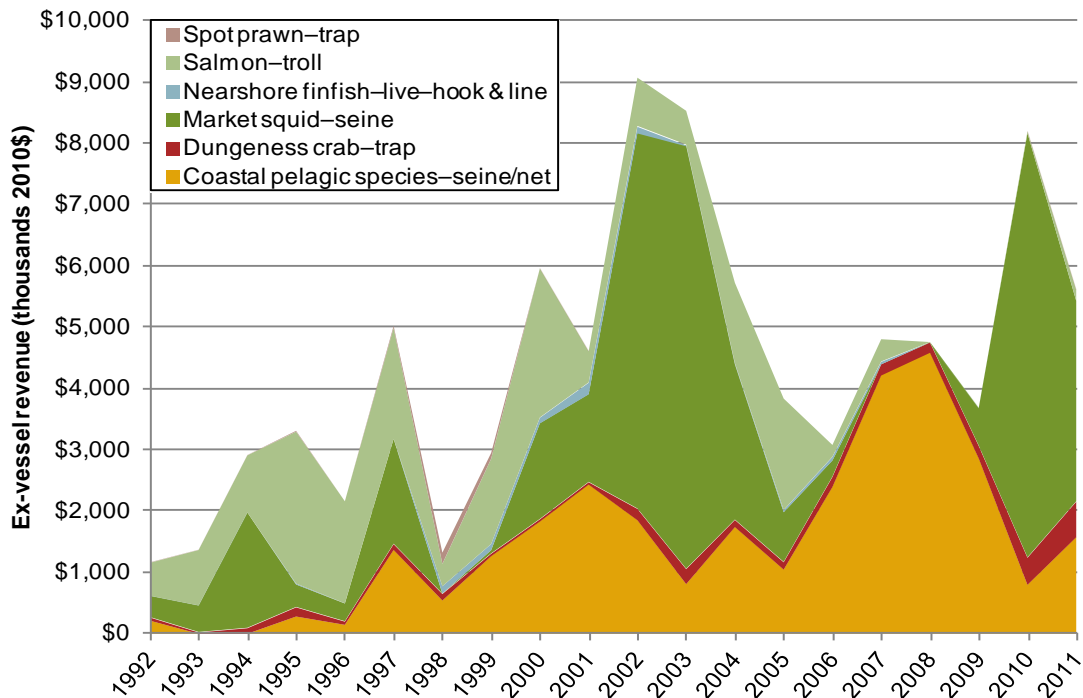
Source: Landings data from CDFG

Figure 85. Moss Landing commercial landings for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

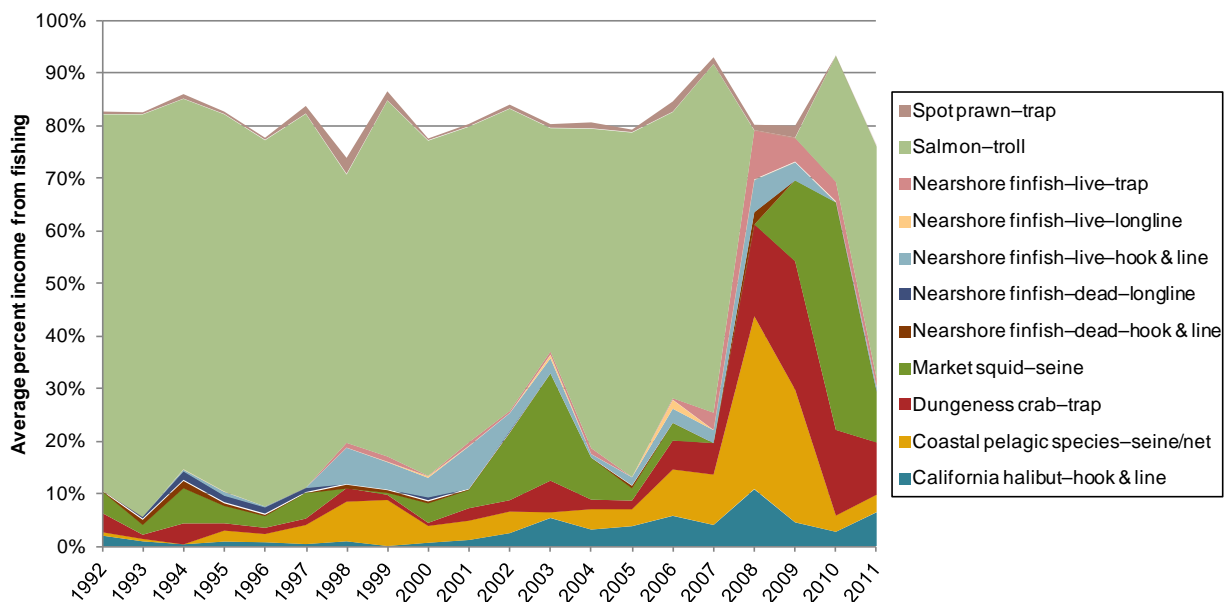
Figure 86. Moss Landing commercial ex-vessel revenues for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

Figure 87. Average percent of individual fishing income from commercial fisheries of interest, Moss Landing, 1992–2011



Source: Landings data from CDFG

Table 189 displays the percent change in total and average per fishermen ex-vessel revenues for each fishery in the port of Moss Landing as compared with the respective changes in the Central Coast Region over the study period. The most significant fisheries of interest in Moss Landing were the coastal pelagic species–seine/net, market squid–seine, salmon–troll, and Dungeness crab–trap fisheries.

Although total ex-vessel revenues of the coastal pelagic species–seine/net fishery increased over the study period in Moss Landing, in 2011 they were 13.9 less than they were in 2000. In the Central Coast Region, coastal pelagic species–seine/net ex-vessel revenues increased by four percent over the same time period—this was largely due to increased revenues in the port of Monterey despite the dominance of Moss Landing in this fishery in the region. Average ex-vessel revenues per fisherman increased significantly between 2004 to 2007, by 335.7 percent in Moss Landing, before decreasing again thereafter at the end of the study period.

It is difficult to characterize changes in the market squid–seine fishery over distinct time periods due to high variability of the availability of this fishery due primarily to environmental conditions.

Trends in the salmon–troll fishery in Moss Landing largely followed those observed in the Central Coast Region as a whole, decreasing 92.7 percent in total ex-vessel revenues from 2000 to 2011, and decreasing 71.7 percent per fisherman over the same time period. On average, the Dungeness crab–trap fishery experienced huge increases year to year in the Central Coast Region, but increased at a faster pace in Moss Landing especially. The Dungeness crab–trap fishery increased from total ex-vessel revenues of \$37,102 in 2000 in Moss Landing to \$578,512 by 2011, or 1,459.3 percent. Average ex-vessel revenues per fisherman did not increase as much simply because there were larger numbers of participating fishermen in 2011 (20 fishermen) than in 2000 (7 fishermen), but still increased a significant amount (445.7 percent).

Table 189. Moss Landing: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011

	Percent change
--	----------------

Fishery	Commercial ex-vessel revenues	Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	2000-2011
Coastal pelagic species—seine/net	Moss Landing total	-55.7%	142.1%	-65.7%	-13.9%
	Moss Landing average per fisherman	-39.1%	335.7%	-65.7%	11.4%
	Central Coast Region total	-58.8%	139.7%	-59.2%	4.0%
	Central Coast Region average per fisherman	-45.0%	314.0%	-75.0%	-6.0%
Dungeness crab—trap	Moss Landing total	556.7%	58.8%	243.2%	1459.3%
	Moss Landing average per fisherman	253.6%	76.4%	71.6%	445.7%
	Central Coast Region total	313.7%	189.7%	165.3%	864.0%
	Central Coast Region average per fisherman	175.8%	189.7%	107.3%	623.0%
Market squid—seine	Moss Landing total	342.1%	—	—	109.3%
	Moss Landing average per fisherman	126.4%	—	—	119.8%
	Central Coast Region total	314.6%	-99.8%	*	217.7%
	Central Coast Region average per fisherman	115.3%	-98.4%	*	114.4%
Nearshore finfish—live—hook & line	Moss Landing total	-85.1%	161.7%	*	-98.8%
	Moss Landing average per fisherman	-57.6%	236.4%	*	-85.9%
	Central Coast Region total	-11.3%	24.8%	15.0%	111.4%
	Central Coast Region average per fisherman	14.0%	40.8%	29.8%	298.8%
Salmon—troll	Moss Landing total	-77.4%	-72.4%	—	-92.7%
	Moss Landing average per fisherman	-32.1%	-50.8%	—	-71.7%
	Central Coast Region total	-77.9%	-66.4%	—	-88.7%
	Central Coast Region average per fisherman	-51.7%	-57.8%	—	-71.0%
Spot prawn—trap	Moss Landing total	*	*	—	—
	Moss Landing average per fisherman	*	*	—	—
	Central Coast Region total	101.8%	-8.8%	280.8%	423.9%
	Central Coast Region average per fisherman	101.8%	-29.1%	280.8%	423.9%

Source: Landings data from CDFG

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates a zero value data point in one of the sample years

Figure 88 displays the average ex-vessel prices over time for four select fisheries. Over the study period, the average ex-vessel prices per pound for the Dungeness crab—trap and nearshore finfish—live—trap fisheries were \$2.85 and \$6.79 respectively. The market squid—seine and coastal pelagic species—seine/net fisheries had average ex-vessel prices of \$448.28 and \$114.98 per metric ton. While the Dungeness crab—trap fishery ex-vessel price decreased 11.7 percent from 1992 to 2011, all other fisheries experienced an increase: market squid—seine at 74.7 percent, coastal pelagic species—seine/net at 46.5 percent, and nearshore finfish—live—trap at 17.2 percent.

Figure 89 displays landings, ex-vessel revenues, and number of fishermen for the coastal pelagic species—seine/net fishery in Moss Landing over the study period. Landings and ex-vessel revenues rose overall across 1992–2011, landings peaking in 2007 at 94.1 million pounds. Ex-vessel revenues peaked the following year in 2008 at \$4.6 million despite lower landings amounts, due to a 41.8 percent increase in the average ex-vessel price per metric ton that year. The number of fishermen in this fishery, unlike most, increased from 1992 to 2011, from 5 to 17, peaking in 1999 at 25 fishermen.

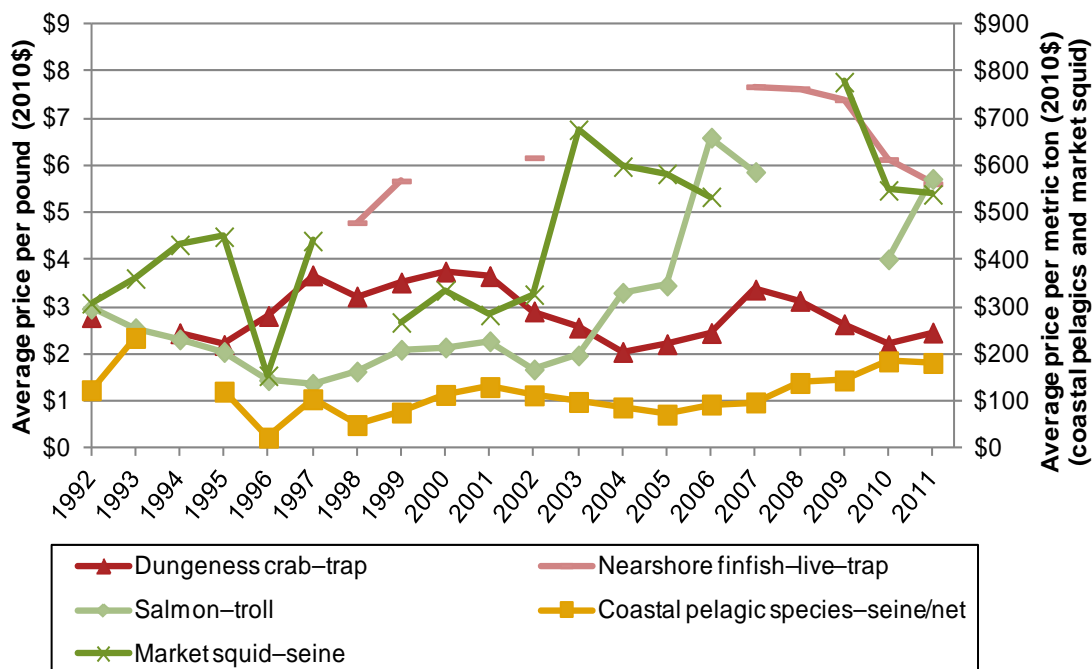
Trends for individual fishermen are presented as averages in Figure 90. The average coastal pelagic species—seine/net fisherman in Moss Landing made a total of 22 landings a year, over which he landed a total of 2.2 million pounds for \$107,036 on average. Fishermen in 2011 were landing 47.6 percent more than those in 1992, and making 116.2 percent more on average in ex-vessel revenues.

Figure 91 displays landings, ex-vessel revenues, and number of fishermen for the Dungeness crab–trap fishery in Moss Landing over the study period. Landings and ex-vessel revenues rose significantly from 1992–2011 by about 12 and 10 times respectively, highest in 2011 over the entire study period at 234,465 pounds and \$578,512.

The average Dungeness crab–trap fisherman in Moss Landing made a total of 11 landings per year, over which he landed a total of 4,844 pounds for \$12,821 on average. Landings, ex-vessel revenues, and count of landings per fishermen have all increased for the Dungeness crab–trap fishery in Moss Landing over the study period, with individual fishermen in 2011 making 11.5 times as much as those in 1992 did on average.

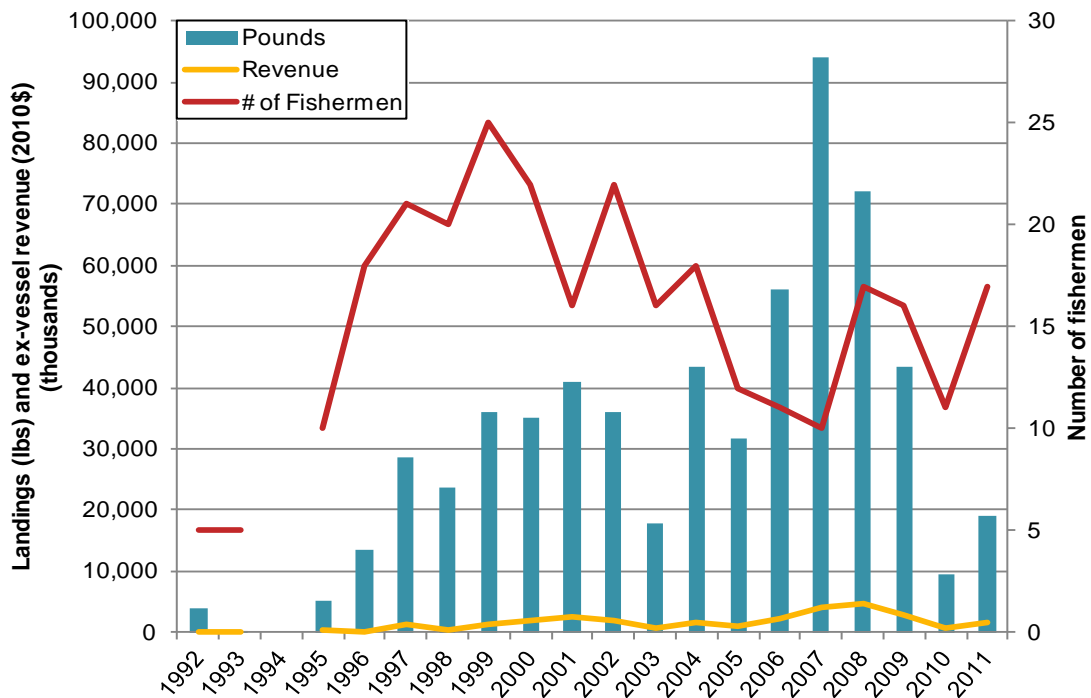
Figure 93 displays the landings, ex-vessel revenues, and number of fishermen for the market squid–seine fishery in Moss Landing over the study period. Landings and ex-vessel revenues rose and fell with the availability of squid, which varied considerably year to year. Landings peaked in 2002 at 41.3 million pounds; ex-vessel revenues peaked the following year in 2003 at \$6.9 million despite landings of nearly half of 2002 due to a 106.9 percent increase in the average ex-vessel price per metric ton in 2003. Trends for individual fishermen are presented as averages in Figure 93. The average market squid–seine fisherman in Moss Landing made 25 landings and landed a total of 372,086 million pounds for \$74,752 on average.

Figure 88. Average ex-vessel prices over time, target commercial fisheries, Moss Landing, 1992–2011



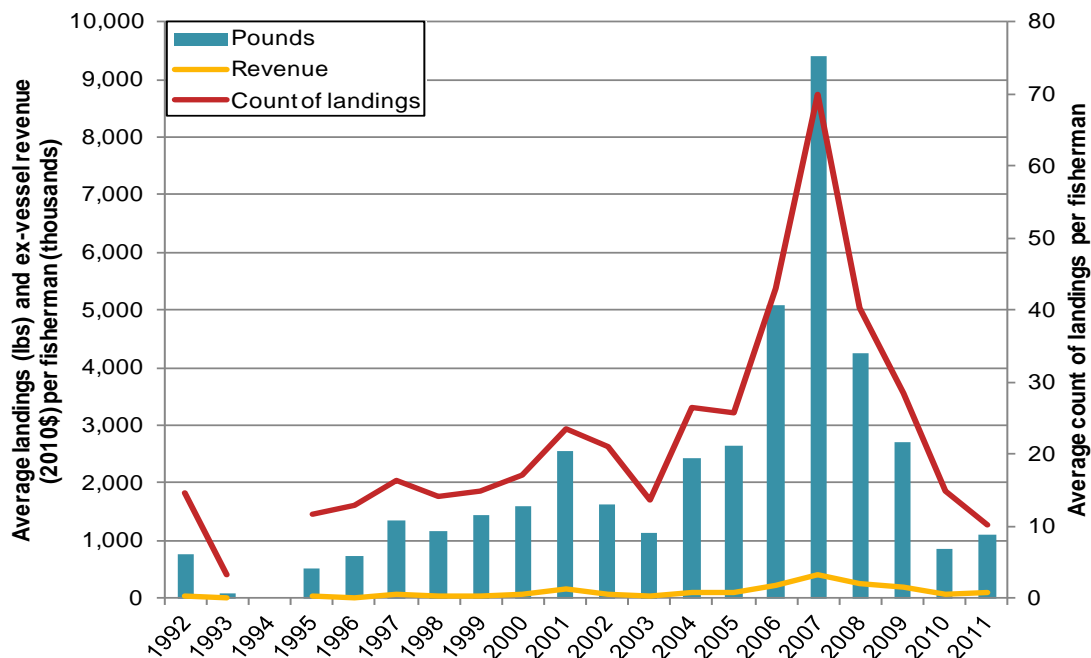
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 89. Coastal pelagic species–seine/net: Commercial landings, ex-vessel revenues, and number of fishermen, Moss Landing, 1992–2011



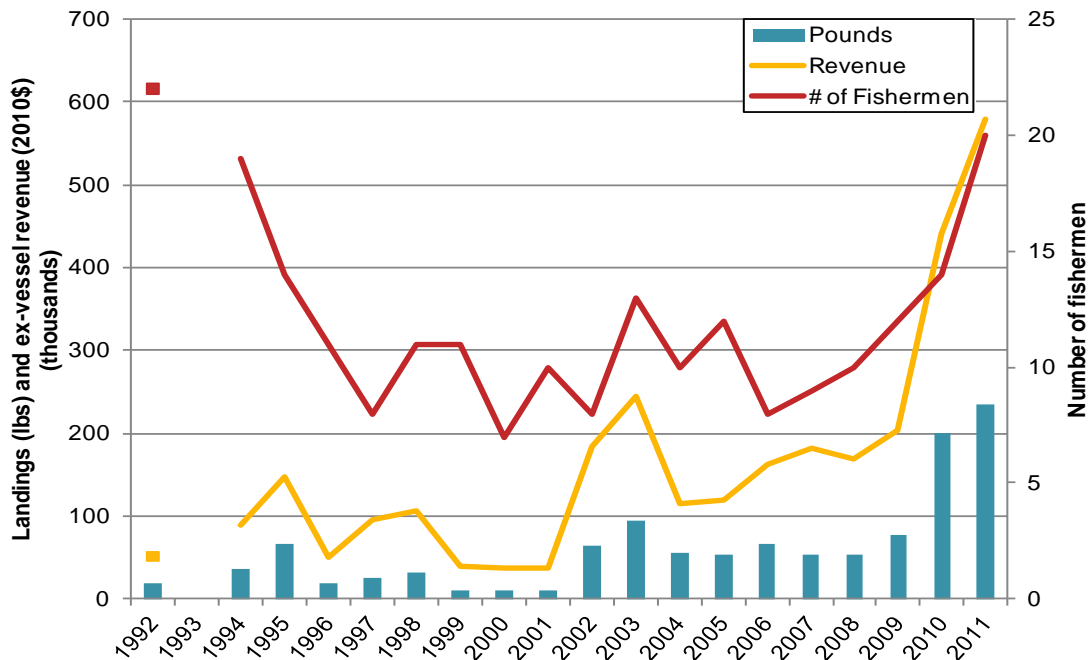
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 90. Coastal pelagic species–seine/net: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Moss Landing, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

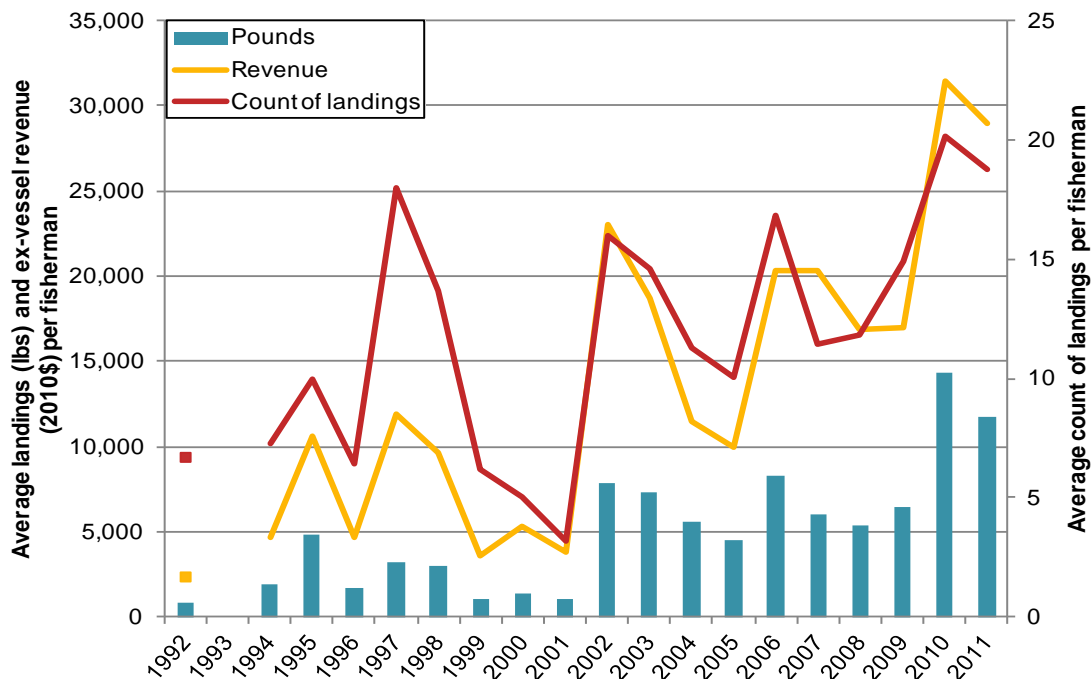
Figure 91. Dungeness crab–trap: Commercial landings, ex-vessel revenues, and number of fishermen, Moss Landing, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

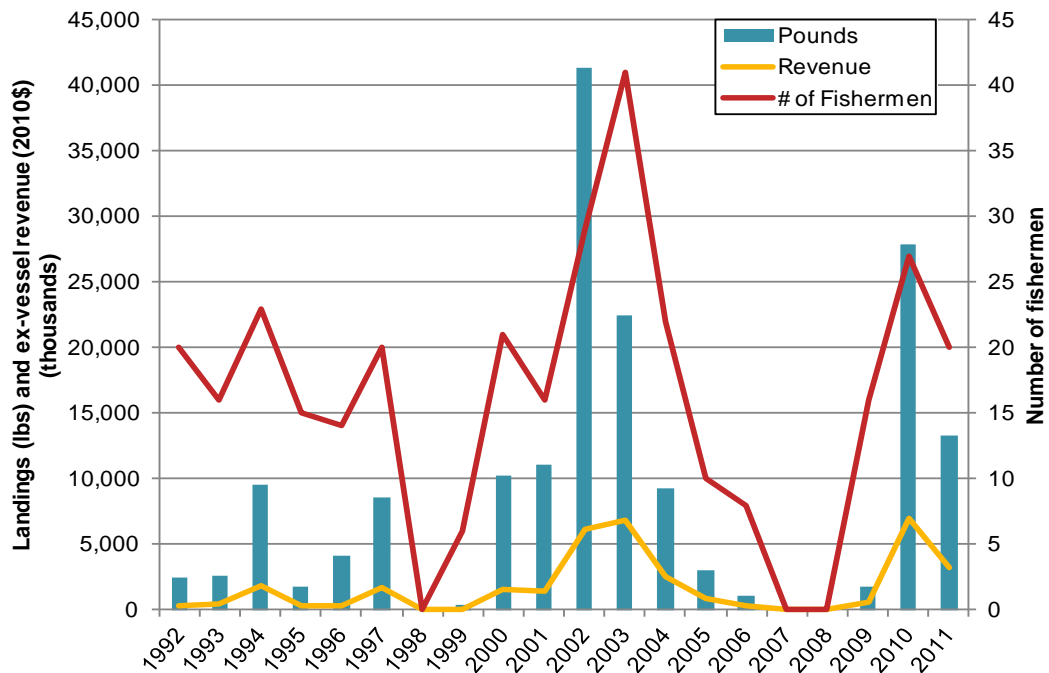
Figure 92. Dungeness crab–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Moss Landing, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

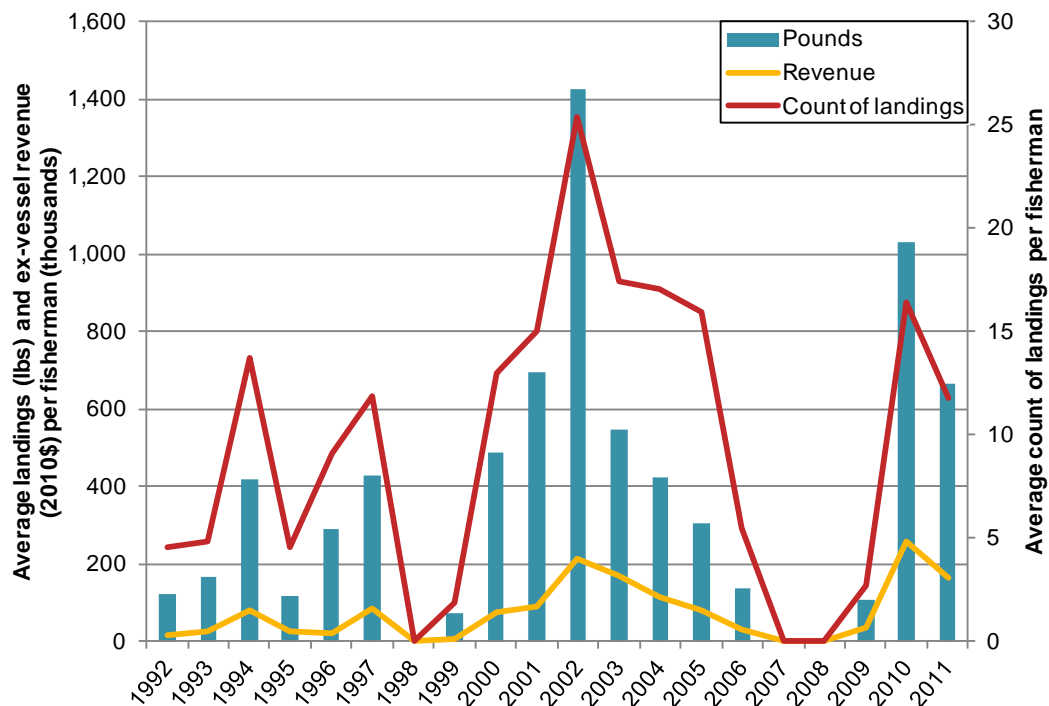
Source: Landings data from CDFG

Figure 93. Market squid–seine: Commercial landings, ex-vessel revenues, and number of fishermen, Moss Landing, 1992–2011



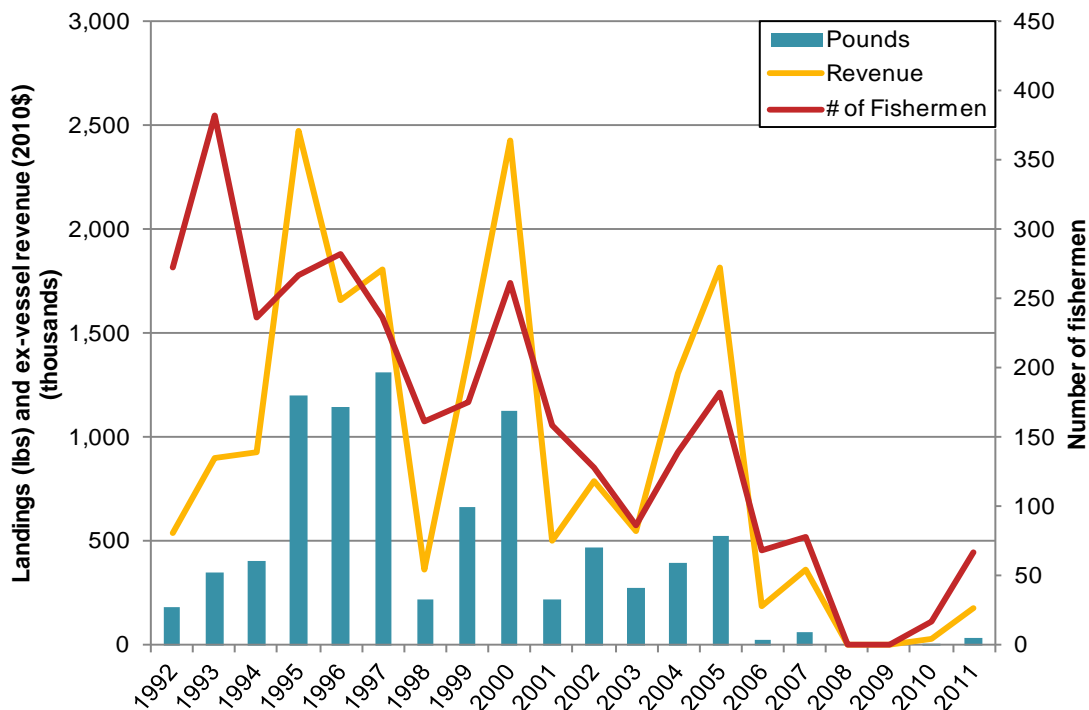
Source: Landings data from CDFG

Figure 94. Market squid–seine: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Moss Landing, 1992–2011



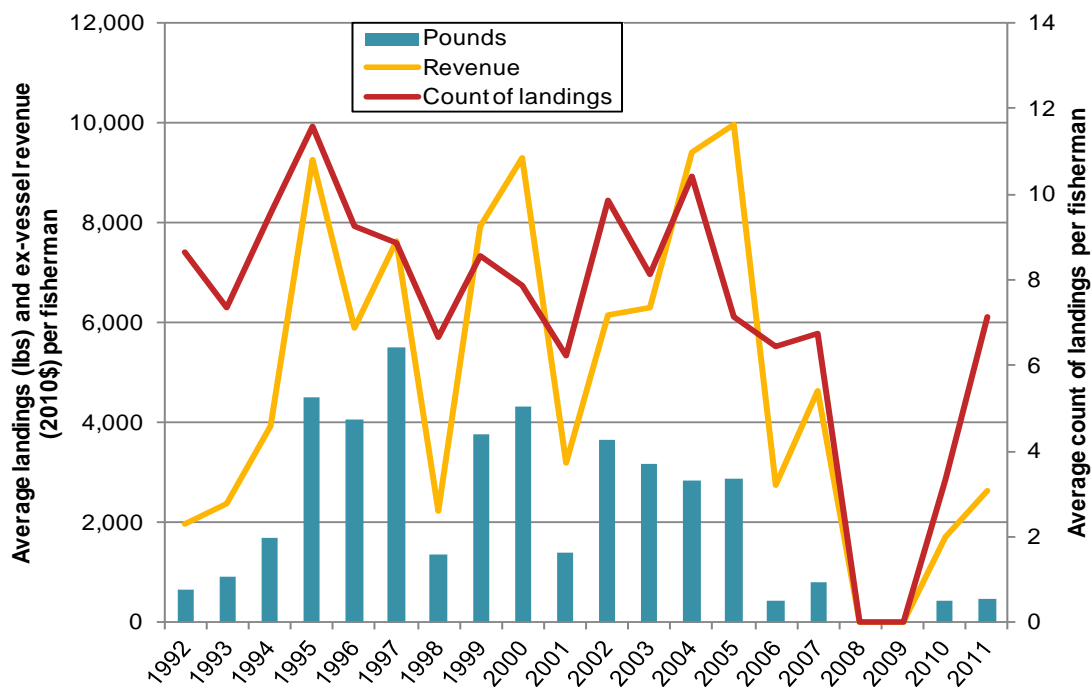
Source: Landings data from CDFG

Figure 95. Salmon–troll: Commercial landings, ex-vessel revenues, and number of fishermen, Moss Landing, 1992–2011



Source: Landings data from CDFG

Figure 96. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Moss Landing, 1992–2011



Source: Landings data from CDFG

Monterey

Monterey, which is located in the center of the Central Coast Region, contributed 23 percent of total landings and 16 percent of total ex-vessel revenues to the Central Coast Region on average. While Monterey's landings contributions fell and rose again over the twenty year period, ex-vessel revenues increased overall from 12.3 percent in 1992 to 26.9 percent in 2011. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

Landings peaked in 1997 at 30.6 million pounds, ex-vessel revenues peaked in 2011 at \$6.3 million, see Figure 97. Despite a low dip in landings in the middle of the study period, landings recovered beginning in 2008 and landings in 2011 were 42.4 percent higher than those in 1992. The number of fishermen declined in this port overall by 58.8 percent from 1992 to 2011, but also appeared to be on the upswing in the last three years of the study period.

Figure 98 displays what percentage the eleven fisheries of interest represented of total landings and ex-vessel revenues made in the port over the study period. Fishery of interest landings regularly remained above 50 percent of all landings except for the year 2006, while ex-vessel revenues varied considerably at first, reaching 92.4 percent in 2011. In Monterey, the groundfish–bottom trawl fishery contributed significantly to ex-vessel revenues, averaging 18.5 percent of total ex-vessel revenues (or \$537,389 on average) annually over 1992–2011. In 1996, this fishery alone contributed 48.5 percent of total ex-vessel revenues at \$2 million. In 2006, groundfish–bottom trawl landings constituted 61.2 percent of total landings at 281,046 pounds. Significant swordfish ex-vessel revenues were also made in this port in 1992 and 1998.

Figure 99 and Figure 100 display the composition of landings and ex-vessel revenues for select fisheries of interest over 1992 to 2011.⁷ The vast majority of landings consisted of the coastal pelagic species–seine/net and the market squid–seine fisheries, while ex-vessel revenues were somewhat more diversified. The coastal pelagic species–seine/net fishery constituted 32.1 percent of total landings and 7.6 percent of total ex-vessel revenues in the port. The market squid–seine fishery is likely responsible for the later upswing in landings and ex-vessel revenues for the last two years of the study period, averaging 78.2 percent and 71.7 percent of total landings and ex-vessel revenues respectively.

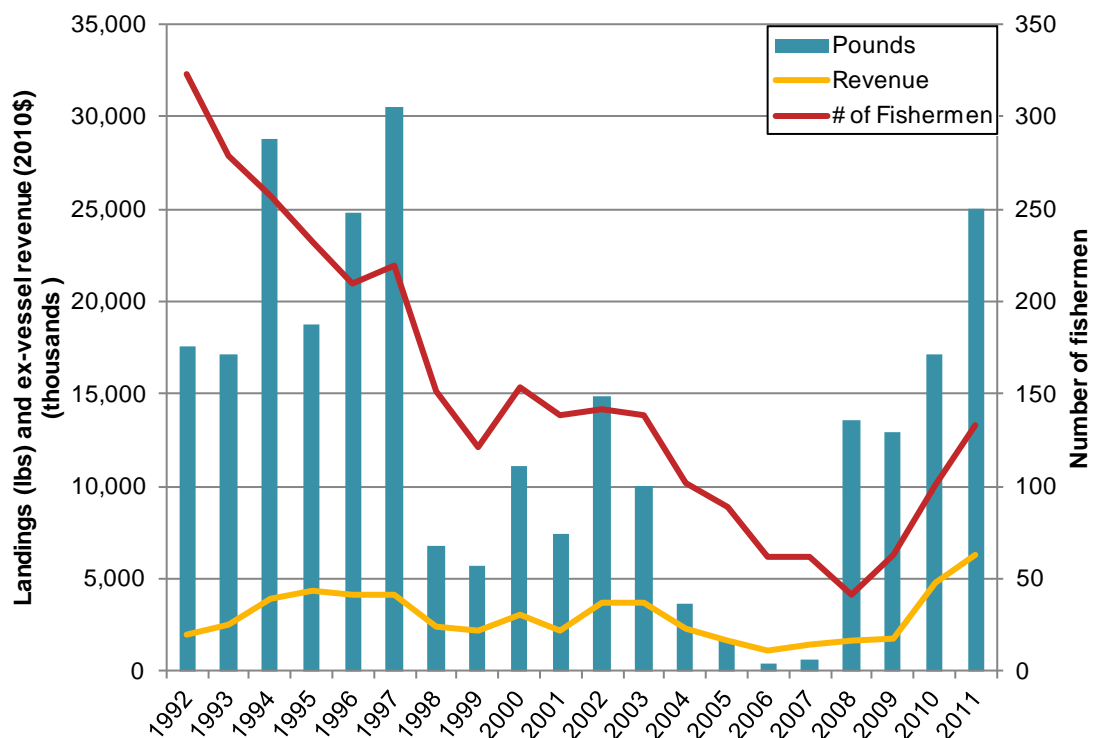
While barely visible in Figure 99, it is worth noting that in 2007 the Dungeness crab–trap fishery constituted 39.1 percent of total landings (and 41.2 percent of total ex-vessel revenues), while averaging only 2.2 percent in landings (and 2.7 percent in ex-vessel revenues) over the entire study period. The spot prawn–trap fishery averaged 12.7 percent of total ex-vessel revenues, and increased in significance over the study period.

Figure 101 displays the average percent fishing income by fishery in Monterey for the eleven fisheries of interest and displays changes in how much fishermen rely upon ex-vessel revenue from specific fisheries of interests relative to other fisheries of interest.⁸ This figure illustrates the significance of the nearshore finfish–live–hook & line fishery to fishing incomes although in terms of ex-vessel revenue this fishery averaged only five percent for total ex-vessel revenues across the eleven fisheries of interest over the study period in Monterey.

⁷ Fisheries of interest were selected for display for compositional landings and ex-vessel revenue figures only if they constituted the top 95 percent of combined landings and ex-vessel revenues for all eleven fisheries of interest in the port over the study period on average. The remaining fisheries that were not selected for display likely wouldn't be visible on the compositional figures had they been included.

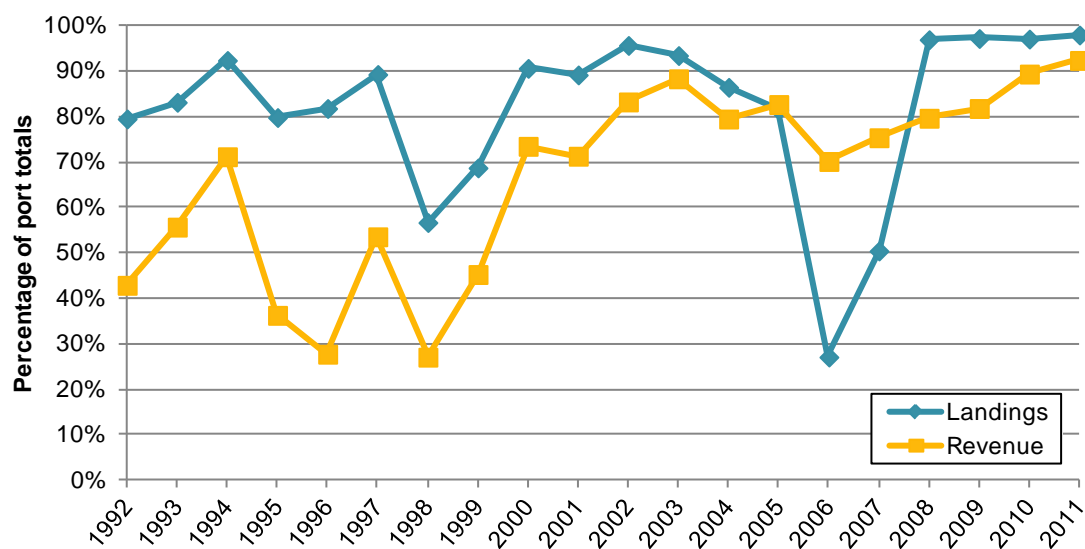
⁸ For more information on this figure, please see section 4.1.1.

Figure 97. Monterey total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011



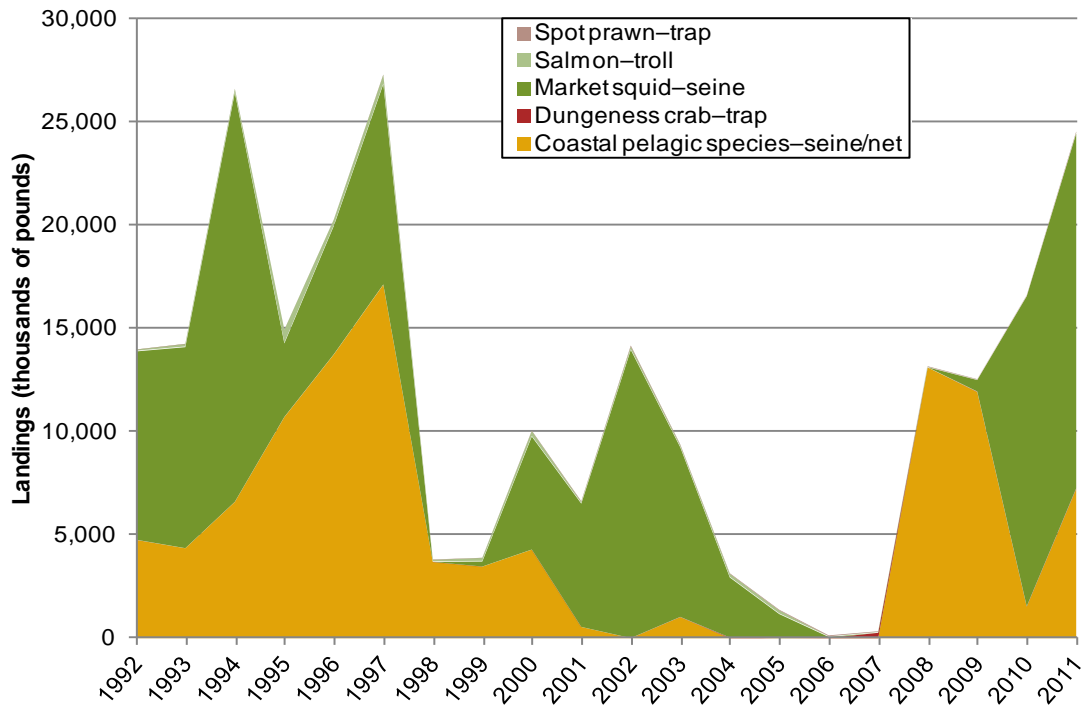
Source: Landings data from CDFG

Figure 98. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Monterey, 1992–2011



Source: Landings data from CDFG

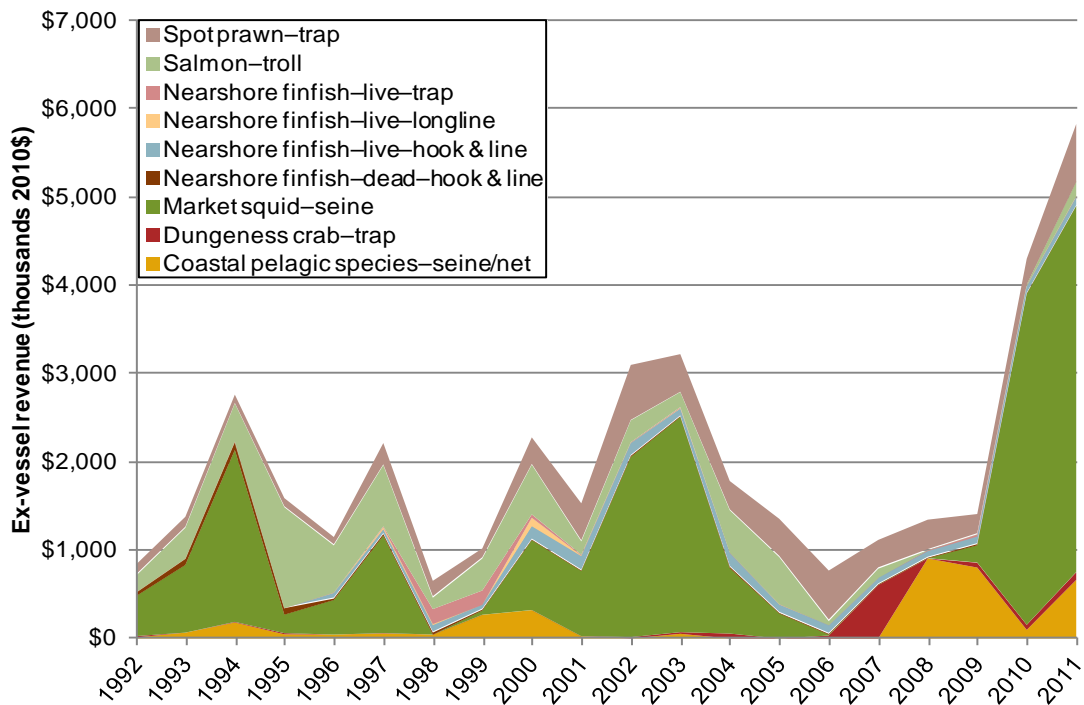
Figure 99. Monterey commercial landings for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

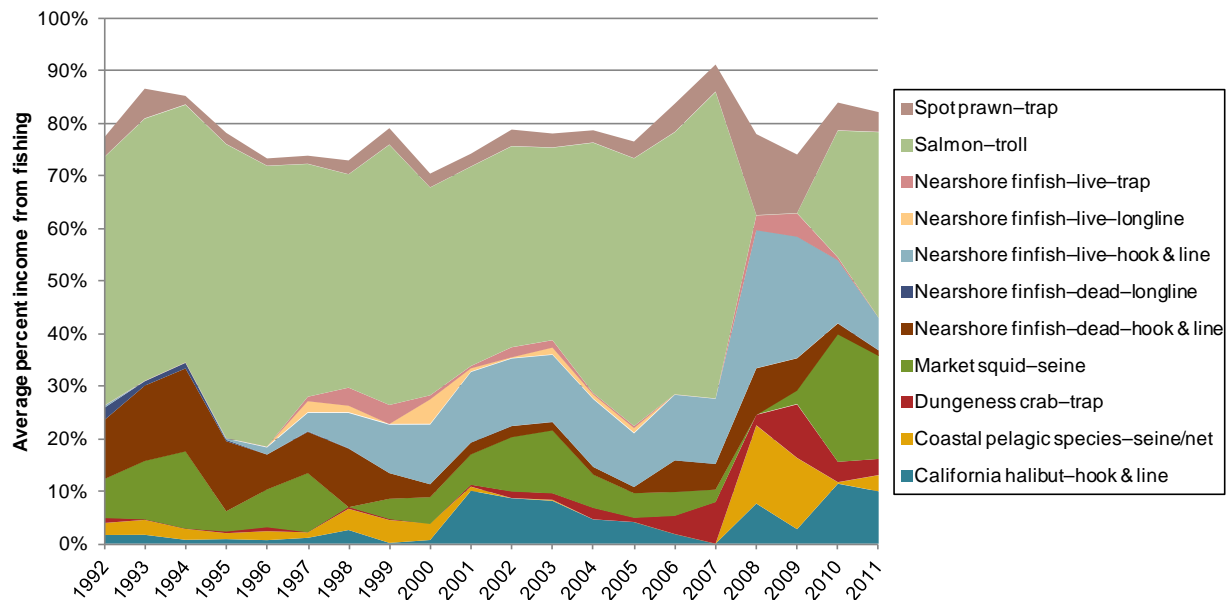
Figure 100. Monterey commercial ex-vessel revenues for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

Figure 101. Average percent of individual fishing income from commercial fisheries of interest, Monterey, 1992–2011



Source: Landings data from CDFG

Table 190 displays the percent change in total and average per fishermen ex-vessel revenues for each fishery in the port of Monterey as compared with the respective changes in the Central Coast Region over the study period.

The trends of the coastal pelagic species-seine/net fishery in Monterey are interesting when compared with the Central Coast Region overall, which increased only 4 percent in total ex-vessel revenues from 2000 to 2011 for this fishery, as Monterey coastal pelagic species-seine/net total ex-vessel revenues increased by 106.5 percent over the same time period. Similarly, average ex-vessel revenues for the Monterey coastal pelagic species-seine/net fishery increased by 91.8 percent from 2000 to 2011 while in the Central Coast Region they fell by 6 percent overall from 2000 to 2011. However, most of the increase in the coastal pelagic species-seine/net fishery for Monterey took place between the years 2008 to 2011, though ex-vessel revenues were greater in 2008 than in 2011 (falling 26.7 percent by 2011).

As in most Central Coast Region ports, trends in the salmon-troll fishery in Monterey largely followed those observed in the region overall, falling 69.9 percent total from 2000 to 2011, and falling 58.4 percent for average ex-vessel revenues per fisherman over the same time.

Spot prawn-trap fishery ex-vessel revenues generally increased overall in the Central Coast region, 423.9 percent from 2000 to 2011. Monterey also observed increased total and average per fisherman ex-vessel revenues in this fishery of 118.8 percent each over the same period (average ex-vessel revenues per fishermen increased at the same rate as total ex-vessel revenues since the number of fisherman, four, remained the same in 2011 as in 2000). Increases were notably higher during the 2008-2011 period (97.5 percent) than in previous periods for that fishery.

Table 190. Monterey: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011

Fishery	Commercial ex-vessel revenue	Percent change			2000–2011
		Pre MPA (2000–2003)	Pre MPA (2004–2007)	Post MPA (2008–2011)	
Coastal pelagic species—seine/net	Monterey total	-83.3%	*	-26.7%	106.5%
	Monterey average per fisherman	-45.8%	*	-73.8%	91.8%
	Central Coast Region total	-58.8%	139.7%	-59.2%	4.0%
	Central Coast Region average per fisherman	-45.0%	314.0%	-75.0%	-6.0%
Dungeness crab—trap	Monterey total	*	976.4%	*	*
	Monterey average per fisherman	*	515.1%	*	*
	Central Coast Region total	313.7%	189.7%	165.3%	864.0%
	Central Coast Region average per fisherman	175.8%	189.7%	107.3%	623.0%
Market squid—seine	Monterey total	207.4%	*	*	422.7%
	Monterey average per fisherman	64.0%	*	*	153.4%
	Central Coast Region total	314.6%	-99.8%	*	217.7%
	Central Coast Region average per fisherman	115.3%	-98.4%	*	114.4%
Nearshore finfish—dead—hook & line	Monterey total	23.0%	-44.3%	-62.1%	-55.7%
	Monterey average per fisherman	107.6%	-13.9%	-40.4%	70.8%
	Central Coast Region total	-12.9%	-6.3%	-11.6%	12.4%
	Central Coast Region average per fisherman	42.0%	4.5%	-5.6%	77.2%
Nearshore finfish—live—hook & line	Monterey total	-44.8%	-52.3%	33.0%	-34.0%
	Monterey average per fisherman	-14.6%	-14.2%	66.2%	180.5%
	Central Coast Region total	-11.3%	24.8%	15.0%	111.4%
	Central Coast Region average per fisherman	14.0%	40.8%	29.8%	298.8%
Nearshore finfish—live—trap	Monterey total	-77.4%	—	*	*
	Monterey average per fisherman	-69.8%	—	*	*
	Central Coast Region total	-45.9%	-39.6%	-36.7%	-78.9%
	Central Coast Region average per fisherman	-19.8%	-36.8%	21.3%	-29.5%
Salmon—troll	Monterey total	-69.7%	-78.1%	—	-69.6%
	Monterey average per fisherman	-62.6%	-68.2%	—	-58.4%
	Central Coast Region total	-77.9%	-66.4%	—	-88.7%
	Central Coast Region average per fisherman	-51.7%	-57.8%	—	-71.0%
Spot prawn—trap	Monterey total	41.7%	-2.9%	97.5%	118.8%
	Monterey average per fisherman	41.7%	-2.9%	97.5%	118.8%
	Central Coast Region total	101.8%	-8.8%	280.8%	423.9%
	Central Coast Region average per fisherman	101.8%	-29.1%	280.8%	423.9%

Source: Landings data from CDFG

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates a zero value data point in one of the sample years

Figure 102 displays the average ex-vessel prices over time for five select fisheries. Over the study period, the average ex-vessel prices for the Dungeness crab—trap, spot prawn—trap, and nearshore finfish—live—trap fisheries were \$3.14, \$10.83, and \$5.98 per pound respectively in Monterey. The market squid—seine and coastal pelagic species—seine/net fisheries had average ex-vessel prices of \$397.57 and \$91.35 per metric ton. For all five fisheries, ex-vessel prices increased from 1992 to 2011.

Figure 103 displays the landings, ex-vessel revenues, and number of fishermen for the coastal pelagic species—seine/net fishery of Monterey over the years 1992–2011. Landings peaked in 1997 at 17.1 million pounds, ex-vessel revenues in 2008 at \$909,876. The number of fishermen followed landings trends, with 14 participating fishermen in 2011. For the coastal pelagic species—seine/net fishery in

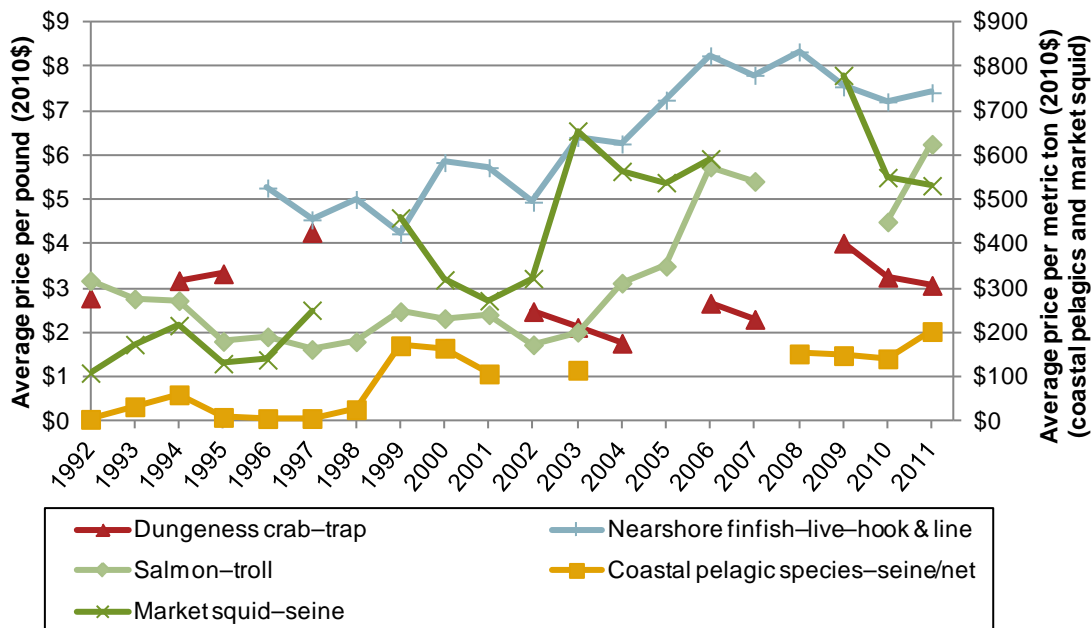
Monterey, the average fisherman made 8 landings, and landed an annual total of 537,877 pounds for \$25,923 in ex-vessel revenue per year on average over the study period, see Figure 104. The share of ex-vessel revenue per fisherman increased substantially, with fishermen in 1992 making \$752 each on average, while those in 2011 made \$47,633 each on average.

Figure 105 displays the landings, ex-vessel revenues, and number of fishermen for the market squid–seine fishery of Monterey over the years 1992–2011. Landings peaked in 1994 at 19.8 million pounds, ex-vessel revenues peaked in 2011 at \$4.1 million. The number of fishermen mostly followed landings trends, though increasingly fewer fishermen targeted larger landings volumes, with 38 fishermen in 1992 and 33 fishermen in 2011. For the market squid–seine fishery in Monterey, the average fisherman made 10 landings per year, over which he landed an average total of 250,830 pounds for \$42,997 in ex-vessel revenue per year, see Figure 106. The share of ex-vessel revenue per fisherman increased by about 9.5 times from 1992 to 2011.

Figure 107 displays the landings, ex-vessel revenues, and number of fishermen for the nearshore finfish–live–hook & line fishery of Monterey over the years 1992–2011. Landings peaked in 2002 at 28,375 pounds and ex-vessel revenues peaked the year before in 2001 at \$160,663. The number of fishermen decreased 46.7 percent from 1992 to 2011 while ex-vessel revenues and landings increased sizably, resulting in fishermen in 2011 making 90.5 times more than those in 1992. The average Monterey nearshore finfish–live–hook & line fisherman made a total of 11 landings, landing an annual total average of 757 pounds for \$4,899 in ex-vessel revenue per year, see Figure 108. The count of landings per fishermen also increased significantly over the study period, from 15 fishermen each making one landing in 1992 to eight fishermen making 29 landings in 2011.

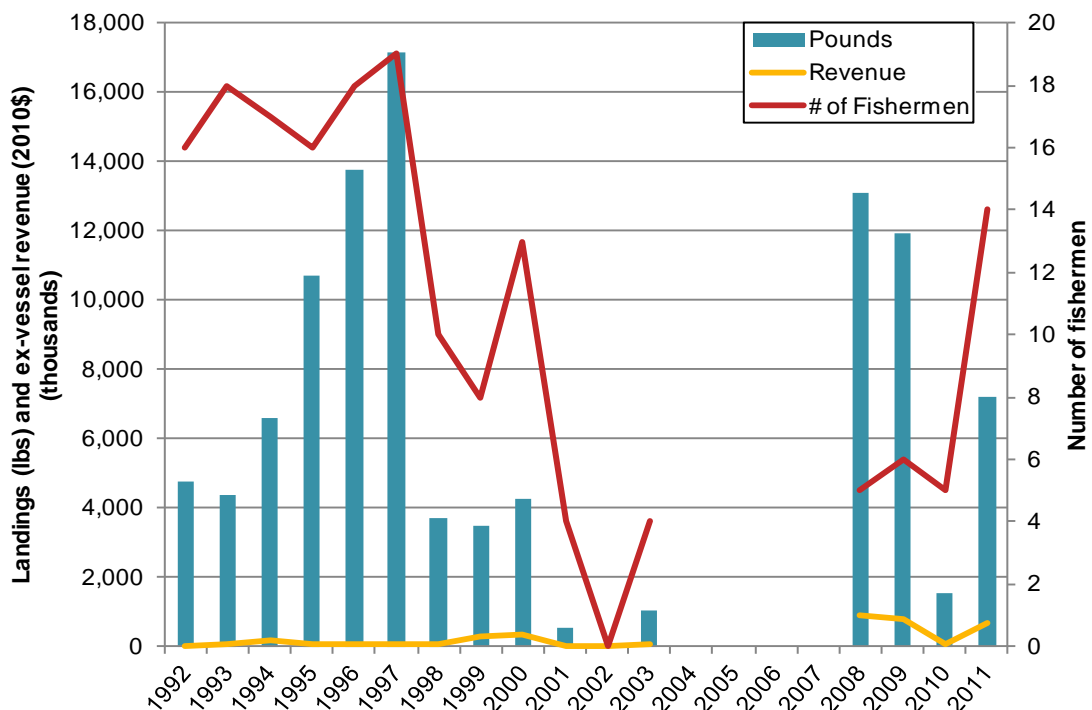
Figure 111 displays the landings, ex-vessel revenues, and number of fishermen for the spot prawn–trap fishery of Monterey over the years 1992–2011. Landings and ex-vessel revenues increased considerably over the study period, peaking in 2011 at 55,417 pounds and \$659,392. Despite these gains, the number of fishermen decreased 69.2 percent from 1992 (13 fishermen) to 2011 (4 fishermen), likely representing an increasing scale of operations for spot prawn–trap fishermen. The average Monterey spot prawn–trap fisherman made 66 landings, over which he landed an annual total average of 6,501 pounds for \$76,528 in ex-vessel revenue per year over the study period, see Figure 112. Fishermen in 1992 made approximately \$8,557 each in this fishery in this port, and in 2011 made \$164,848 each on average.

Figure 102. Average ex-vessel prices over time, target commercial fisheries, Monterey, 1992–2011



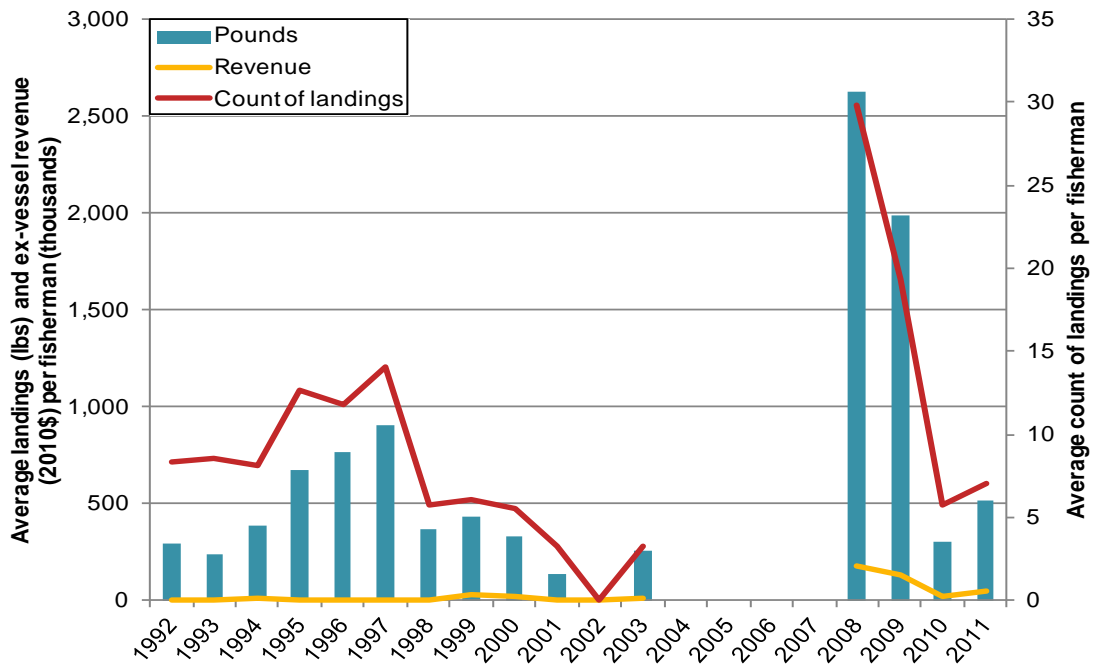
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 103. Coastal pelagic species-seine/net: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

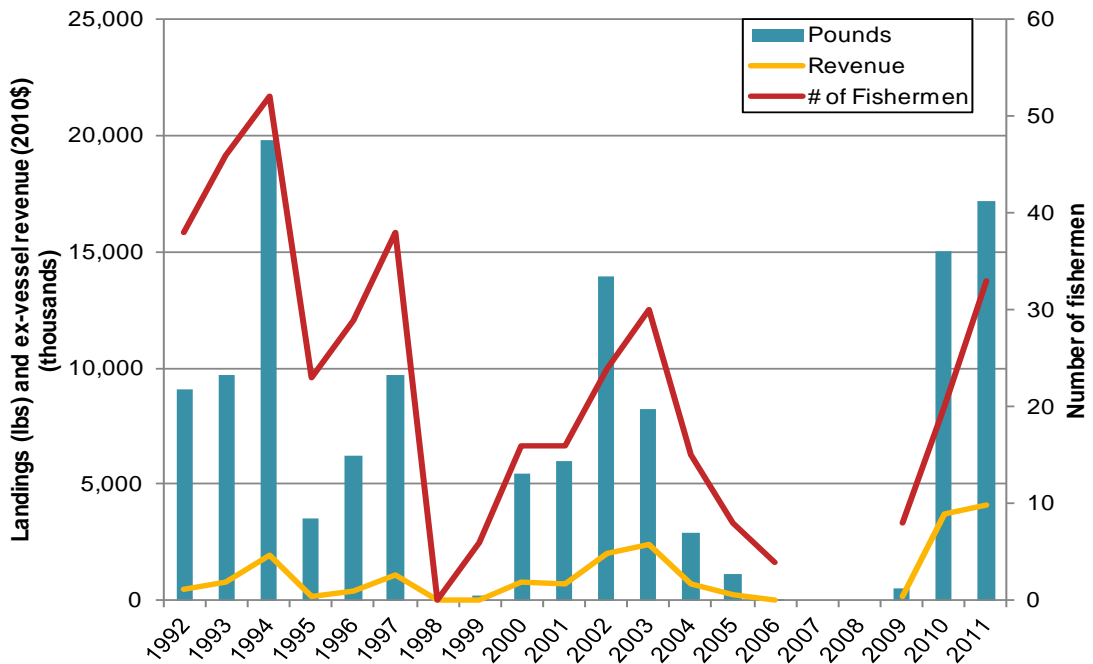
Figure 104. Coastal pelagic species–seine/net: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

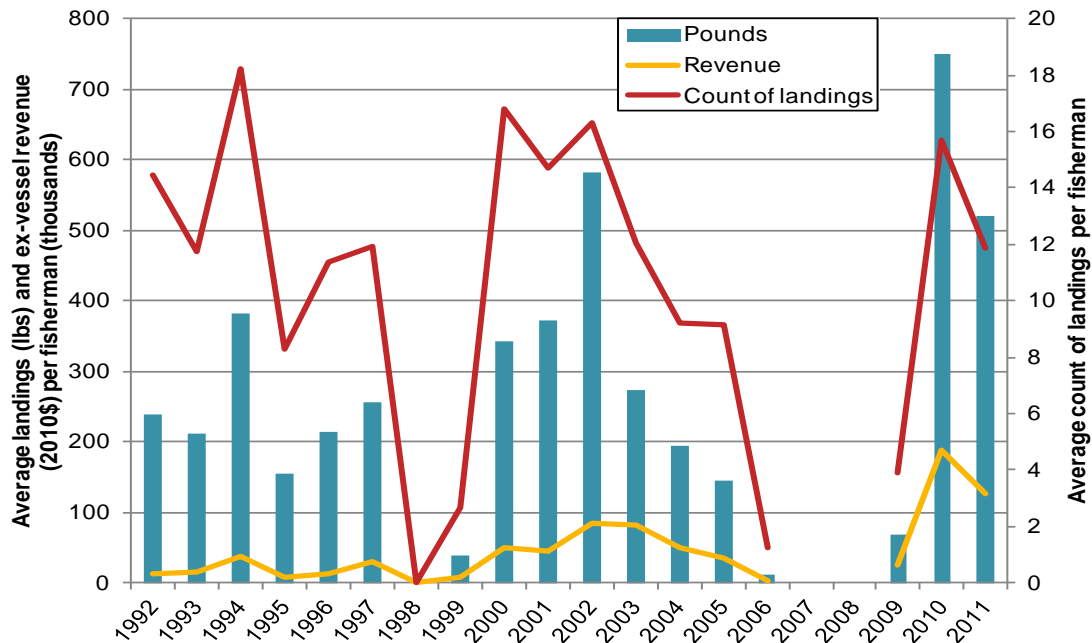
Figure 105. Market squid–seine: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

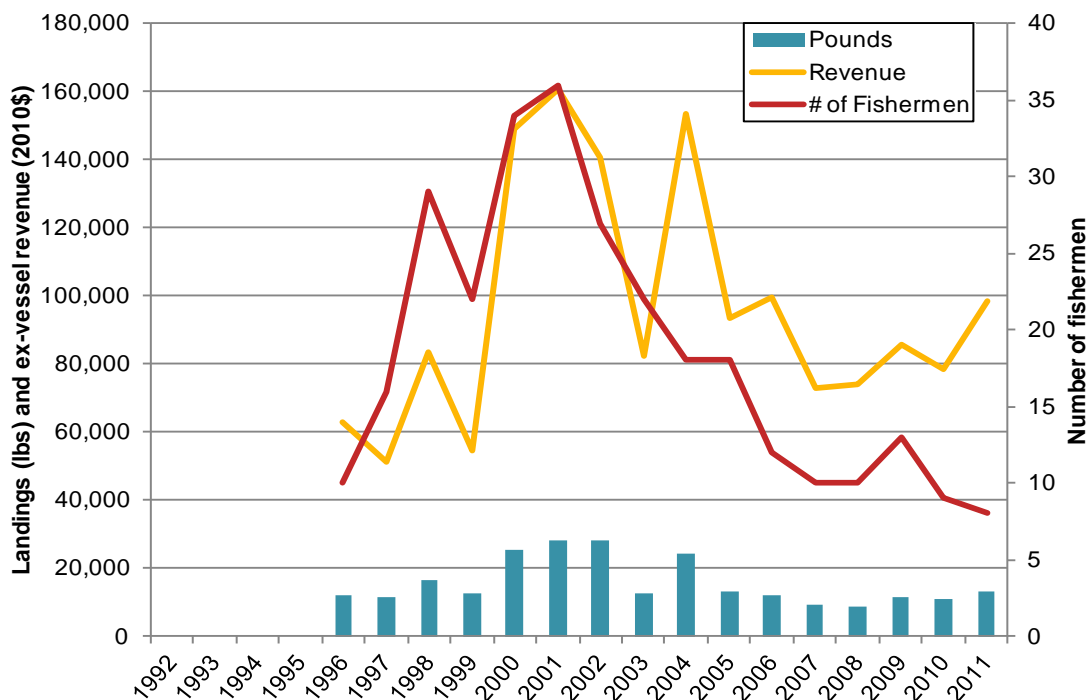
Source: Landings data from CDFG

Figure 106. Market squid–seine: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011



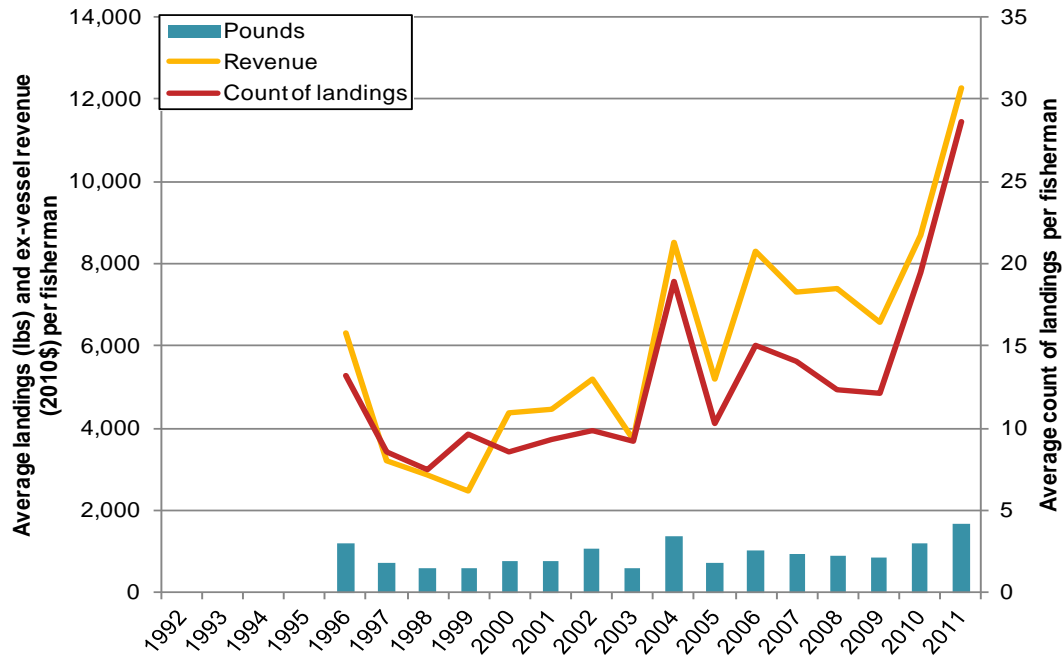
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 107. Nearshore finfish–live–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

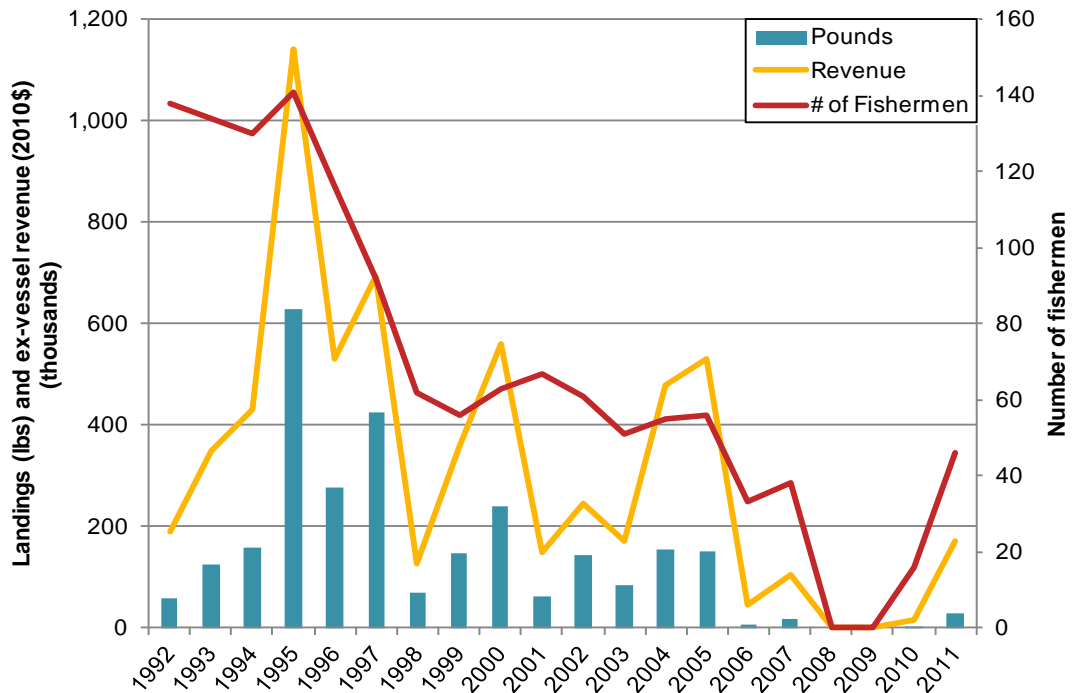
Figure 108. Nearshore finfish–live–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

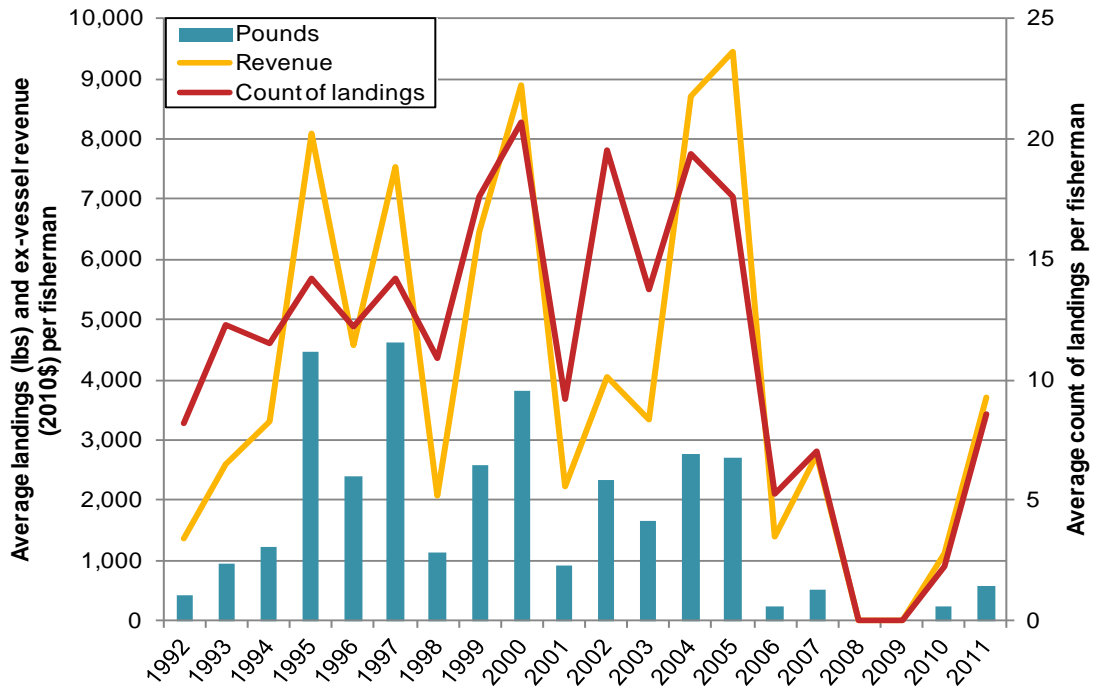
Source: Landings data from CDFG

Figure 109. Salmon–troll: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011



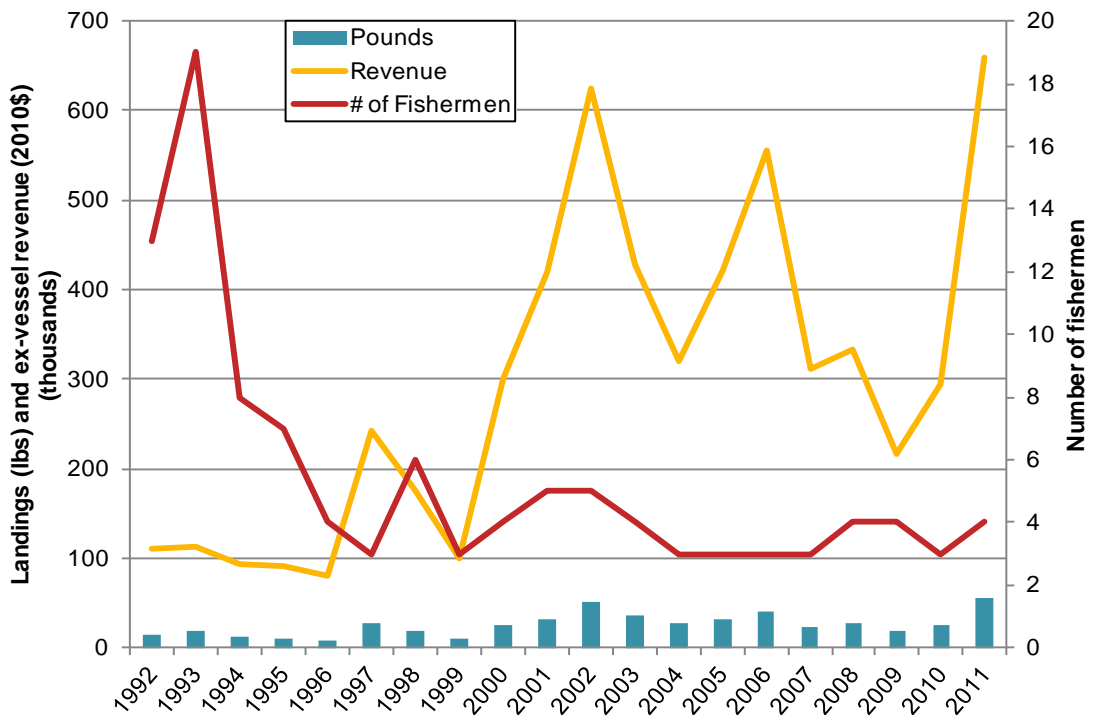
Source: Landings data from CDFG

Figure 110. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011



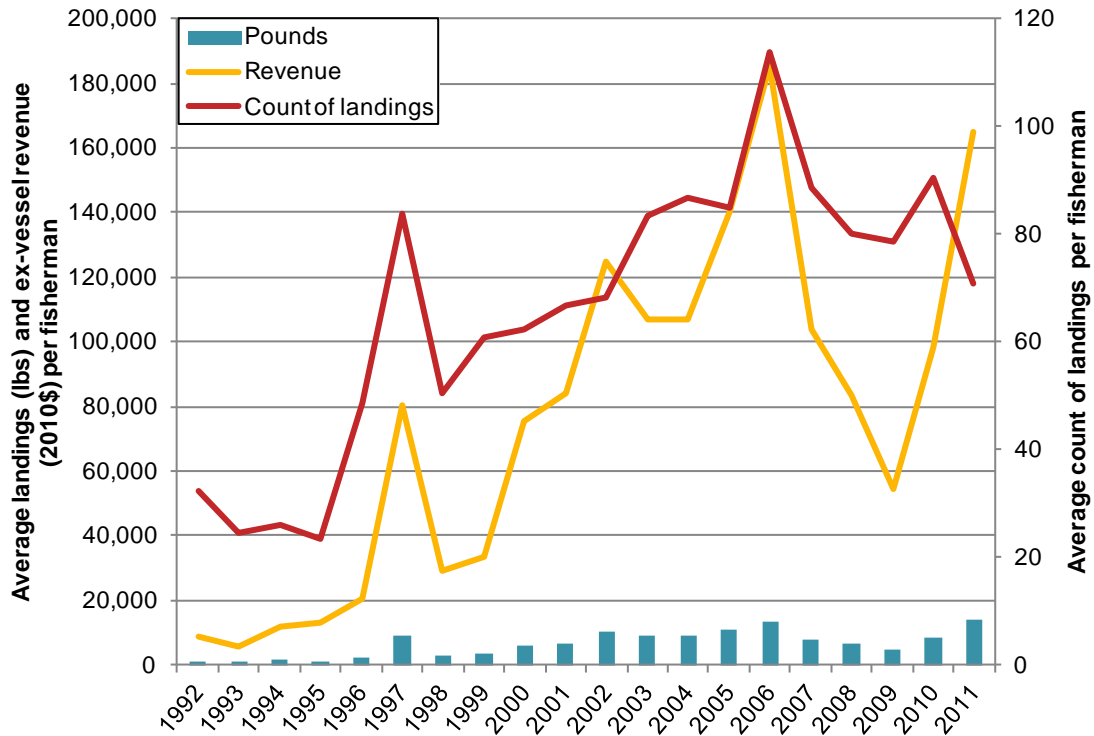
Source: Landings data from CDFG

Figure 111. Spot prawn–trap: Commercial landings, ex-vessel revenues, and number of fishermen, Monterey, 1992–2011



Source: Landings data from CDFG

Figure 112. Spot prawn–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Monterey, 1992–2011



Source: Landings data from CDFG

5.2.2. Moss Landing/Monterey Commercial Fisheries Baseline Characterization

In 2011 the coastal pelagic species–seine/net and market squid–seine fisheries were the largest revenue generators in both commercial fishing ports of Moss Landing and Monterey (Table 192). For the year 2011 ex-vessel revenue levels, the number of fishermen making landings, and the number of fishermen interviewed for each of the target fisheries are presented in Table 191 and Table 192.

Table 191. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Moss Landing

Fishery	2011 Landings revenue (2010\$)	Total number of individuals in 2011 landings revenue	Number interviewed
California halibut–hook & line	\$8,509	22	1
Coastal pelagic species–seine/net	\$1,572,679	17	1
Dungeness crab–trap	\$578,512	20	2
Market squid–seine	\$3,267,270	20	1
Nearshore finfish–live–hook & line	\$1,161	3	1
Nearshore finfish–live – longline	—	—	—
Nearshore finfish–live–trap	\$25,900	4	1
Nearshore finfish–live	\$27,061	7	1
Salmon–troll	\$176,733	67	2
Spot prawn–trap	—	—	—
All target fisheries		118	3

Source: California Department of Fish and Game, Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Table 192. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Monterey

Fishery	2011 Landings revenue (2010\$)	Total number of individuals in 2011 landings revenue	Number interviewed
California halibut–hook & line	\$15,485	21	1
Coastal pelagic species–seine/net	\$666,864.28	14	3
Dungeness crab–trap	\$86,516	4	2
Market squid–seine	\$4,145,325	33	3
Nearshore finfish–live–hook & line	\$98,188	8	—
Nearshore finfish–live – longline	—	—	—
Nearshore finfish–live–trap	*	1	1
Nearshore finfish–live	\$98,215	9	1
Salmon–troll	\$175,936	46	3
Spot prawn–trap	\$659,392	4	2
All target fisheries		98	7

Source: California Department of Fish and Game, Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

For the data presented below we chose to merge the ports of Moss Landing and Monterey as fishing grounds were similar between the two ports and fishermen noted they often used the ports interchangeably. Secondly, by merging the two ports we avoided having to suppress data summaries due to confidentiality restraints. Between the two ports we interviewed ten commercial fishermen whose average age was 49.7 and had an average of 27.3 years experience commercial fishing.

Table 193. Average age and years experience commercial fishing, Moss Landing/Monterey

Fisheries	Age		Years experience	
	Average	Standard deviation	Average	Standard deviation
California halibut–hook & line	*	*	*	*
Coastal pelagic species–seine/net	56.3	12.0	35.0	17.5
Dungeness crab–trap	45.8	26.5	21.8	18.8
Market squid–seine	56.3	12.0	35.0	17.5
Nearshore finfish–live	38.6	12.7	19.6	15.2
Salmon–troll	45.8	23.0	21.8	16.3
Spot prawn–trap	*	*	*	*
All target fisheries (unique individuals)	49.7	17.8	27.3	16.3

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

Fishermen were asked to estimate the percent of their personal income that came from commercial fishing for the years 2006 and 2011. In the table below (Table 194), percent change was calculated after the interview was completed. All fishermen who participate in the nearshore finfish–live fishery and Dungeness crab–trap fishery indicated that 100 percent of their income came from commercial fishing in 2011. This is a 22.2 percent increase for fishermen participating in the nearshore finfish–live fishery and an 8.3 percent increase for fishermen participating in the Dungeness crab–trap fishery since 2006. When averaging all unique respondents together from all target fisheries there was an overall decrease in percent of overall income from commercial fishing (-2.7 percent). However, most fishermen's percent of total income from commercial fishing remained unchanged between the two years.

Table 194. Percent change in income from overall commercial fishing from 2006-2011, Moss Landing/Monterey

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut–hook & line	*	*	*	*	*	*
Coastal pelagic species–seine/net	97.5%	5.0%	97.5%	5.0%	—	—
Dungeness crab–trap	93.8%	12.5%	100.0%	—	8.3%	16.7%
Market squid–seine	97.5%	5.0%	97.5%	5.0%	—	—
Nearshore finfish–live	83.3%	14.4%	100.0%	—	22.2%	19.2%
Salmon–troll	85.0%	22.4%	84.0%	35.8%	-5.3%	33.8%
Spot prawn–trap	*	*	*	*	*	*
All target fisheries (unique individuals)	91.5%	16.7%	91.0%	25.1%	-2.7%	22.7%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

After reporting the percent of their total income from commercial fishing for 2006 and 2011, fishermen who reported a change were asked to describe factors to which they attributed this change. This was posed as an open-ended question and respondents were encouraged to speak freely as the interviewer took notes on key aspects that were mentioned. After the interview the notes were coded into several categories which are shown below in Table 195. Additional sources of income are listed below in Table 196.

Table 195. Cause of change in percent income from commercial fishing from 2006–2011, Moss Landing/Monterey

Response	Number responding			
	California halibut – hook & line	Dungeness crab – trap	Nearshore finfish – live	Salmon – troll
Increased regulation	*	—	—	—
Intensified fishing efforts	*	—	—	—
Had additional job or source of income	*	1	2	1
Found additional job or source of income	*	—	—	—
Change in fish abundance	*	—	—	1
Total number responding	2	1	2	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 196. Other sources of income other than commercial fishing in 2011, Moss Landing/Monterey.

Response	Number responding			
	California halibut– hook & line	Coastal pelagic species–seine/net	Market squid– seine	Salmon–troll
Skilled labor	*	—	—	1
Investments/retirement/social security	*	1	1	—
Business/office work	*	—	—	1
Other maritime occupation	*	—	—	—
Total number responding	1	1	1	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were asked what percent of their total gross economic revenue (GER) from commercial fishing was spent on their overall operating costs across all his/her fisheries. Percent change between 2006 and 2011 was calculated after the interview.

All fisheries in Moss Landing/Monterey reported an increase in the percentage of their total ex-vessel revenue going towards commercial fishing operating costs. Fishermen who participated in the nearshore finfish–live fishery reported the largest increase (40.0 percent) which is much higher than the average across the region (19.4 percent). Information for the other target fisheries in Moss Landing/Monterey is found below in Table 197.

Table 197. Percent change in overall commercial fishing operating costs from 2006–2011, Moss Landing/Monterey

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut – hook & line	*	*	*	*	*	*
Coastal pelagic species – seine/net	70.0%	13.2%	73.5%	5.1%	7.1%	10.1%
Dungeness crab – trap	48.8%	29.0%	52.5%	22.5%	15.0%	26.0%
Market squid – seine	70.0%	13.2%	73.5%	5.1%	7.1%	10.1%
Nearshore finfish – live	33.3%	40.4%	43.3%	31.8%	40.0%	28.3%
Salmon – troll	49.0%	25.1%	56.0%	21.0%	17.7%	23.9%
Spot prawn – trap	*	*	*	*	*	*
All target fisheries (unique individuals)	37.6%	28.4%	48.4%	23.1%	32.3%	28.1%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

Several fishermen in Moss Landing/Monterey reported that an increase in fishing expenses (especially fuel) as a cause for more of their gross revenue going towards operating costs. Additional reasons for changes in percent of GER used for overall operating costs are listed below in Table 198.

Table 198. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Moss Landing/Monterey

Response	Number responding					
	California halibut–hook & line	Coastal pelagic species–seine/net	Dungeness crab–trap	Market squid–seine	Nearshore finfish–live	Salmon–troll
Large capital investment	*	1	1	1	2	1
Decrease in fishing income	*	—	—	—	—	1
Decrease in fishing grounds	*	—	—	—	—	—
Increase in fishing expenses	*	4	1	4	—	2
Fishing less in 2006	*	—	—	—	—	—
Fishing less in 2011	*	—	—	—	—	—
Total number responding	2	4	2	4	2	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Of all the target fisheries in the ports of Moss Landing and Monterey the market squid–seine fishery reported the highest number of years experience (21.8 years) in the fishery. Both coastal pelagic species–seine/net and market squid fishermen reported that they have an average of 5.3 crew members.

Accordingly, the highest percentage of gross economic revenue (GER) going towards crew was reported for these fisheries. These fisheries also reported a relatively low percentage of their GER that went towards fuel.

Table 199. Additional commercial fishery specific data, Moss Landing/Monterey

Fisheries	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut–hook & line	*	*	*	*	*	*	*	*
Coastal pelagic species–seine/net	27.8	5.9	5.3	1.0	46.3%	8.5%	10.0%	—
Dungeness crab–trap	16.3	15.9	1.5	0.6	18.8%	8.5%	21.3%	16.5%
Market squid–seine	31.8	1.7	5.3	1.0	46.3%	8.5%	10.0%	—
Nearshore finfish–live	8.5	4.9	1.0	n/a	13.3%	12.6%	17.5%	10.6%
Salmon–troll	26.3	15.7	0.8	1.0	7.4%	10.2%	11.3%	3.9%
Spot prawn–trap	*	*	*	*	*	*	*	*

Source: Current study

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Additionally, for each fishery they participated in fishermen were asked if they had added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. If they had answered yes to any of these questions, they were additionally asked an open-ended question as to why added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. These questions were asked to investigate if fishermen have entered fisheries to diversify their fishing portfolio or if they had left fisheries and the factors driving those decisions. Furthermore, some fishermen may not drop a fishery entirely and participate in the fishery on and off across the years. If this was the case we also sought to investigate the reasoning behind this situation such as fishery closures or regulatory complications. Most fishermen fell into the 'none of the above' category, which is not shown in the table below, but makes up the remainder of the reported percentages.

Several fishermen reported they had added a fishery since 2006, none reported dropping and two reported not fishing Dungeness crab–trap in 2010. One fisherman indicated they had added a fishery due to changes in fish populations and two indicated they were new to commercial fishing (Table 200 and Table 201).

Table 200. Commercial fisheries added/dropped since 2006 or not fished in 2011, Moss Landing/Monterey

Fisheries	Number responding	Added	Dropped	Not fished in 2011
California halibut–hook & line	2	*	*	*
Coastal pelagic species–seine/net	4	—	—	—
Dungeness crab–trap	4	25.0%	—	50.0%
Market squid–seine	4	—	—	—
Nearshore finfish–live	3	66.7%	—	—
Salmon–troll	5	20.0%	—	—
Spot prawn–trap	2	*	*	*

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

Table 201. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Monterey/Moss Landing

Responses	Dungeness crab–trap	Nearshore finfish–live
Started commercial fishing	1	1
Change in fish population	1	—
Diversify fisheries	—	—
Was able to obtain permit	—	—
High costs	—	*
Total number responding	2	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked for each fishery separately to compare the success of his/her fishery in 2011 to the success of his/her fishery in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse.

Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

All of the fishermen in the market squid–seine fishery indicated that their success in the fishery was either significantly better or somewhat better than prior years. One of the nearshore finfish–live fishermen interviewed indicated that 2011 was better than years before and another indicated it was the same. Additional responses are shown below in Table 202.

Table 202. Overall success in specific commercial fishery compared to previous five years, Moss Landing/Monterey

Fisheries	Number responding	Did not participate in previous seasons	Percent response				
			Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
California halibut–hook & line	2	*	*	*	*	*	*
Coastal pelagic species–seine/net	4	—	25.0%	—	25.0%	25.0%	25.0%
Dungeness crab–trap	4	25.0%	75.0%	—	—	—	—
Market squid–seine	4	—	75.0%	25.0%	—	—	—
Nearshore finfish–live	2	—	50.0%	—	50.0%	—	—
Salmon–troll	4	—	25.0%	—	—	25.0%	50.0%
Spot prawn–trap	2	*	*	*	*	*	*

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen in Monterey and Moss Landing expressed several regulatory issues/factors which impacted their fisheries (Table 203). Several noted inefficiencies and inconsistencies in fishery regulations. Market squid–seine and coastal pelagic species–seine/net fishermen noted that the coast wide quota on these fisheries often favors one state over the other. Additionally, the system also creates a ‘race mentality’ where fishermen are competing to catch as much fish as possible before quota limits are reached. Several fishermen, including all market squid–seine respondents, indicated that direct impacts from MPAs had an effect on the success of their fisheries. Additionally, market squid–seine and spot prawn–trap fishermen mentioned that there was ambiguity over the status of several MPAs. They indicated they would like to see more communication around these fishing area closures.

Table 203. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey

Response	Number responding						
	California halibut—hook & line	Coastal pelagic species—seine/net	Dungeness crab—trap	Market squid—seine	Nearshore finfish—live	Salmon—troll	Spot prawn—trap
MPA impacts	*	1	2	4	—	—	*
Insufficient monitoring/enforcement/communication of MPAs	*	1	2	—	—	—	*
Trawlers impacting nearshore fleet	*	—	—	—	—	—	*
Quota limit issues	*	4	—	1	—	1	*
Concentration of fishing effort into smaller areas/over-crowding	*	—	—	—	1	—	*
Less competition	*	—	—	—	1	—	*
Inefficiencies in bycatch regulations	*	1	—	—	—	—	*
Inefficiencies/inconsistencies in fishery regulations	*	4	1	3	—	2	*
Inequities in fishery regulations	*	1	2	2	—	—	*
Loss of historical fishery knowledge	*	—	1	1	—	—	*
Inadequate research for policy	*	—	—	1	—	—	*
Inequities in obtaining fishery permits	*	—	—	—	—	—	*
Insufficient regulation on land-based impacts to fisheries	*	—	—	—	—	1	*
Lack of influence on policy/regulation development	*	—	1	—	1	—	*
Insufficient communication of fishery regulations	*	—	1	—	—	—	*
Populations recovering from fishing gear ban	*	—	—	—	—	—	*
Distress around unintended infractions	*	1	—	3	—	—	*
Increased number of fishermen participating in the fishery	*	—	—	—	—	—	*
Increased personal fishing effort	*	—	—	—	—	—	*
Rockfish conservation area (RCA)	*	—	—	—	1	—	*
Total number responding	*	4	2	4	1	2	*

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Environmental factors influencing the success of the fisheries are found below in Table 204. Market squid–seine fishermen noted an increase in fish abundance and catch, but also noted an increase in predator species such as seals and otters. Additionally, salmon–troll fishermen reported a decrease in habitat and water quality, citing land based water management issues such as agricultural and residential irrigation harming salmon spawning grounds.

Table 204. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey

Response	Number responding				
	Coastal pelagic species–seine/net	Dungeness crab–trap	Market squid–seine	Salmon–troll	Spot prawn–trap
Increase in bait fish	—	—	—	—	*
Increase in fish abundance	1	2	1	—	*
Stable fish abundance	—	1	1	—	*
Increase in catch	—	2	1	—	*
Decrease in catch	—	—	—	—	*
Increase in predators	—	—	1	—	*
Good weather	1	—	—	—	*
Biomass of fish largely in MPAs	—	—	1	—	*
PG&E seismic testing impacts	—	—	—	—	*
Decrease in habitat or water quality	—	—	—	3	*
Decrease in fish abundance	—	—	—	3	*
Change in normal water temp	—	1	—	—	*
Fish population moved further offshore	—	—	—	—	*
Decrease in fish size	—	—	—	—	*
Farmed fish spreading disease	—	—	—	—	*
Protected species overpopulated	—	—	1	—	*
Total number responding	2	2	3	3	*

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Although less common, a few economic factors were mentioned. They are shown below in Table 205.

Table 205. Economic changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey

Response	Number responding					
	Coastal pelagic species– seine/net	Dungeness crab– trap	Market squid– seine	Nearshore finfish–live	Salmon–troll	Spot prawn– trap
Increased number of fishermen participating in the fishery	—	—	—	—	—	*
Increase in operating costs	—	—	—	1	—	*
Increase in fish price	1	—	1	—	—	*
Decrease in fish price	—	—	—	—	—	*
Market flooded	—	—	—	—	—	*
Longer season allowed increase in catch	—	1	—	—	1	*
Increased demand for fish	—	—	1	—	—	*
Decrease in demand for fish	—	—	—	1	—	*
Increased personal fishing effort	—	—	—	—	—	*
Increased number of outside vessels fishing in local grounds	—	—	—	—	—	*
Lack of port infrastructure	—	—	—	—	—	—
Increase in travel distance	—	1	—	—	—	*
Total number responding	1	2	2	2	1	*

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

5.2.3. Moss Landing/Monterey CPFV Fisheries Initial Changes

This section provides a summary and analysis of California Department of Fish and Game (CDFG) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the Central Coast Region by CPFV operators from ports outside the Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each species/fishery
6. Total number of trips for multiple species/fishery combo trips
7. Percent change in total number of vessels, trips, and anglers in pre and post MPA periods

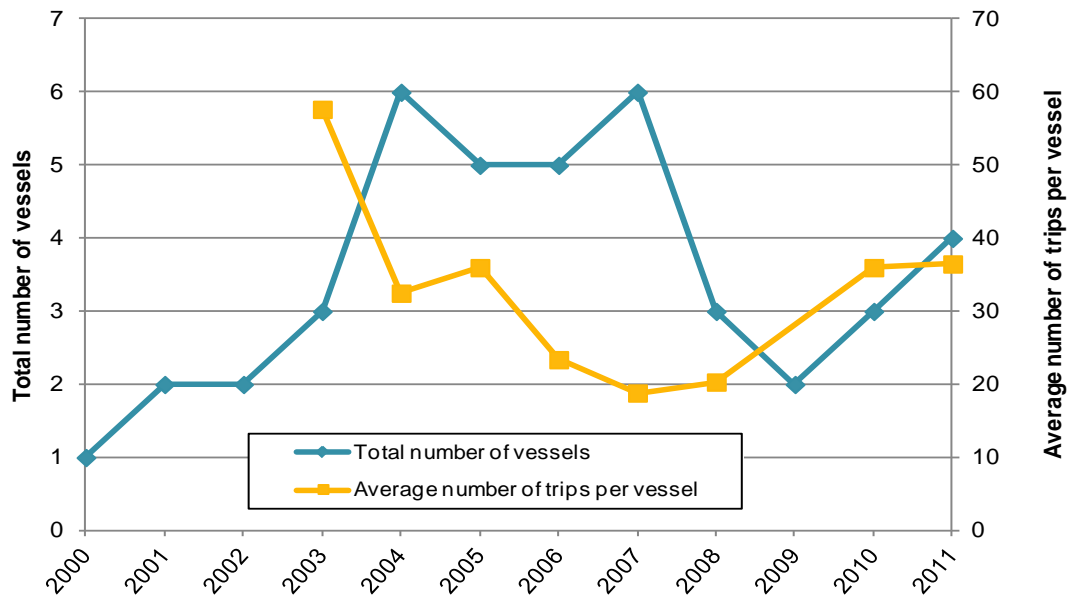
CPFV operators are required to complete and submit a log to the CDFG for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Game Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish. For a more detailed description of how CPFV logbook data was utilized in this analysis please see section 4.5.

Moss Landing

In the early 2000s, only a few vessels operated out of Moss Landing (Figure 113). Then, from 2004 through 2007, several additional vessels provided charter trips from this port. However, the average number of trips per vessel decreased during these four years, resulting in an overall decrease of 35 percent in the total number of trips by 2007 (Figure 114). Since the average number of anglers per trip also showed a general decreasing trend through this time, the total number of anglers also dropped (Figure 115). The average number of anglers per vessel dropped as well.

Vessel numbers dropped to just three vessels in 2008 and two in 2009, but then increased back to four vessels by 2011. All the other metrics also increased in varying degrees over the last few years of the study period.

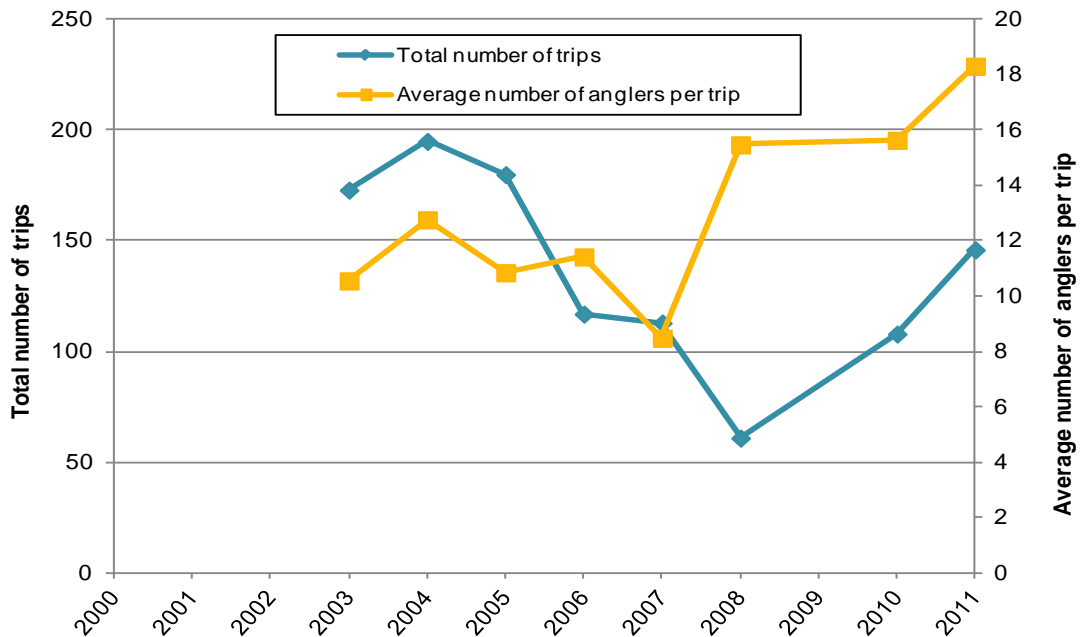
Figure 113. Total number of CPFV vessels and average number of trips per vessel, Moss Landing, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

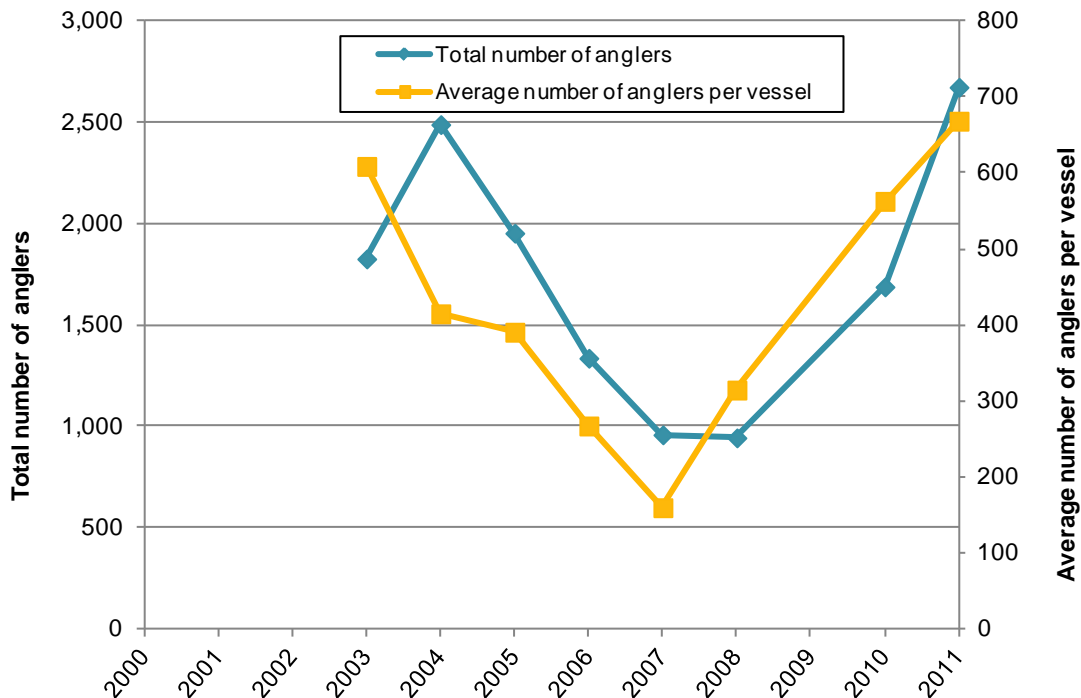
Figure 114. Total number of CPFV trips and average number of anglers per trip, Moss Landing, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 115. Total number of CPFV anglers and average number of anglers per vessel, Moss Landing, 2000-2011



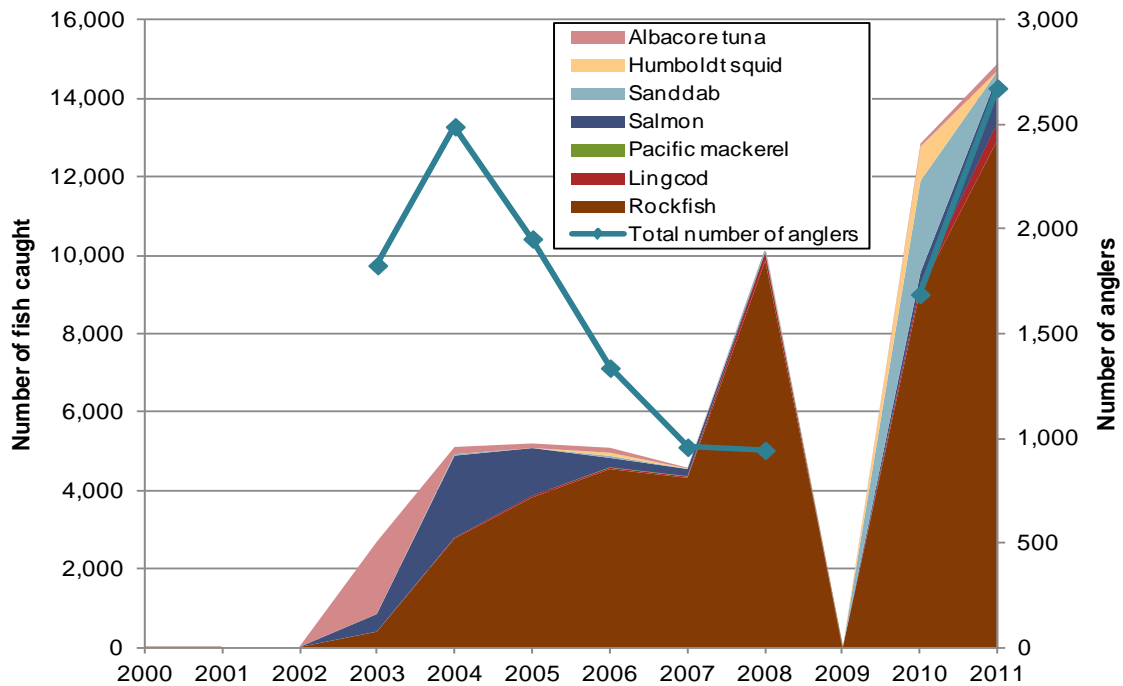
Source: CDFG CPFV logbook data

The trend in the number of fish caught was not similar to the total number of anglers (Figure 116). Catch increased between 2003 and 2004, stayed relatively stable in 2005 through 2007 and then increased in 2008. During the last two years, the number of fish caught increased over 450 percent between 2003 and 2011.

The primary fishes taken by CPFVs in 2003 were albacore tuna and salmon followed by rockfish (The vast majority of trips at this time primarily targeted the first two species (Figure 117). The influx of additional vessels in 2004 primarily targeted albacore tuna and salmon, but the take of these species dwindled between 2004 and 2007. Meanwhile, the number of rockfish trips and the number of rockfish caught increased such that most of the catch in 2006 and 2007 was rockfish. The small number of vessels that remained in Moss Landing after 2007 continued to primarily take rockfish, but sanddabs and Humboldt squid also were taken. Also in 2010 and 2011 (after the 2008 and 2009 salmon closures), an increase was observed in the number of trips catching salmon.

Only a few salmon-rockfish trips and rockfish-halibut trips were observed during the study period (Figure 118). A number of sanddab-rockfish trips also occurred 2011, but these trips only represented 29 percent of the sanddab trips.

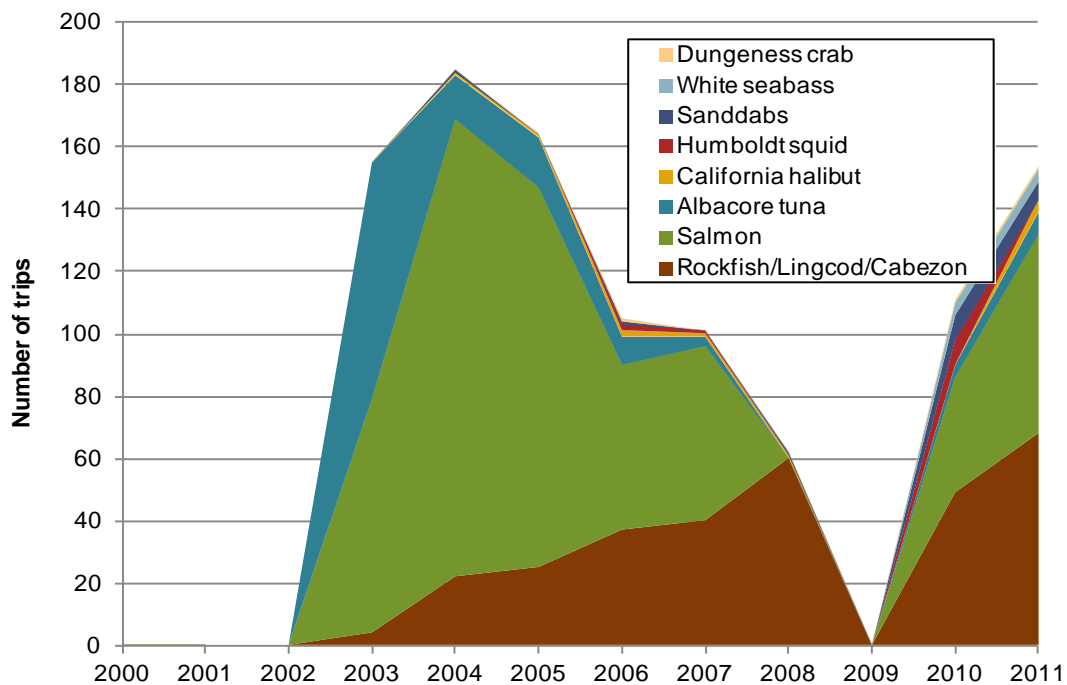
Figure 116. CPFV total number of fish caught for each fishery, Moss Landing, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicate the data were suppressed to protect confidential data

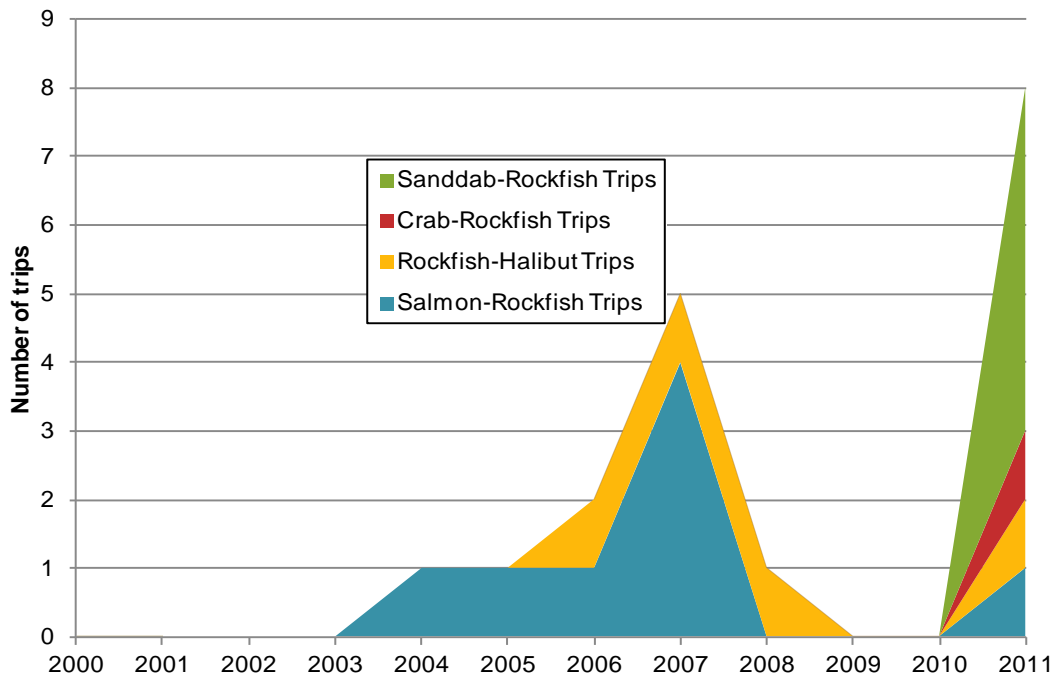
Figure 117. Total number of CPFV trips for each fishery, Moss Landing, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 118. Count of select multiple species CPFV trips, Moss Landing, 2000-2011



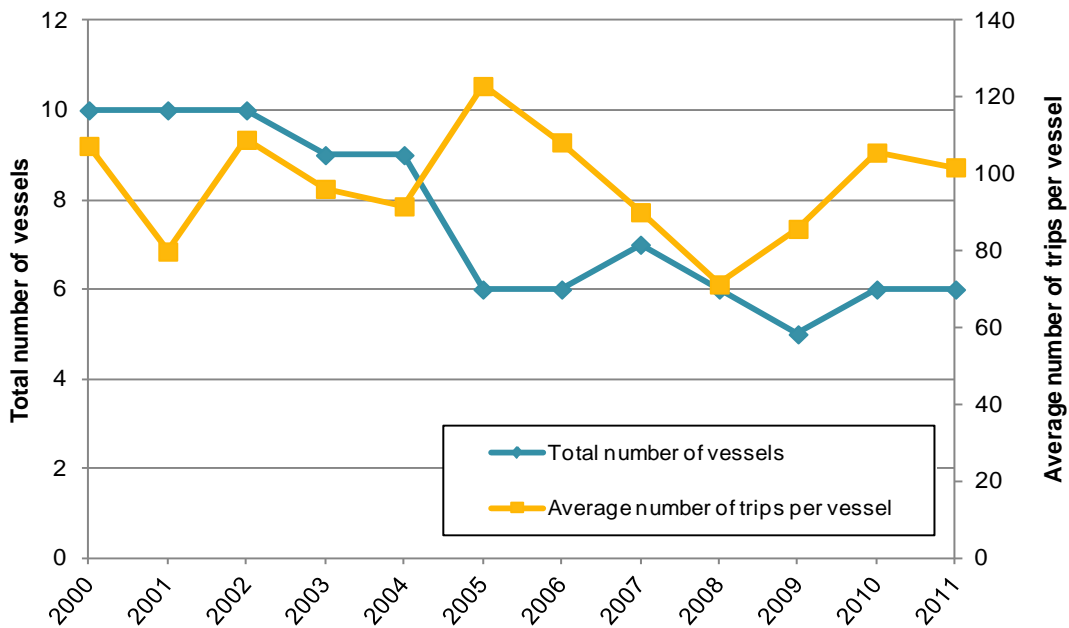
Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Monterey

The total number of CPFVs in Monterey remained relatively stable during the first several years, then dropped by 33 percent between 2004 and 2005, after which this number stayed relatively stable (Figure 119). The average number of trips per vessel fluctuated over the entire study period, reaching its highest level in 2005, its lowest level in 2008, and moving back by 2011 to about the same level as in 2000. Due to the stable number of boats, the total number of trips during the first several years initially reflected the fluctuations observed in the average number of trips per vessel (Figure 119). The total number of trips then declined to a low in 2008 and 2009 (coincidental with the salmon closures), followed by a small increase. Interestingly, the average number of anglers per trip remained fairly stable over the entire time period (Figure 120). Because of this, the changes observed in the total number of anglers (Figure 121) were similar to those observed for the total number of trips (Figure 8), and the decreases observed for the total number of trips and the total number of anglers between 2000 and 2011 were similar, 43 percent and 47 percent respectively. Due to the stable average number of anglers per trip, the changes in the average number of anglers per vessel (Figure 121) also reflected those observed in the average number of trips per vessel (Figure 119).

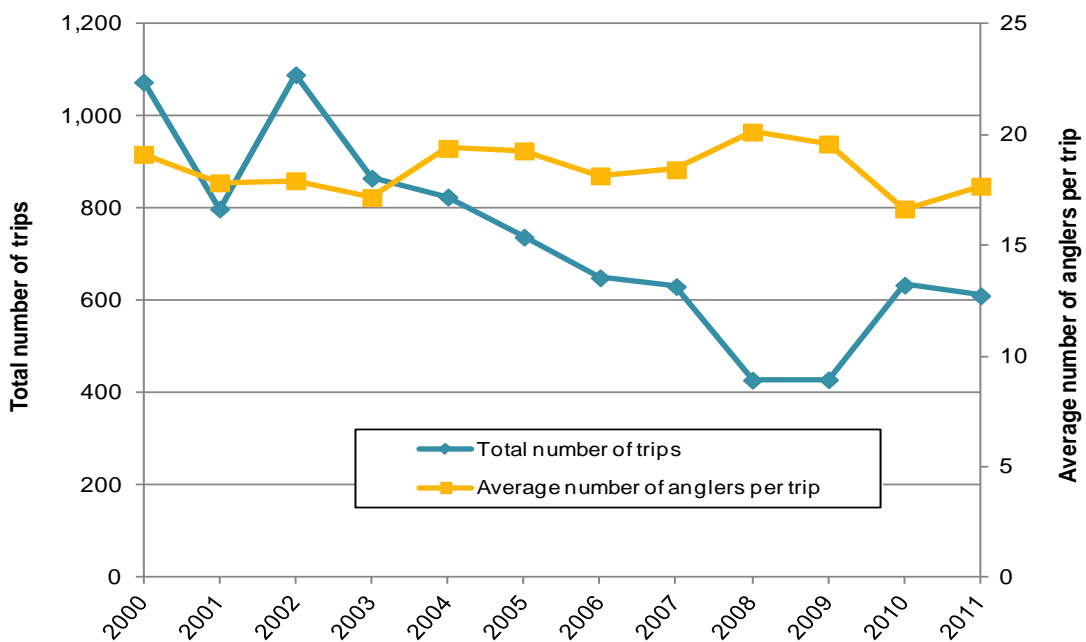
Figure 119. Total number of CPFV vessels and average number of trips per vessel, Monterey, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

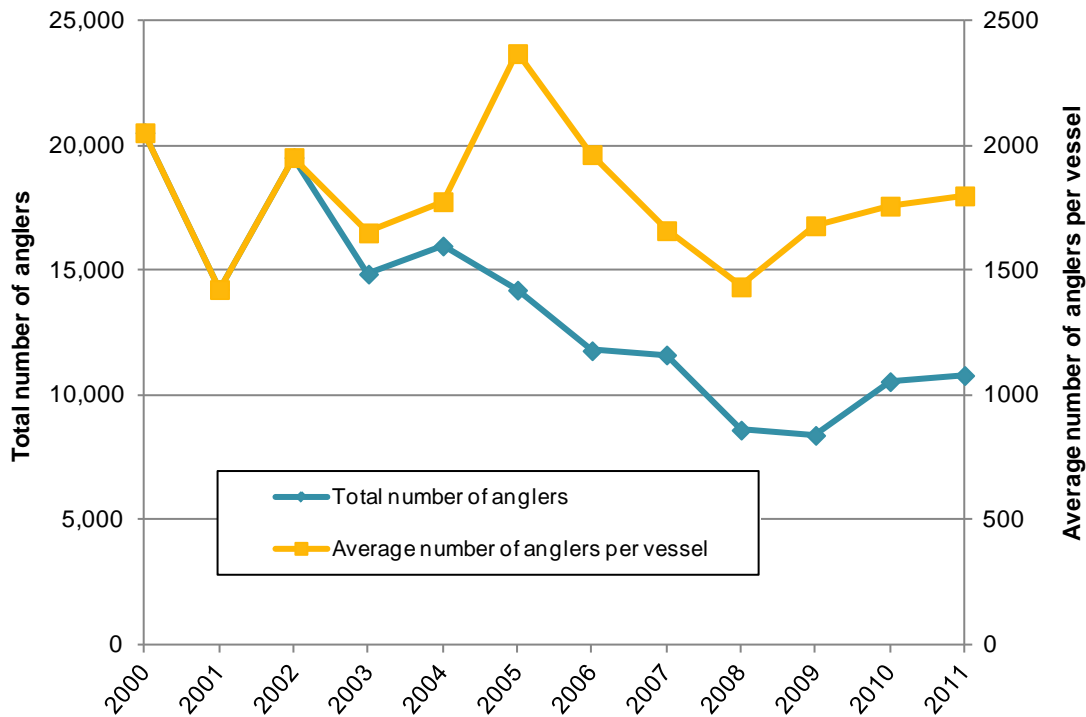
Figure 120. Total number of CPFV trips and average number of anglers per trip, Monterey, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 121. Total number of CPFV anglers and average number of anglers per vessel, Monterey, 2000-2011



Source: CDFG CPFV logbook data

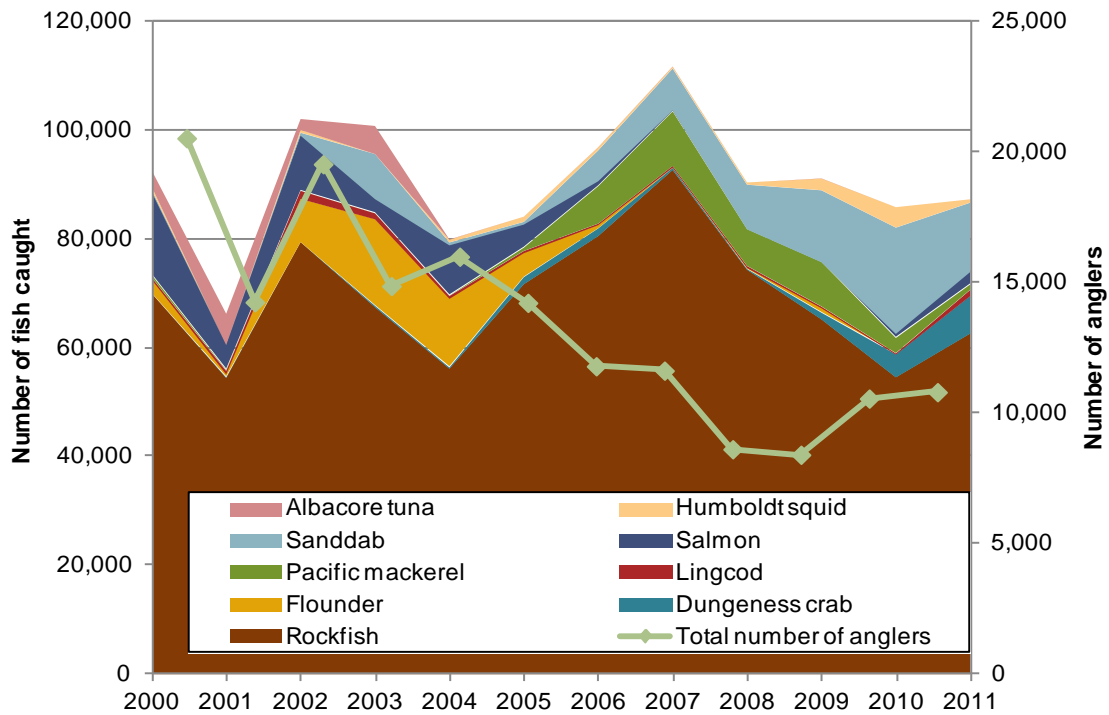
Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

The trend in the number of fish caught was not similar to the total number of anglers (Figure 122). Dips in catch were observed in 2001, 2004, and to a lesser extent, 2010. As noted for Santa Cruz, 2004 was the year with the most restrictive rockfish regulations during the entire study period (7-month closure with the remaining five months under a depth restriction). Peaks were observed in 2002 and 2007. Overall, the number of fish caught in 2011 was similar to that observed in 2000.

The most prevalent species/species group taken by Monterey CPFVs in the early 2000s was rockfish, followed by salmon, albacore tuna, and flounder (Figure 122). California halibut were taken, but the take over the entire period was less than 1 percent of the total number of fish caught. In addition to these species/species, a few trips also took white seabass (Figure 123). Starting in 2002, about the time that major changes occurred in rockfish regulations, trips for crabs (primarily Dungeness crab), sanddabs, and Humboldt squid also began to increase. In addition to these species, more Pacific mackerel also was observed in the overall catch. Meanwhile, salmon, albacore tuna, and California halibut trips decreased such that by 2006 and 2007, more trips were taken for rockfish than for any other species. In addition, salmon-rockfish trips, which were important in the early 2000s, decreased, while sanddab-rockfish, crab-rockfish, and crab-sanddab trips increased (Figure 124).

Rockfish catch climbed to a high in 2007, but then dropped over the next four years. The number of rockfish trips also dropped slightly during this time period, but the number of sanddab, crab, and Humboldt squid trips climbed. Trips with sanddab-rockfish, crab-rockfish, and crab-sanddab also climbed during this latter part of the study period (2008-2011). The sanddab-rockfish and crab-sanddab trips represented 41 percent and 24 percent, respectively, of the total sanddab trips, while the crab-rockfish trips represented 43 percent of the crab trips. Due to these increased trips, the catches for all of these species increased and the total catches for Monterey stayed high.

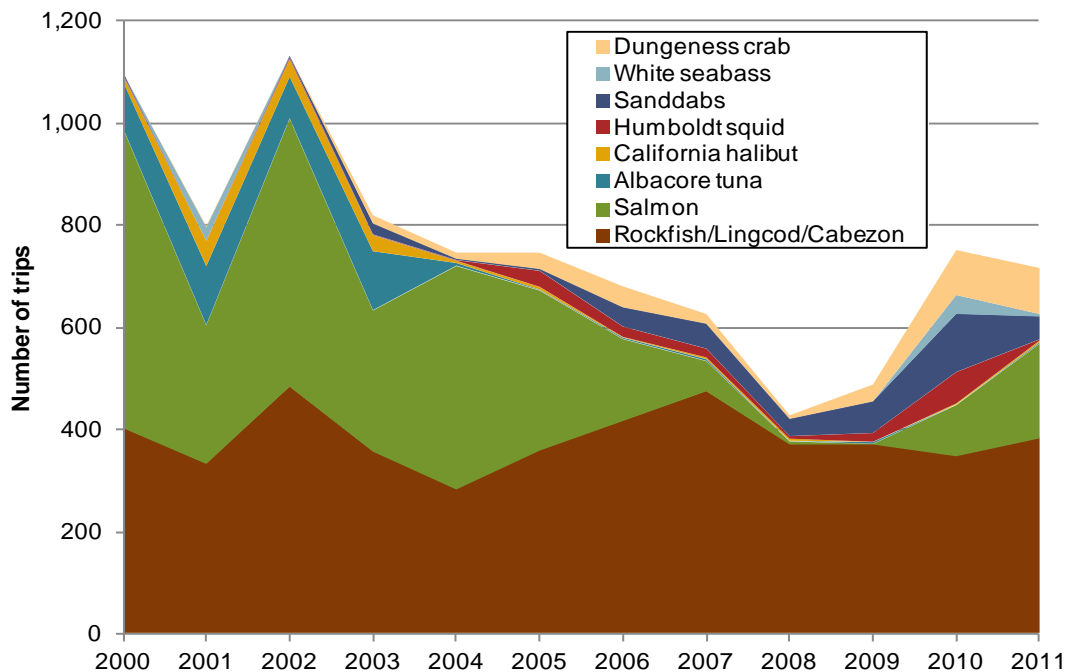
Figure 122. CPFV total number of fish caught for each fishery, Monterey, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

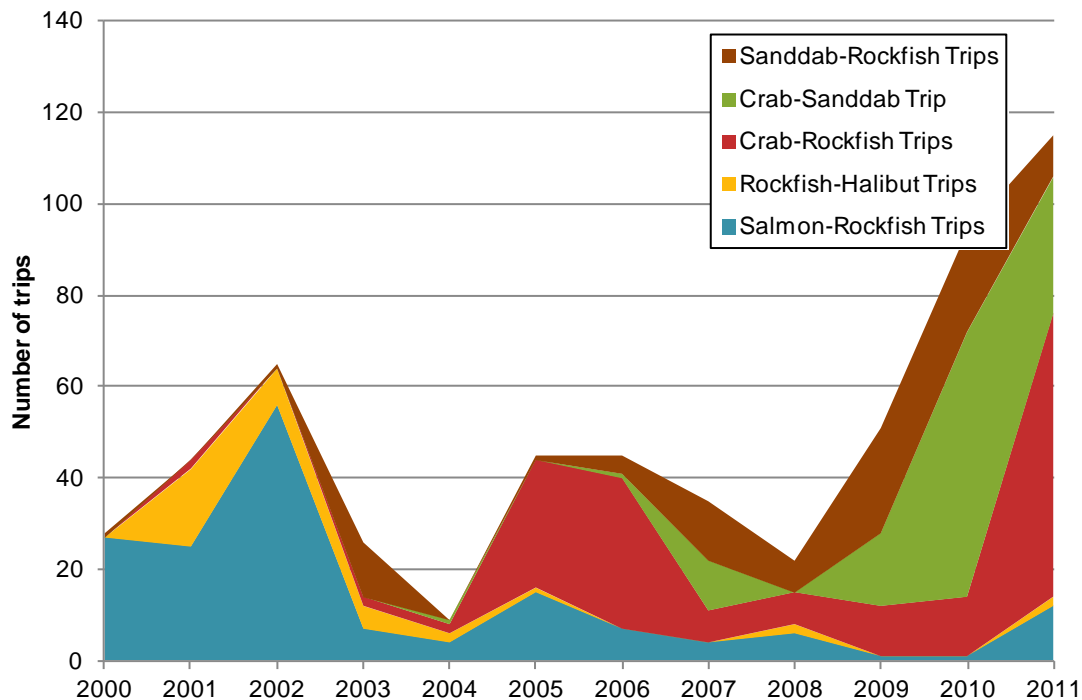
Figure 123. Total number of CPFV trips for each fishery, Monterey, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 124. Count of select multiple species CPFV trips, Monterey, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

5.2.4. Moss Landing/Monterey CPFV Fisheries Baseline Characterization

The majority of the individuals we interviewed in Moss Landing and Monterey were hired captains (4 individuals) and were the only ports reporting hired captains. Additionally, we interviewed 2 owners and one owner/operator. The average CPFV respondent was 60.6 years old, has owned CPFV vessels for 29.7 years (if applicable), and operated them for 29.4 years (if applicable.) Additionally there was slight decrease in the average percent of total income derived from CPFV operations, but it was much less than other ports.

Table 206. CPFV survey response statistics, Moss Landing/Monterey

	Response	Standard deviation
Individuals interviewed	7	—
Hired captain	4	—
Owner and captain	1	—
Owner only	2	—
Average age	60.6	9.3
Average number of years owning CPFV boat/s	29.7	20.5
Average number of years operating CPFV boat/s	29.4	17.2
Average percent income from CPFV operations in 2011	89.3%	28.3%
Number of those interviewed who were operating in 2006	6	—
Average percent income from CPFV operations in 2006	91.7%	20.4%

Source: Current study

After reporting the percent of their income from commercial fishing for 2006 and 2011, fishermen who reported a change between the two years were asked to describe factors to which they attributed this change. This was posed as an open-ended question and respondents were encouraged to speak freely as the interviewer took notes on key aspects that were mentioned. After the interview, the notes were coded and summarized into the categories which are shown below. One respondent was not in operation in 2006; another cited economic decline, increased regulation, and an increase in operating costs as the reason for the decline in the proportion of their total income from CPFV operations.

Table 207. Cause of change in percent income from CPFV operations from 2006 - 2011, Moss Landing/Monterey

Response	Number responding
Began business after 2006/wasn't participating	1
Economic decline	1
Increase in regulation	1
Increase in operation cost	1
Decrease in clients	—
Negative public impression of fishing	—
Inability to provide consistent employment	—
Total number responding	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the fishery was not sampled in a particular port

The average gross economic revenue (GER) earned from CPFV operation from Moss Landing/Monterey for both 2006 and 2011 were greater than the Central Coast Region average. However, there was a \$47,000 decrease in GER over those two years. The average percent of GER that was used for crew, fuel, and all other operating costs are shown below in Table 208.

Table 208. Average CPFV gross economic revenue (GER) to operating costs, Moss Landing/Monterey

	Average response	Standard deviation
Total GER 2011	\$148,000	\$104,678
% GER to crew	26.4%	9.5%
% GER to fuel	29.0%	7.3%
% GER to other operating costs	31.6%	12.0%
Total GER 2006	\$195,000	\$151,327

Source: Current study

Four respondents cited an increase in regulation as a factor contributing to their decrease in GER from 2006 to 2011. Additional reasons, show below in Table 209, include economic decline, decrease in fish quality, and a decrease in the number of clients.

Table 209. Cause of change in CPFV gross economic revenue (GER) from 2006 to 2011, Moss Landing/Monterey

Response	Number responding
Began business after 2006	—
Economic decline	3
Increase in regulation	4
Decrease in quality of fish	2
Fishing effort condensed	2
Increase in operation cost	1
Decrease in clients	3
Didn't participate in 2006	1
Traveling farther distances	1
Negative public impression of fishing	—
Total number responding	5

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Of the five operations we interviewed, four operations offer consumptive and non consumptive trips and one offers only consumptive trips. Consumptive trip and fishing trips and non consumptive trips are trips such as whale watching, leisure cruises, or nature cruises. The average consumptive trip in Moss Landing/Monterey is \$85, which is \$40 less than the Central Coast Region average (\$125). Non consumptive trips were also less expensive in Moss Landing/Monterey than elsewhere in the region. Additionally, Moss Landing/Monterey reported taking more trips of both types than anywhere else in the region (Table 210).

Table 210. CPFV trip statistics, Moss Landing/Monterey

	Consumptive trips		Non consumptive trips	
	Response	Standard deviation	Response	Standard deviation
Number of people reporting trips	5	—	4	—
Average number of trips per vessel	131.0	86.6	112.5	51.9
Average number of passengers(per trip)	14.6	6.2	22.0	6.7
Average price per passengers (per trip)	\$85	\$21	\$30	\$2
Average number of crew (per trip)	1.0	—	1.0	—

Source: Current study

— indicates that the port/fishery was not sampled or a zero value data point

CPFV operators reported spending on average the largest number of days whale watching which also generated nearly half (49.5 percent) of their overall GER. Rockfish/lingcod fishing was the next most frequent trip generating 44.2 percent of an average operators GER (Table 211).

Table 211. CPFV fishery/activity specific data, Moss Landing/Monterey

	Fishery	Individuals interviewed	Number of days targeting species (2011)		Percent of GER from fishery/activity (2011)	
			Average	Standard deviation	Average	Standard deviation
Fishery	Albacore tuna	1	*	*	*	*
	California halibut	2	*	*	*	*
	Dungeness crab	2	*	*	*	*
	Humboldt squid	1	*	*	*	*
	Rockfish/lingcod	5	110.6	71.6	44.3%	13.7%
	Salmon	5	50.0	43.4	18.3%	10.4%
	Sanddab	3	33.7	41.2	1.0%	n/a
	White sea bass	3	3.3	0.6	3.0%	2.8%
Activity	Whale watching	4	115.0	50.7	49.5%	0.7%
	^Other	3	10.0	4.6	1.0%	n/a

Source: Current study

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

* indicates data were collected but cannot be shown due to confidentiality constraints

Fishermen were asked for each fishery/activity separately to compare the success of his/her fishery/activity in 2011 to that in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse.

Of the four rockfish/lingcod CPFV operators who provided a response, three indicated the fishery was doing significantly worse in 2001 and one responded that it was somewhat better.

Table 212. Overall success of CPFV fishery/activity compared to past five years, Moss Landing/Monterey

		Number responding	Did not participate in previous seasons	Number responding				
				Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	Albacore tuna	1	*	*	*	*	*	*
	California halibut	2	*	*	*	*	*	*
	Dungeness crab	2	*	*	*	*	*	*
	Humboldt squid	1	*	*	*	*	*	*
	Rockfish/lingcod	4	—	—	25.0%	—	—	75.0%
	Salmon	4	—	50.0%	50.0%	—	—	—
	Sanddab	3	33.3%	—	33.3%	33.3%	—	—
	White sea bass	3	—	66.7%	—	—	33.3%	—
Activity	Whale watching	4	—	—	—	50.0%	50.0%	—
	^Other	3	33.3%	—	—	66.7%	—	—
All target fisheries/ activities		27	7.4%	18.5%	22.2%	25.9%	11.1%	14.8%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were then asked what factors they felt had contributed to their level of success in his/her fishery/activity. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

Several respondents included impacts from MPAs as primary regulatory factors influencing the success of their fishery; indicating they felt it was forcing fishermen into smaller areas. Additionally, some cited that the current bycatch regulatory system was inefficient as it often forced fishermen to throw back fish that would likely not survive. A variety of environmental factors were mentioned (Table 214) including an increase in bait fish (which has benefitted the white seabass fishery), an increase in fish abundance (salmon), and a decrease in fish abundance (rockfish/lingcod). Those conducting whale watching trips noted that adding this activity to their portfolio had been a major reason they were able to stay a economically viable operation in the past few years (Table 215).

Table 213. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey

Response	Number responding		
	Rockfish/ lingcod	Salmon	Sanddabs
MPA impacts	3	—	1
Insufficient monitoring/enforcement/communication of MPAs	1	—	—
Concentration of fishing effort into smaller areas/over-crowding	3	—	—
Inefficiencies in bycatch regulations	1	—	—
Inefficiencies/inconsistencies in fishery regulations	—	—	—
Inequities in fishery regulations	2	1	—
Inadequate research for policy	2	—	—
Distress around unintended infractions	1	1	—
Rockfish Conservation Area (RCA)	1	—	—
Total number responding	5	1	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 214. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Monterey/ Moss Landing

Changes	Rockfish/ lingcod	Salmon	Sanddab	White seabass
Increase in bait fish	—	—	1	2
Increase in fish/whale abundance	—	2	—	—
Stable fish abundance	1	—	1	—
Increase in catch	—	—	—	1
Decrease in catch	—	—	—	—
Increase in fish size	—	—	—	—
Decrease in habitat or water quality	—	1	—	—
Decrease in fish abundance	2	—	—	—
Protected species overpopulated	—	—	—	—
Total number responding	3	2	1	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Table 215. Economic changes/factors influencing success in specific commercial fishery in previous five years, Moss Landing/Monterey

Response	Whale watching
Increased regulation forced fishery/activity diversification	1
Increase in clients	—
Decrease in clients	—
Increase in concentrated fishing effort affecting catch size/rate	—
General economic decline	1
Increased number of fishermen participating in the fishery	—
Increase dependence on walk-in business	1
Total number responding	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

5.3. Morro Bay

Commercial fishing has been conducted in Morro Bay since at least the 1930s when the sardine fishery experienced a boom period from the 1930s to the 1950s. During the early 1950s, as the sardine fishery was declining, deep-water groundfish trawling developed in popularity (Pettersen et al. 2010). This fishery was important to shaping the ex-vessel revenue profile of Morro Bay through the late 1990s (Lisa Wise Consulting 2008). Trawl fleets generated large amounts of revenue in the port; both through sale of fish landings and through consumption of products such as ice and fuel. As trawl fishing became increasingly regulated and restricted with less vessel operating out of the port of Morro Bay—port infrastructure services loss significant revenue sources. With the decrease of commercial fishing presence, the City of Morro Bay has implemented several measures to assist the commercial fishing economy. The City has provided funds for infrastructure improvement, subsidized slip fees, and zoned a portion of the harbor's main street which prevent tourism development from dominating the area (Pettersen et al. 2010). As seen in Figure 128 amongst the eleven fisheries of interest the port of Morro Bay relies heavily upon ex-vessel revenue from the nearshore finfish—live—hook & line, salmon – troll fisheries, and spot prawn—trap fisheries. Figure 125 illustrates the port's ex-vessel revenue levels have almost recovered to revenue levels in the mid 1990s, however, the number of fishermen landing in the port remains comparatively low. A large contributing factor to the rise in ex-vessel revenue is from the spot prawn—trap fishery. This fishery has developed rapidly since 2004, and has grown to comprise approximately 17.0 percent of total ex-vessel revenue in the port in 2011. The overall increase in ex-vessel revenue in the port may also be due to rises in the ex-vessel prices as prices for all fisheries of interest in this port have increased since 1992, see Figure 130.

Although rockfish have become heavily regulated; the fishery still dominates the types of trips operated by the CPFV industry and number of fish caught as seen in Figure 142 and Figure 143. CPFV operations, like in other ports, have had to diversify their businesses in the face of increased regulation and economic downturn. For fishing trips, this had included combining sanddab and rockfish fishing into one trip. Non-consumptive activities such as whale watching have also begun to play a major role the CPFV businesses. Before the spatial restrictions, such as MPAs and the RCA, fishermen reported having the ability to rotate their fishing effort so as to not apply too much pressure in a fishing area. There is concern from the CPFV and commercial fishing community that this concentration of fishing effort may have negative impacts on fish stocks in remaining open fishing areas.

5.3.1. Morro Bay Commercial Fisheries Initial Changes

Morro Bay contributed 7 percent of total landings and 25.3 percent of total ex-vessel revenues to the Central Coast Region on average. Landings peaked early in the study period in 1993 at 10.5 million pounds, ex-vessel revenues peaked in 1995 at \$8.7 million, see Figure 125. Landings decreased overall from 1992 to 2011 by 57.1 percent; ex-vessel revenues on the other hand increased by 24.2 percent over the same time period. The number of fishermen declined significantly by 73.2 percent from 1992 to 2011 from 522 fishermen to 140. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

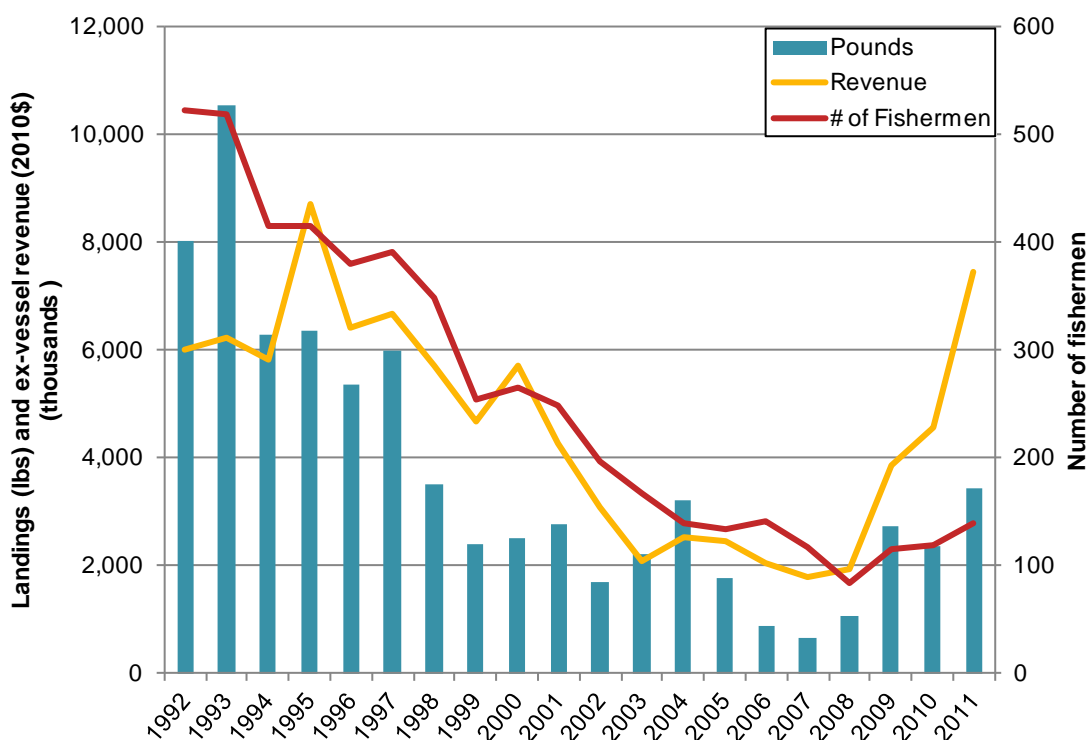
Figure 126 displays the percentage the eleven fisheries of interest represented of total landings and ex-vessel revenues made in the port over the study period. Fishery of interest landings and ex-vessel revenues regularly remained below 60 percent of all landings and ex-vessel revenues made in the port. Other significant fisheries to Morro Bay include the groundfish—bottom trawl, spot prawn—bottom trawl, sablefish—longline, and albacore tuna—troll fisheries. In 1992, groundfish—bottom trawl ex-vessel revenues constituted 40.7 percent of total ex-vessel revenues in Morro Bay at \$2.4 million. The sablefish—longline fishery, while constituting less than 1 percent of total ex-vessel revenues from 1992–2007, suddenly averaged approximately 33 percent (\$1.6 million) of total ex-vessel revenues in Morro Bay annually from 2008–2011. Similarly, the albacore tuna—troll fishery had a relatively larger average contribution to total ex-vessel revenues in Morro Bay during the four year period of 2000–2003, than other years in the study period (17.3 vs. 1.1 percent of total ex-vessel revenues). From 1994–2002, the spot prawn—bottom trawl fishery constituted an average of 19.9 percent of total ex-vessel revenues at \$981,378 on average annually. Ex-vessel revenues from swordfish were significant in Morro Bay for the years 2007 and 2011, as were ex-vessel revenues of hagfish in 2011.

Figure 127 and Figure 128 display the composition of landings and ex-vessel revenues for select fisheries of interest over 1992 to 2011⁹. Relative to other ports in the Central Coast Region, Morro Bay had a more diversified landings portfolio, notable is the near absence of the coastal pelagic species–seine/net fishery in this port. The market squid–seine fishery still had great impact in Morro Bay, constituting 7.7 percent of total landings over the study period. In years where market squid was scarce, the primary landed fisheries were salmon–troll (19.9 percent), nearshore finfish–live–longline (2.8 percent), and nearshore finfish–live–trap (1.1 percent).

Morro Bay's ex-vessel revenue portfolio for the eleven fisheries of interest over the study period is appears relatively diversified, but this is likely due to the majority of ex-vessel revenues occurring outside of the fisheries of interest. The top ex-vessel revenue contributors among the fisheries of interest were the nearshore finfish–live–longline fishery at 6.6 percent, the salmon–troll fishery at 5.9 percent, and the nearshore finfish–live–trap fishery at 4.3 percent. Notable is the rise the of the spot prawn–trap fishery, which represented less than one percent of total ex-vessel revenues in 1992, and 17.2 percent in 2011.

Figure 129 displays the average percent fishing income by fishery in Morro Bay for the eleven fisheries of interest. This figure displays changes in how much fishermen rely upon ex-vessel revenue from specific fisheries of interests relative to other fisheries of interest¹⁰. For Morro Bay, this figure more closely resembles the composition of ex-vessel revenues figure than observed for other ports.

Figure 125. Morro Bay total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011

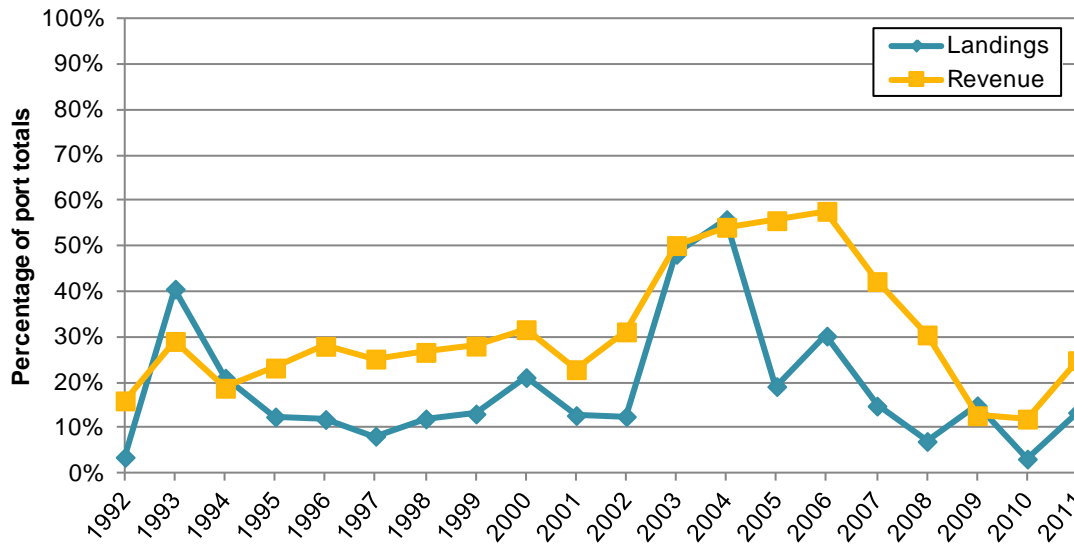


Source: Landings data from CDFG

⁹ Fisheries of interest were selected for display for compositional landings and ex-vessel revenue figures only if they constituted the top 95 percent of combined landings and ex-vessel revenues for all eleven fisheries of interest in the port over the study period on average. The remaining fisheries that were not selected for display likely wouldn't be visible on the compositional figures had they been included.

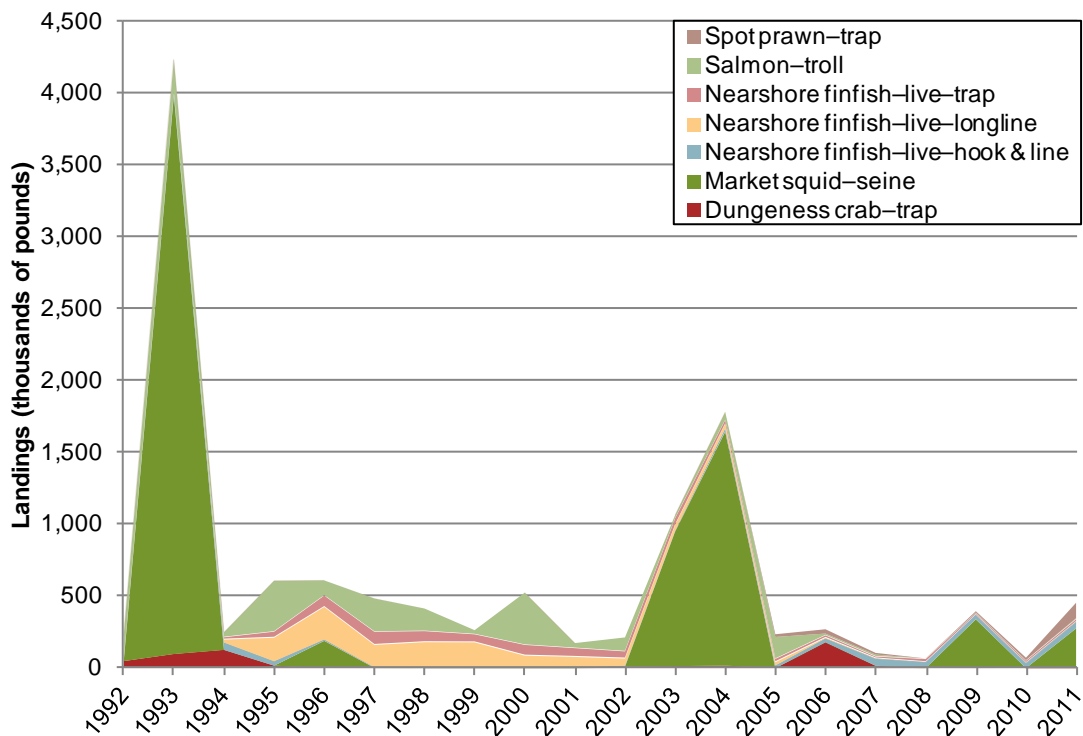
¹⁰ For more information on this figure, please see section 4.1.1.

Figure 126. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Morro Bay, 1992–2011



Source: Landings data from CDFG

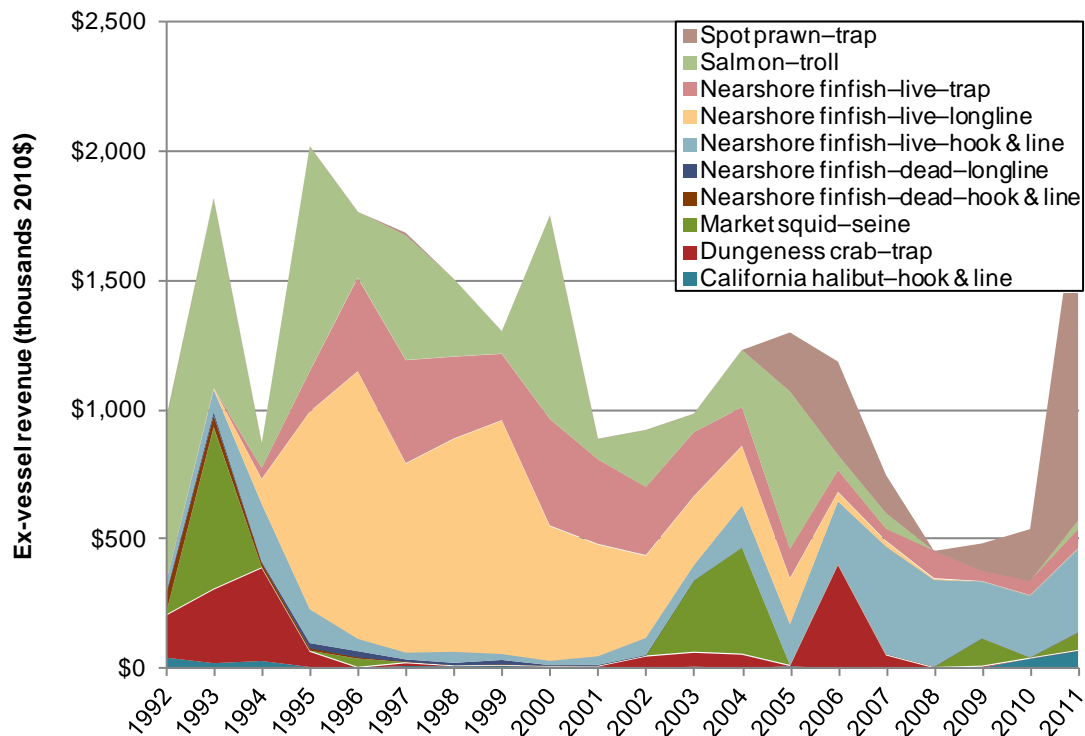
Figure 127. Morro Bay commercial landings for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

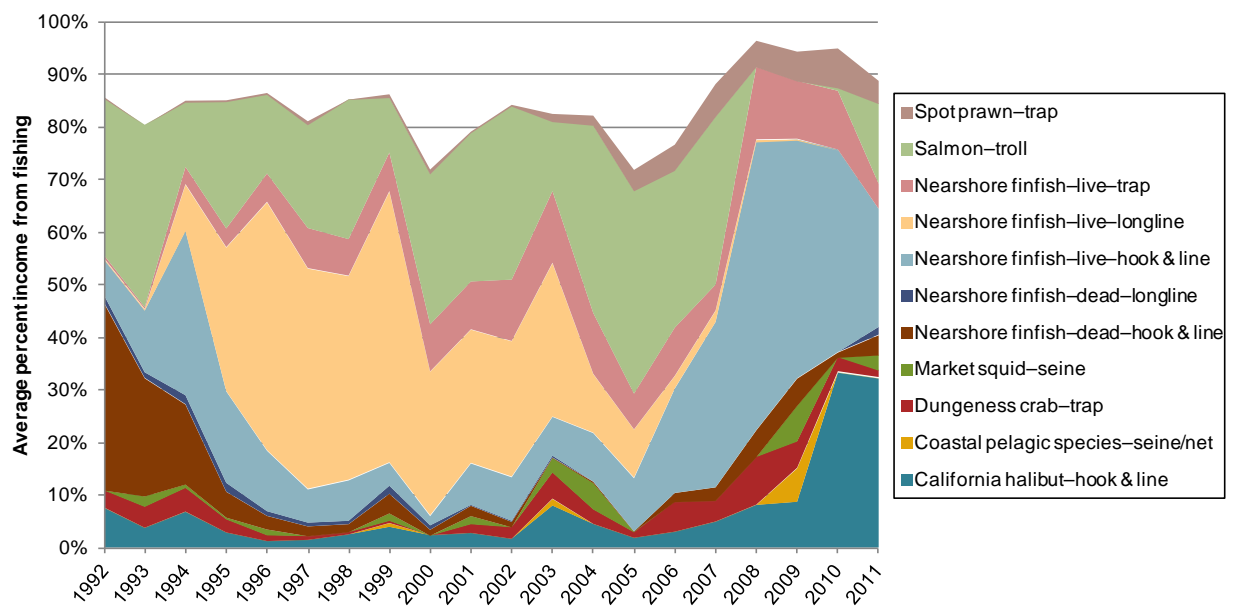
Figure 128. Morro Bay commercial ex-vessel revenues for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

Figure 129. Average percent of individual fishing income from commercial fisheries of interest, Morro Bay, 1992–2011



Source: Landings data from CDFG

Table 216 displays the percent change in total and average per fishermen ex-vessel revenues for each fishery in the port of Morro Bay as compared with the respective changes in the Central Coast Region over the study period. Significant fisheries of interest for the port of Morro Bay were the California halibut–hook & line, nearshore finfish–live–hook & line, nearshore finfish–live–trap fisheries.

While California halibut–hook & line ex-vessel revenues constituted only a small percentage of total ex-vessel revenues in Morro Bay, the port itself constituted 21.1 percent of total California halibut–hook & line landings in Central Coast Region annually over the study period. Ex-vessel revenues for this fishery significantly increased in Morro Bay (by 2222.2 percent) from 2008 to 2011, while increasing by 205.2 percent in the region as a whole over the same time. Similarly, average ex-vessel revenues per fishermen for Morro Bay California halibut–hook & line fishermen increased by 540.6 percent from 2008 to 2011, while increasing at only 17.8 percent in the Central Coast Region, despite the larger increase in number of fishermen participating in the fishery in Morro Bay than the increase at the Central Coast Region level.

The nearshore finfish–live–hook & line fishery also saw larger ex-vessel revenues increases in Morro Bay than at the Central Coast Region level. In 2011, Morro Bay nearshore finfish–live–hook & line total revenues were 1524.5 percent higher than they were in 2000 (\$325,764 and \$20,053 respectively); in the Central Coast region the associated increase was 111.4 percent. Average ex-vessel revenues per fishermen increased by 2093.1 percent from 2000 to 2011 in Morro Bay, and increased 298.8 percent at the Central Coast Region level over the same time. Although the number of fishermen participating in the nearshore finfish–live–hook & line fishery in Morro Bay did decrease from 2000 (27 fishermen) to 2011 (20 fishermen), and the average ex-vessel prices increased slightly (by 6.8 percent), the majority of the considerable increases in ex-vessel revenues comes primarily from larger landings volumes made in the port.

While at a smaller scale, total and average per fishermen ex-vessel revenues in the nearshore finfish–dead–hook & line fishery were also much higher in Morro Bay than in the Central Coast region as a whole over the study period.

Table 216. Morro Bay: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011

Fishery	Commercial ex-vessel revenue	Percent change			2000-2011
		Pre MPA (2000-2003)	Pre MPA (2004-2007)	Post MPA (2008-2011)	
California halibut–hook & line	Morro Bay total	12.8%	-64.0%	2222.2%	777.4%
	Morro Bay average per fisherman	28.9%	-48.5%	540.6%	384.1%
	Central Coast Region total	85.6%	-66.6%	205.2%	103.9%
	Central Coast Region average per fisherman	33.2%	-9.8%	17.8%	23.1%
Dungeness crab–trap	Morro Bay total	—	-3.0%	*	*
	Morro Bay average per fisherman	—	-22.4%	*	*
	Central Coast Region total	313.7%	189.7%	165.3%	864.0%
	Central Coast Region average per fisherman	175.8%	189.7%	107.3%	623.0%
Market squid–seine	Morro Bay total	—	—	—	—
	Morro Bay average per fisherman	—	—	—	—
	Central Coast Region total	314.6%	-99.8%	*	217.7%
	Central Coast Region average per fisherman	115.3%	-98.4%	*	114.4%
Nearshore finfish–dead–hook & line	Morro Bay total	-60.4%	88.8%	68.6%	165.0%
	Morro Bay average per fisherman	-36.0%	37.3%	68.6%	142.0%
	Central Coast Region total	-12.9%	-6.3%	-11.6%	12.4%
	Central Coast Region average per fisherman	42.0%	4.5%	-5.6%	77.2%
Nearshore finfish–dead–longline	Morro Bay total	-35.2%	-99.1%	—	—
	Morro Bay average per fisherman	-19.0%	-95.4%	—	—
	Central Coast Region total	-31.2%	-92.3%	251.4%	-97.7%
	Central Coast Region average per fisherman	7.5%	-69.3%	195.8%	-80.6%
Nearshore finfish–live–hook & line	Morro Bay total	205.5%	154.7%	-4.0%	1524.5%
	Morro Bay average per fisherman	229.9%	128.4%	44.0%	2093.1%
	Central Coast Region total	-11.3%	24.8%	15.0%	111.4%
	Central Coast Region average per fisherman	14.0%	40.8%	29.8%	298.8%
Nearshore finfish–live–longline	Morro Bay total	-49.2%	-91.5%	—	—
	Morro Bay average per fisherman	-16.1%	-73.4%	—	—
	Central Coast Region total	-56.8%	-63.5%	-27.4%	-91.5%
	Central Coast Region average per fisherman	-37.5%	-0.3%	3.8%	-1.9%
Nearshore finfish–live–trap	Morro Bay total	-40.0%	-68.1%	-30.3%	-81.8%
	Morro Bay average per fisherman	-15.4%	-55.8%	39.5%	-19.3%
	Central Coast Region total	-45.9%	-39.6%	-36.7%	-78.9%
	Central Coast Region average per fisherman	-19.8%	-36.8%	21.3%	-29.5%
Salmon–troll	Morro Bay total	-90.9%	-72.4%	—	-95.7%
	Morro Bay average per fisherman	-58.6%	-56.7%	—	-85.7%
	Central Coast Region total	-77.9%	-66.4%	—	-88.7%
	Central Coast Region average per fisherman	-51.7%	-57.8%	—	-71.0%
Spot prawn–trap	Morro Bay total	*	*	*	*
	Morro Bay average per fisherman	*	*	*	*
	Central Coast Region total	101.8%	-8.8%	280.8%	423.9%
	Central Coast Region average per fisherman	101.8%	-29.1%	280.8%	423.9%

Source: Landings data from CDFG

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates a zero value data point in one of the sample years

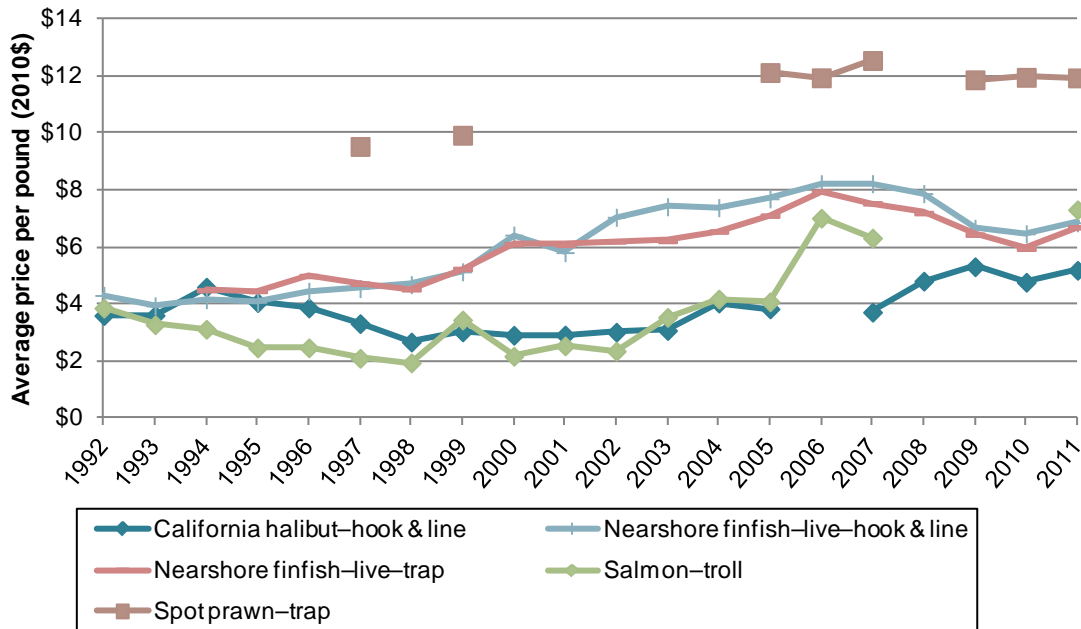
Figure 130 displays the average ex-vessel prices over time for four select fisheries. Over the study period, the average ex-vessel prices for the California halibut–hook & line, nearshore finfish–live–hook & line, nearshore finfish–live–trap, and spot prawn–trap fisheries were \$3.83, \$6.07, \$5.82, \$10.99 per pound respectively in Morro Bay. All ex-vessel prices increased over the study period from about 27 to 86 percent.

Figure 131 displays the landings, ex-vessel revenues, and number of fishermen for the California halibut–hook & line fishery of Morro Bay over the years 1992–2011. Landings and ex-vessel revenues fell and rose again over the study period, peaking in 2011 at 13,324 pounds and \$69,192. The number of fishermen decreased 62.3 percent from 1992 (77 fishermen) to 2011 (29 fishermen). The average California halibut–hook & line fisherman made a total of 4 landings per year, landing an annual total of 198 pounds for \$761 in ex-vessel revenue per year on average in Morro Bay, see Figure 132. 2011 was an unusual year with fishermen making 12 landings each on average.

Figure 133 displays the landings, ex-vessel revenues, and number of fishermen for Morro Bay's nearshore finfish–live–hook & line fishery over the years 1992–2011. Landings and ex-vessel revenues considerably rose over the study period, and were 372 and 651 percent higher respectively in 2011 than in 1992. At the same time, the number of fishermen decreased 67.2 percent from 1992, meaning fishermen in this fishery were making almost 22 times in 2011 as those in 1992 on average. The average fisherman made 12 landings, over which he landed an average total of 675 pounds for \$4,686 in ex-vessel revenue per year, see Figure 134. Count of landings increased by almost 555 percent from 1992 to 2011.

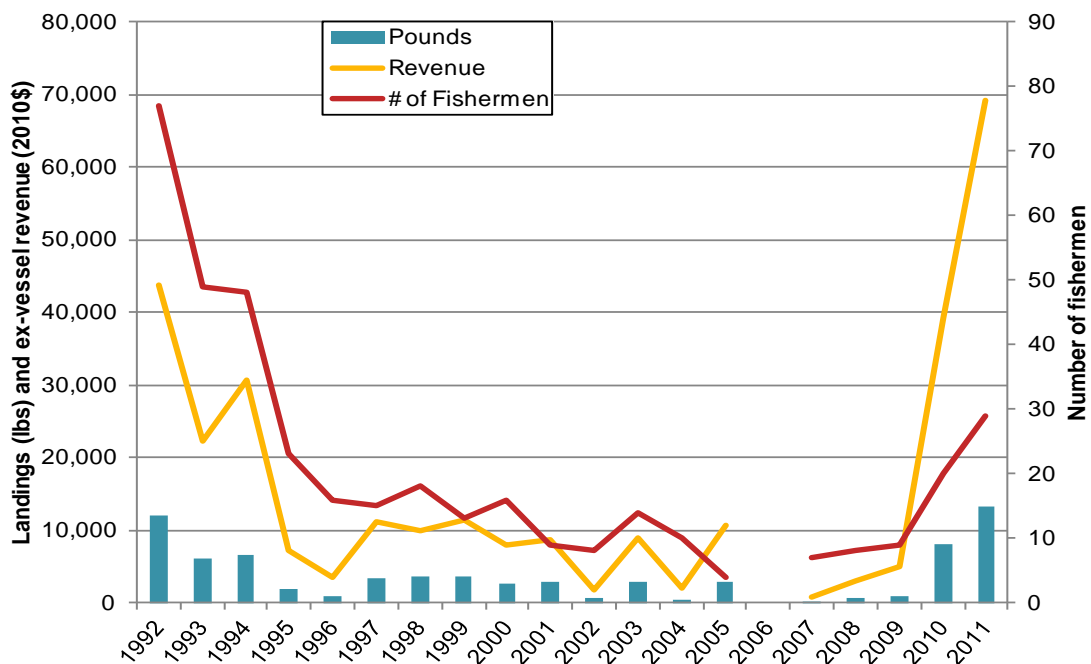
Figure 135 displays the landings, ex-vessel revenues, and number of fishermen for the nearshore finfish–live–trap fishery of Morro Bay over the years 1992–2011. Landings and ex-vessel revenues rose significantly at the first half of the study period before declining in the second half. Still, in 2011 landings and ex-vessel revenues were several times what they had been in 1992. The number of fishermen closely followed landings and ex-vessel revenues trends overall, peaking with the landings peak at 42 fishermen and 84,323 pounds in 1997. Ex-vessel revenues peaked at \$412,114 in 2000. The average nearshore finfish–live–trap fisherman in Morro Bay made a total of 14 landings per year landing and average annual total of 1,309 pounds for \$7,558 in ex-vessel revenue per year, see Figure 136.

Figure 130. Average ex-vessel prices over time, target commercial fisheries, Morro Bay, 1992–2011



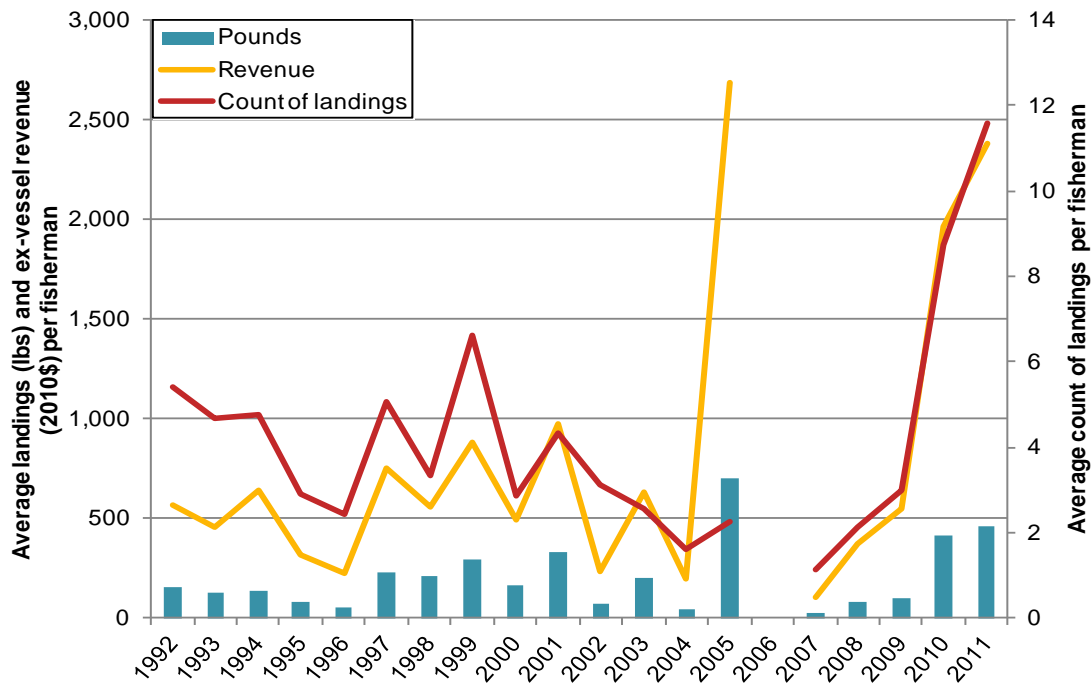
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 131. California halibut-hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Morro Bay, 1992–2011



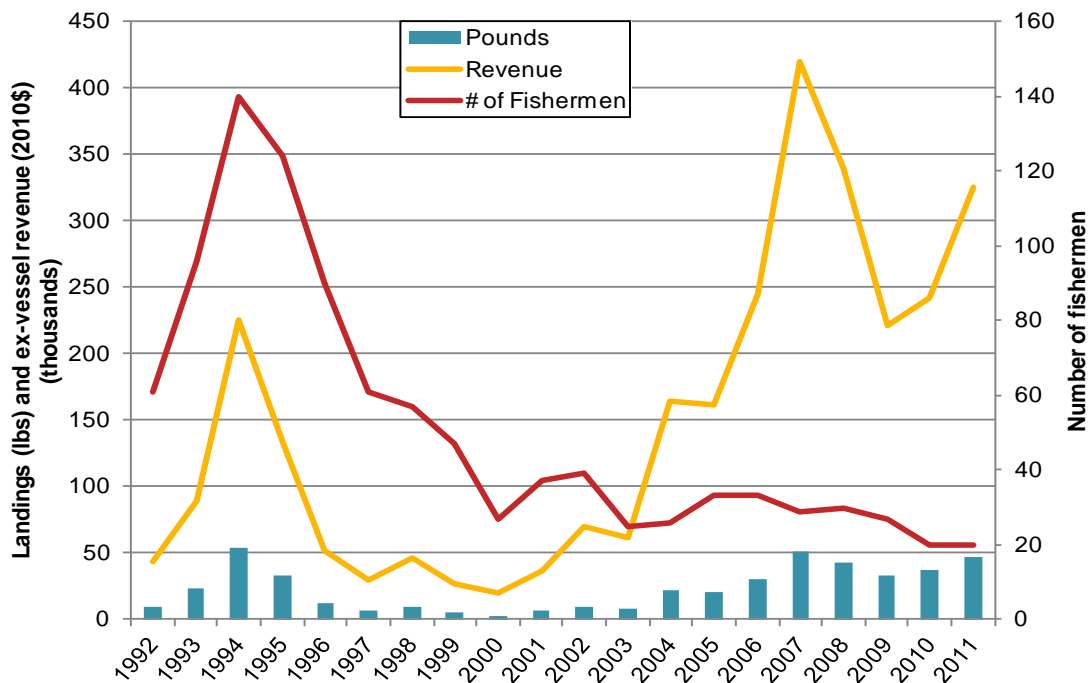
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 132. California halibut–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Morro Bay, 1992–2011



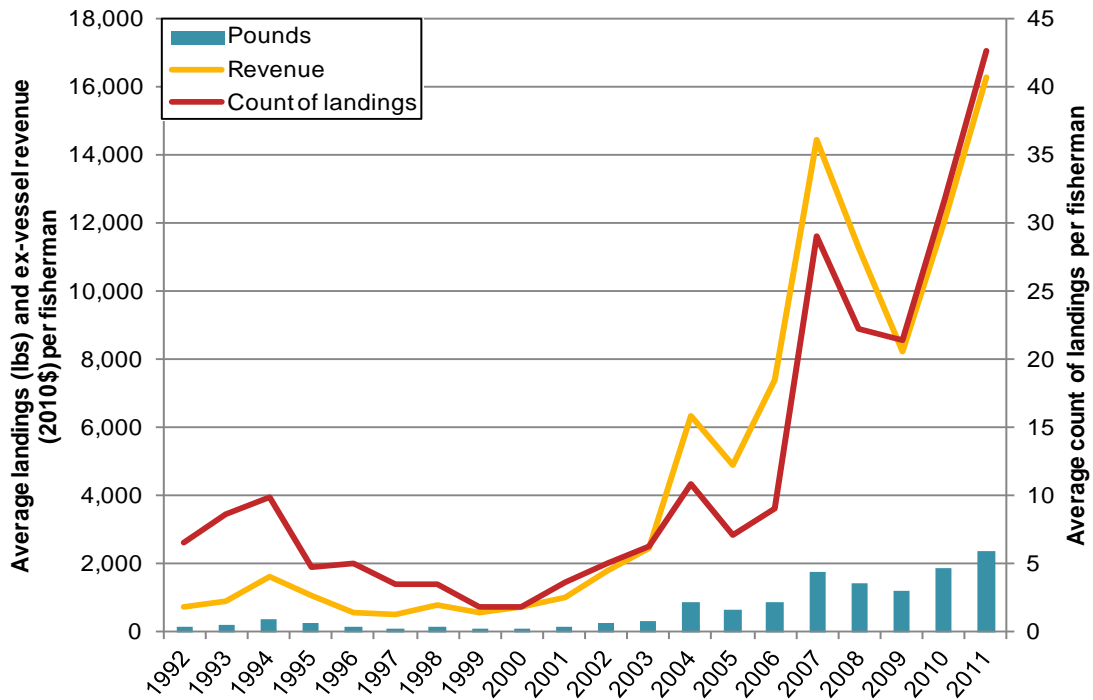
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 133. Nearshore finfish–live–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Morro Bay, 1992–2011



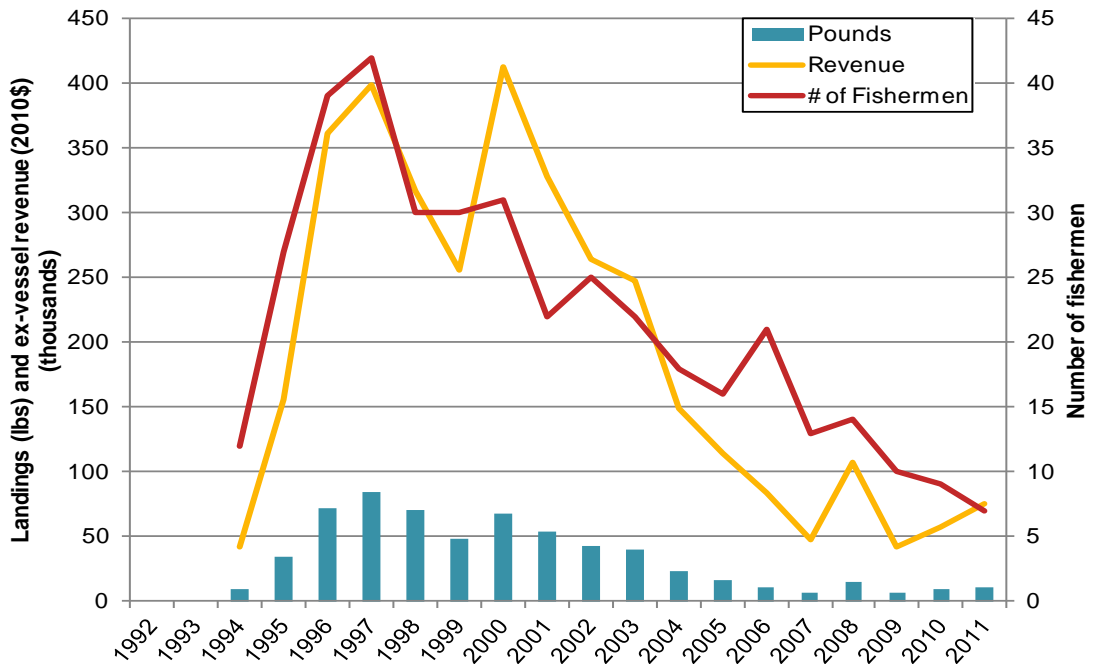
Source: Landings data from CDFG

Figure 134. Nearshore finfish–live–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Morro Bay, 1992–2011



Source: Landings data from CDFG

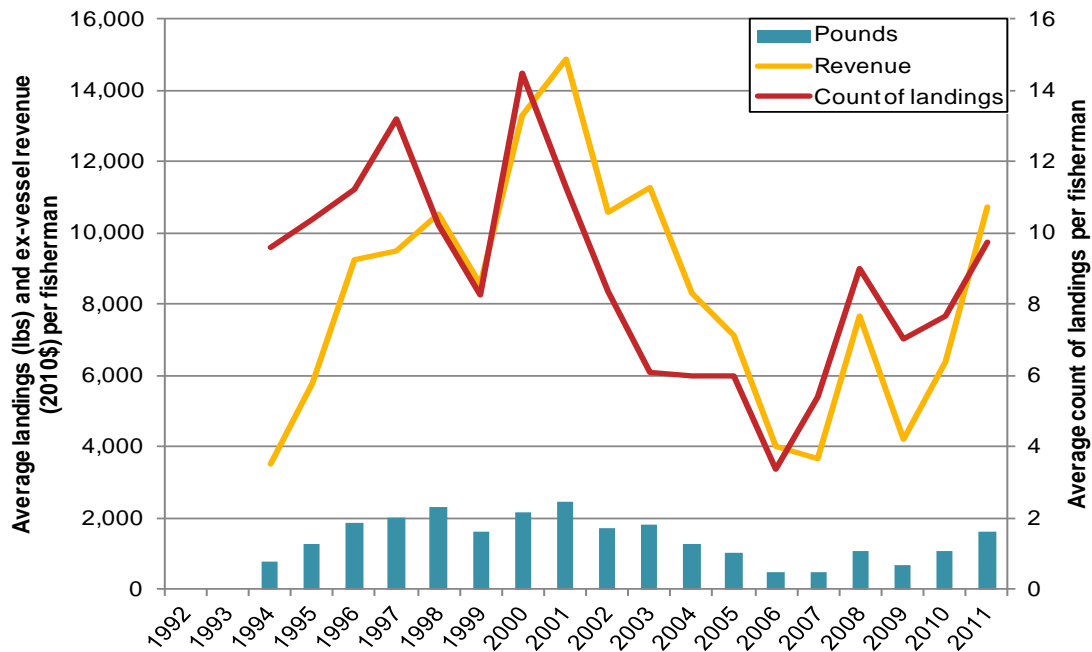
Figure 135. Nearshore finfish–live–trap: Commercial landings, ex-vessel revenues, and number of fishermen, Morro Bay, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

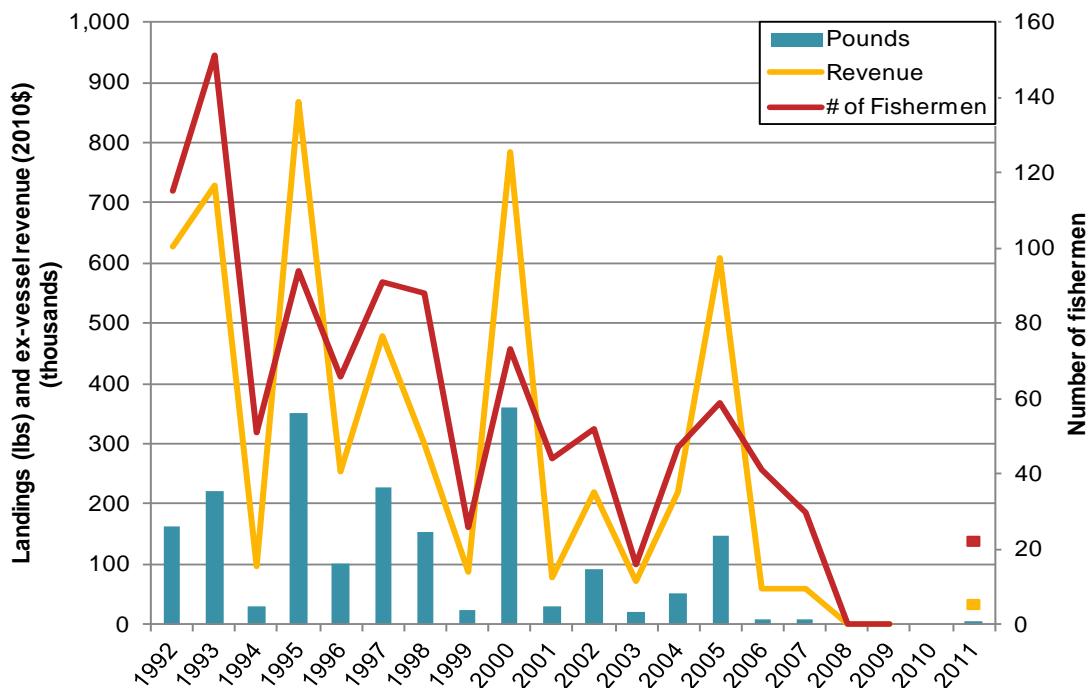
Source: Landings data from CDFG

Figure 136. Nearshore finfish–live–trap: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Morro Bay, 1992–2011



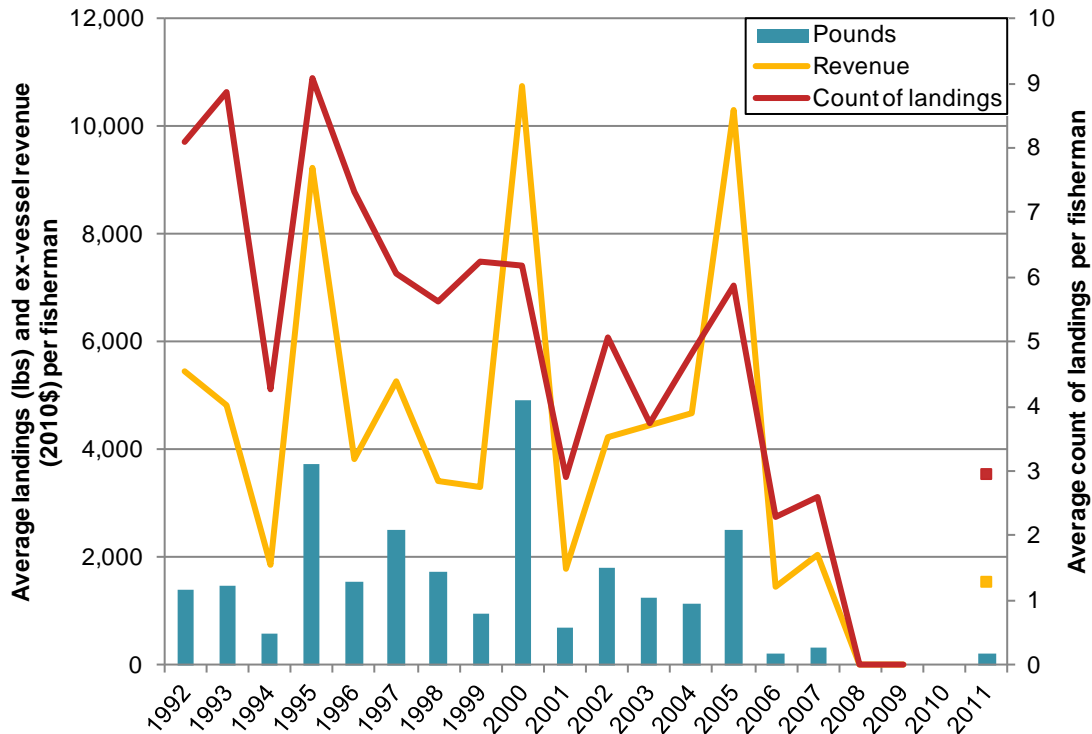
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 137. Salmon–troll: Commercial landings, ex-vessel revenues, and number of fishermen, Morro Bay, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 138. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Morro Bay, 1992–2011



*Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG*

5.3.2. Morro Bay Commercial Fisheries Baseline Characterization

In Morro Bay we interviewed eight commercial fishermen (Table 217). Out of all the target fisheries, California halibut–hook & line had the largest number of fishermen landing in Morro Bay in 2011 (29 fishermen). Half of the fishermen we interviewed in Morro Bay participated in the California halibut–hook & line fishery. We interviewed five out of 27 nearshore finfish–live fishermen making landings in the port in 2011. All five of the nearshore finfish–live participated in hook & line and three of them used traps as well. Spot prawn–trap generated the largest dollar values in terms of landings (\$1.28 million) followed by the nearshore finfish–live fishery at \$400,854 in 2011.

Table 217. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Morro Bay.

Fishery	2011 Landings revenue (2010\$)	Total number of individuals in 2011 landings revenue	Number interviewed
California halibut–hook & line	\$69,192	29	4
Coastal pelagic species–seine/net	—	—	—
Dungeness crab–trap	*	1	—
Market squid–seine	\$65,699	3	—
Nearshore finfish–live–hook & line	\$325,763	20	5
Nearshore finfish–live – longline	—	—	—
Nearshore finfish–live–trap	\$75,089	7	3
Nearshore finfish–live	\$400,854	27	5
Salmon–troll	\$33,815	22	2
Spot prawn–trap	\$1,281,456	3	1
All target fisheries		65	8

Source: California Department of Fish and Game, Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

The average fisherman from Morro Bay that we interviewed is 44.5 years old, which is younger than the average for the entire study region. Age and number of years experience commercial fishing are broken out by fishery in Table 218 below.

Table 218. Average age and years experience commercial fishing, Morro Bay

Fisheries	Age		Years experience	
	Average	Standard deviation	Average	Standard deviation
California halibut–hook & line	40.3	12.6	19.5	18.0
Coastal pelagic species–seine/net	—	—	—	—
Dungeness crab–trap	—	—	—	—
Market squid–seine	—	—	—	—
Nearshore finfish–live	38.6	12.7	19.6	15.2
Salmon–troll	*	*	*	*
Spot prawn–trap	*	*	*	*
All target fisheries (unique individuals)	44.5	13.9	22.4	15.5

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Between 2006 and 2011 the percentage of the average Morro Bay fisherman's total income from commercial fishing decreased from 75 percent to 65 percent (-17.1 percent change) (Table 219).

Table 219. Percent change in income from overall commercial fishing from 2006-2011, Morro Bay

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut–hook & line	66.7%	41.6%	47.5%	32.8%	-20.8%	68.8%
Coastal pelagic species–seine/net	—	—	—	—	—	—
Dungeness crab–trap	—	—	—	—	—	—
Market squid–seine	—	—	—	—	—	—
Nearshore finfish–live	83.3%	25.8%	73.1%	29.0%	-21.7%	18.1%
Salmon–troll	*	*	*	*	*	*
Spot prawn–trap	—	—	—	—	—	—
All target fisheries (unique individuals)	75.0%	33.3%	65.0%	36.5%	-17.1%	46.0%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

The most commonly cited reason for change in percent of total income from commercial fishing in Morro Bay was increased regulations. Some individuals also indicated they were unable to make enough income from commercial fishing and had diversified into other areas of work. One fisherman specifically noted the decreased length of the salmon season (Table 220) which was noted under increased regulation.

Table 220. Cause of change in percent income from commercial fishing from 2006–2011, Morro Bay

Response	Number responding		
	California halibut – hook & line	Nearshore finfish – live	Salmon – troll
Increased regulation	—	2	1
Intensified fishing efforts	1	—	—
Had additional job or source of income	—	—	—
Found additional job or source of income	1	2	—
Change in fish abundance	1	—	1
Total number responding	3	4	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The mostly commonly cited source of additional income was skilled labor such as construction work followed by business and office work. Specifics are found below in Table 221.

Table 221. Other sources of income other than commercial fishing in 2011, Morro Bay

Response	Number responding		
	California halibut–hook & line	Nearshore finfish–live	Salmon–troll
Skilled labor	2	5	—
Investments/retirement/social security	—	—	—
Business/office work	2	1	1
Other maritime occupation	2	—	1
Total number responding	4	5	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Respondents in Morro Bay reported on average an increase in the percentage of their commercial fishing gross revenue that was put towards operating costs (Table 222).

Table 222. Percent change in overall commercial fishing operating costs from 2006–2011, Morro Bay

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut – hook & line	17.5%	3.5%	48.3%	45.4%	40.0%	40.0%
Coastal pelagic species – seine/net	—	—	—	—	—	—
Dungeness crab – trap	—	—	—	—	—	—
Market squid – seine	—	—	—	—	—	—
Nearshore finfish – live	31.7%	15.7%	35.0%	16.7%	13.3%	18.9%
Salmon – troll	*	*	*	*	*	*
Spot prawn – trap	*	*	*	*	*	*
All target fisheries (unique individuals)	31.8%	16.4%	47.5%	29.6%	30.5%	33.2%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

The most commonly cited reason for increased operating costs was increases in fishing expenses—specifically fuel costs was commonly mentioned.

Table 223. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Morro Bay

Response	Number responding		
	California halibut—hook & line	Nearshore finfish—live	Salmon—troll
Large capital investment	—	—	*
Decrease in fishing income	—	—	*
Decrease in fishing grounds	—	—	*
Increase in fishing expenses	2	5	*
Fishing less in 2006	—	—	*
Fishing less in 2011	1	—	*
Total number responding	2	3	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

California halibut—hook & line fishermen interviewed reported 18.3 years experience in the fishery and nearshore finfish—live fishermen reported 13.6 years. Both are just slightly lower than the region wide average (19.2 and 14.9 years experience respectively). A larger percent of California halibut—hook & line fishermen's gross economic revenue in Morro Bay (20.0 percent) is spent on crew which is higher than the average over the region (11.0 percent). See Table 224.

Table 224. Additional commercial fishery specific data, Morro Bay.

Fisheries	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut—hook & line	18.3	19.2	0.8	0.5	20.0%	0.1%	15.7%	5.1%
Coastal pelagic species—seine/net	—	—	—	—	—	—	—	—
Dungeness crab—trap	—	—	—	—	—	—	—	—
Market squid—seine	—	—	—	—	—	—	—	—
Nearshore finfish—live	13.6	7.2	1.0	—	17.0%	8.5%	13.0%	2.8%
Salmon—troll	*	*	*	*	*	*	*	*
Spot prawn—trap	*	*	*	*	*	*	*	*

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Additionally, for each fishery they participated in fishermen were asked if they had added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. If they had answered yes to any of these questions, they were additionally asked an open-ended question as to why added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. These questions were asked to investigate if fishermen have entered fisheries to diversify their fishing portfolio or if they had left fisheries and the factors driving those decisions. Furthermore, some fishermen may not drop a fishery entirely and participate in the fishery on and off across the years. If this was the case we also sought to investigate the reasoning behind this situation such as fishery closures or regulatory complications. Most fishermen fell

into the 'none of the above' category, which is not shown in the table below, but makes up the remainder of the reported percentages.

One fisherman indicated adding the California halibut–hook & line to his/her fishing portfolio and two indicated adding nearshore finfish–live since 2006. Only one of the individuals chose to comment on why he added a fishery, indicating that he was new to commercial fishing overall (Table 226).

Table 225. Commercial fisheries added/dropped since 2006 or not fished in 2011, Morro Bay

Fisheries	Number responding	Added	Dropped	Not fished in 2011
California halibut–hook & line	4	25.0%	—	—
Coastal pelagic species–seine/net	—	—	—	—
Dungeness crab–trap	—	—	—	—
Market squid–seine	—	—	—	—
Nearshore finfish–live	8	25.0%	—	—
Salmon–troll	2	*	*	*
Spot prawn–trap	1	*	*	*

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Table 226. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Morro Bay

Responses	California halibut–hook & line
Started commercial fishing	1
Change in fish population	—
Diversify fisheries	—
Was able to obtain permit	—
High costs	—
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked for each fishery separately to compare the success of his/her fishery in 2011 to the success of his/her fishery in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse.

Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

In Morro Bay responses were highly varied indicating a high variation in fishing success within the port (Table 227).

Table 227. Overall success in specific commercial fishery compared to previous five years, Morro Bay

Fisheries	Number responding	Did not participate in previous seasons	Percent response				
			Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
California halibut–hook & line	4	—	—	25.0%	25.0%	50.0%	—
Coastal pelagic species–seine/net	—	—	—	—	—	—	—
Dungeness crab–trap	—	—	—	—	—	—	—
Market squid–seine	—	—	—	—	—	—	—
Nearshore finfish–live	7	—	14.3%	28.6%	14.3%	14.3%	28.6%
Salmon–troll	2	*	*	*	*	*	*
Spot prawn–trap	1	*	*	*	*	*	*

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Few responses were cited regulatory impacts that were affecting fisheries. MPAs were mentioned, especially their ability to force more fishermen into smaller areas. An individual also mentioned having to increase effort and gear for the same size catch (Table 228).

Table 228. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay

Response	Number responding		
	Nearshore finfish–live	Salmon–troll	Spot prawn–trap
MPA impacts	2	*	*
Insufficient monitoring/enforcement/communication of MPAs	—	*	*
Trawlers impacting nearshore fleet	—	*	*
Quota limit issues	—	*	*
Concentration of fishing effort into smaller areas/over-crowding	1	*	*
Less competition	—	*	*
Inefficiencies in bycatch regulations	—	*	*
Inefficiencies/inconsistencies in fishery regulations	—	*	*
Inequities in fishery regulations	—	*	*
Inadequate research for policy	—	*	*
Inequities in obtaining fishery permits	—	*	*
Insufficient regulation on land-based impacts to fisheries	—	*	*
Lack of influence on policy/regulation development	—	*	*
Insufficient communication of fishery regulations	—	*	*
Populations recovering from fishing gear ban	—	*	*
Distress around unintended infractions	—	*	*
Increased number of fishermen participating in the fishery	—	*	*
Increased personal fishing effort	—	*	*
Rockfish conservation area (RCA)	—	*	*
Total number responding	2	*	*

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

The nearshore finfish–live respondent indicated he had seen a decrease in habitat, specifically kelp habitat that supports fish that rockfish rely on. Two California halibut–hook & line fishermen indicated that they were catching more than previous years, while one indicated they were catching less. The two indicated an increase in catch attributed part of this to an increase in squid populations in the region.

Table 229. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay

Response	Number responding		
	California halibut–hook & line	Nearshore finfish–live	Salmon–troll
Increase in bait fish	2	—	*
Increase in fish abundance	—	—	*
Stable fish abundance	1	—	*
Increase in catch	2	—	*
Decrease in catch	1	—	*
Increase in predators	—	—	*
Good weather	—	—	*
Biomass of fish largely in MPAs	—	—	*
PG&E seismic testing impacts	—	—	*
Decrease in habitat or water quality	—	1	*
Decrease in fish abundance	—	—	*
Change in normal water temp	—	—	*
Fish population moved further offshore	—	—	*
Decrease in fish size	—	—	*
Farmed fish spreading disease	—	—	*
Protected species overpopulated	—	—	*
Total number responding	3	1	*

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Economic factors, though mentioned by few individuals are shown below in Table 230. The fishermen who indicated an increase in operating costs specifically mentioned bait and fuel.

Table 230. Economic changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay

Response	Number responding		
	California halibut–hook & line	Nearshore finfish–live	Salmon–troll
Increased number of fishermen participating in the fishery	1	—	*
Increase in operating costs	1	—	*
Increase in fish price	—	—	*
Decrease in fish price	—	—	*
Market flooded	—	—	*
Longer season allowed increase in catch	—	—	*
Increased demand for fish	—	—	*
Decrease in demand for fish	—	—	*
Increased personal fishing effort	—	1	*
Increased number of outside vessels fishing in local grounds	—	—	*
Lack of port infrastructure	—	—	*
Increase in travel distance	—	—	*
Total number responding	1	1	*

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

For other changes/factors influencing success in the fishery, fishermen cited that as time passed experiential knowledge grew but that the difficulty in maintaining a viable fishing livelihood has caused a loss of valuable historical fishing knowledge (Table 231).

Table 231. Other changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay

Response	Nearshore finfish–live
Increase in fishing experience	1
Loss of historical fishing knowledge	1
Fisherman's knowledge not valued	—
Lack of outreach to fishing community	—
Loss of cultural fishing heritage	—
Total number responding	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

5.3.3. Morro Bay CPFV Fisheries Initial Changes

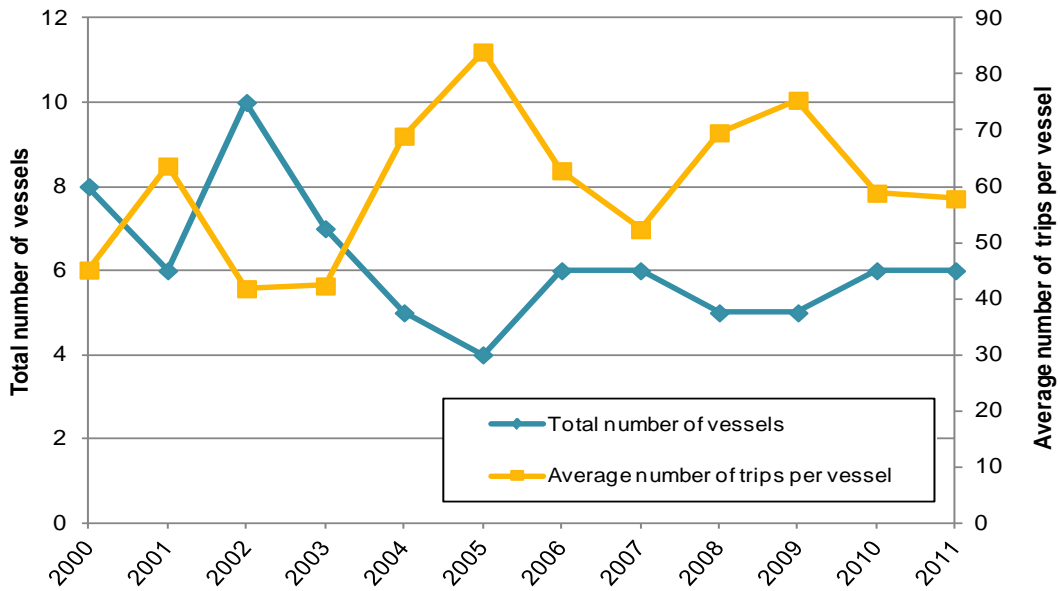
This section provides a summary and analysis of California Department of Fish and Game (CDFG) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the Central Coast Region by CPFV operators from ports outside the Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each species/fishery
6. Total number of trips for multiple species/fishery combo trips
7. Percent change in total number of vessels, trips, and anglers in pre and post MPA periods

CPFV operators are required to complete and submit a log to the CDFG for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Game Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish. For a more detailed description of how CPFV logbook data was utilized in this analysis please see section 4.5.

The total number of vessels in Morro Bay fluctuated slightly between 2000 and 2002, reaching its highest level in 2002 (Figure 139). This total number of vessels then decreased by 60 percent between 2002 and 2005. After a slight increase from 2005 to 2006, the total number of vessels remained fairly stable. The average number of trips showed fluctuations throughout the entire time period, but in contrast to the other ports, showed a slight increasing trend between 2000 and 2011. The total number of trips also fluctuated, but the value in 2011 was only slightly lower than that in 2000 (Figure 140). The average number of anglers per trip and the total number of anglers (Figure 141) experienced several increases and decreases during the study period, but overall changed little. Greater fluctuations were observed in the average number of anglers per vessel. The highest value for this statistic was observed in 2005 which was when the highest average number of trips per vessel also was observed. This average then showed a general decreasing trend. The 2011 value was lower than that for 2005, but higher than that noted for 2000.

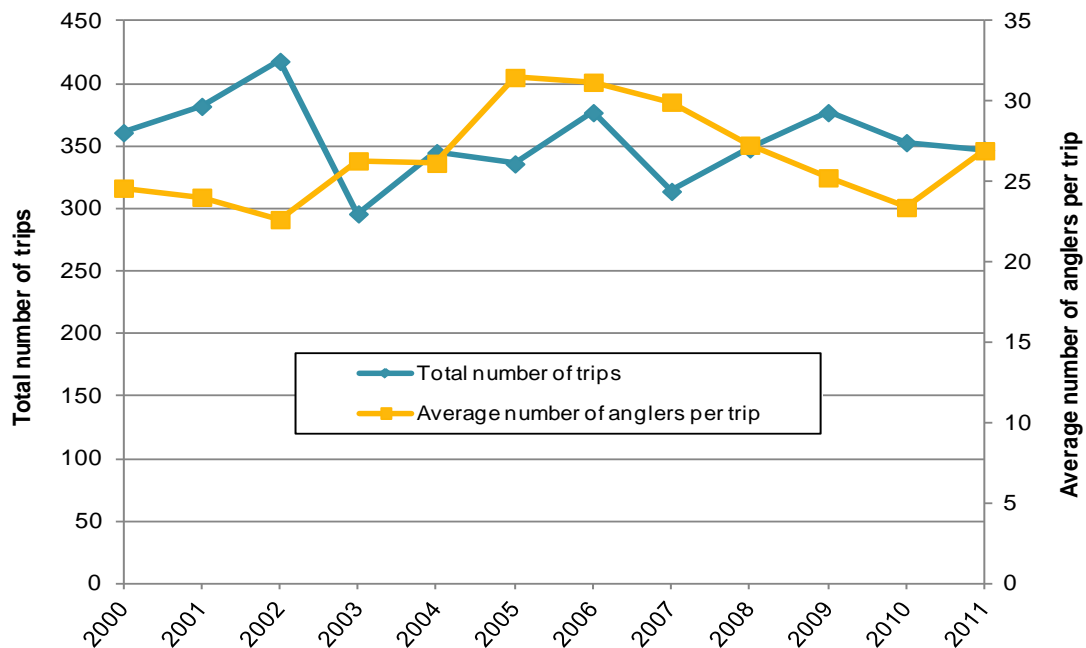
Figure 139. Total number of CPFV vessels and average number of trips per vessel, Morro Bay, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

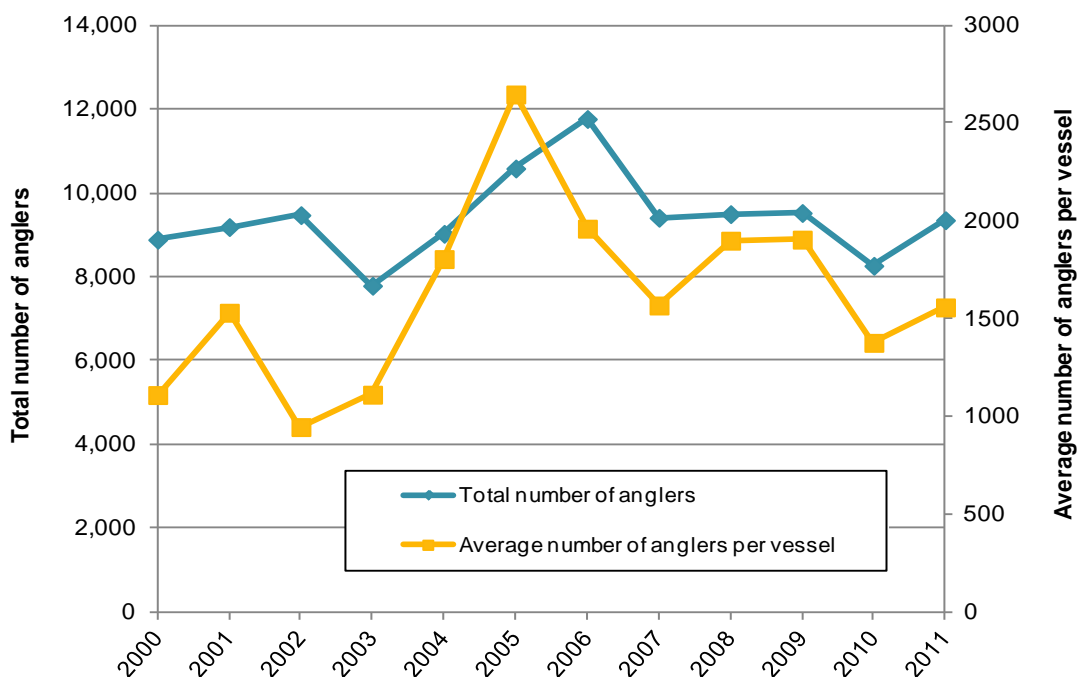
Figure 140. Total number of CPFV trips and average number of anglers per trip, Morro Bay, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 141. Total number of CPFV anglers and average number of anglers per vessel, Morro Bay, 2000-2011



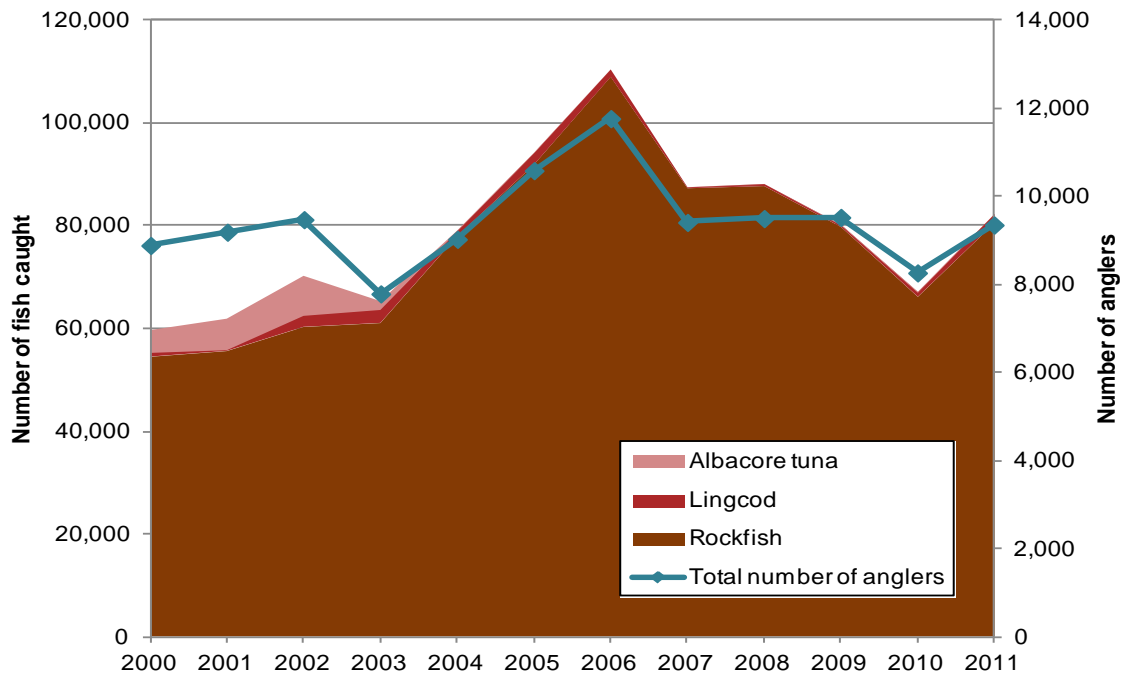
Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

The trend in the number of fish caught was somewhat similar to the total number of anglers (Figure 142). Catch reached its highest level in 2006, generally decreased through 2010, and then increased again between 2010 and 2011. Overall, the number of fish caught in 2011 was 38 percent higher than the catch in 2000, but 26 percent lower than the catch in 2006.

Rockfish was the predominant component of the catch throughout the study period (Figure 142). Up until 2003, albacore tuna also was an important component of the catch. Lingcod, while a distant third in numbers during the early 2000s, was taken in small, but notable, numbers throughout the study period. Most of the trips over the 12 years took rockfish. In 2000, these trips comprised around 63 percent of the combined fishery trips while in 2011 they comprised 54 percent (Figure 143). The composition of the remaining trips (those considered to be other than rockfish) changed from primarily albacore tuna, salmon, and California halibut to primarily sanddabs (although a few trips still caught albacore tuna, salmon, and California halibut). Salmon-rockfish and rockfish-halibut trips were observed throughout the study period, but their prevalence decreased starting around 2006 when sanddab-rockfish trips became more common (Figure 144).

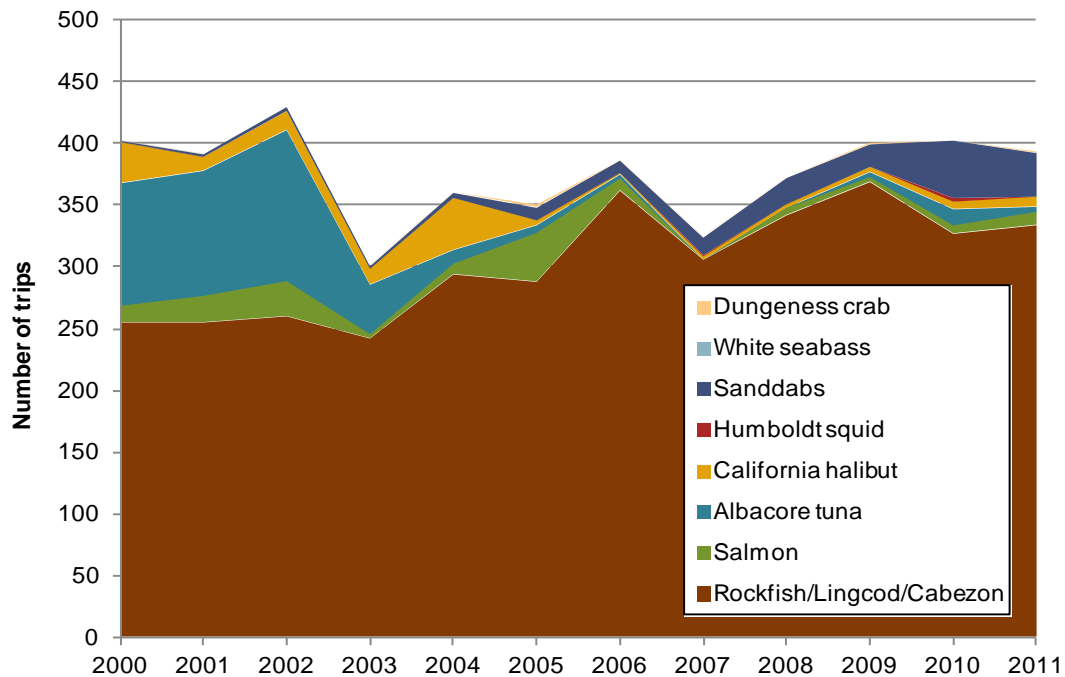
Figure 142. CPFV total number of fish caught for each fishery, Morro Bay, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

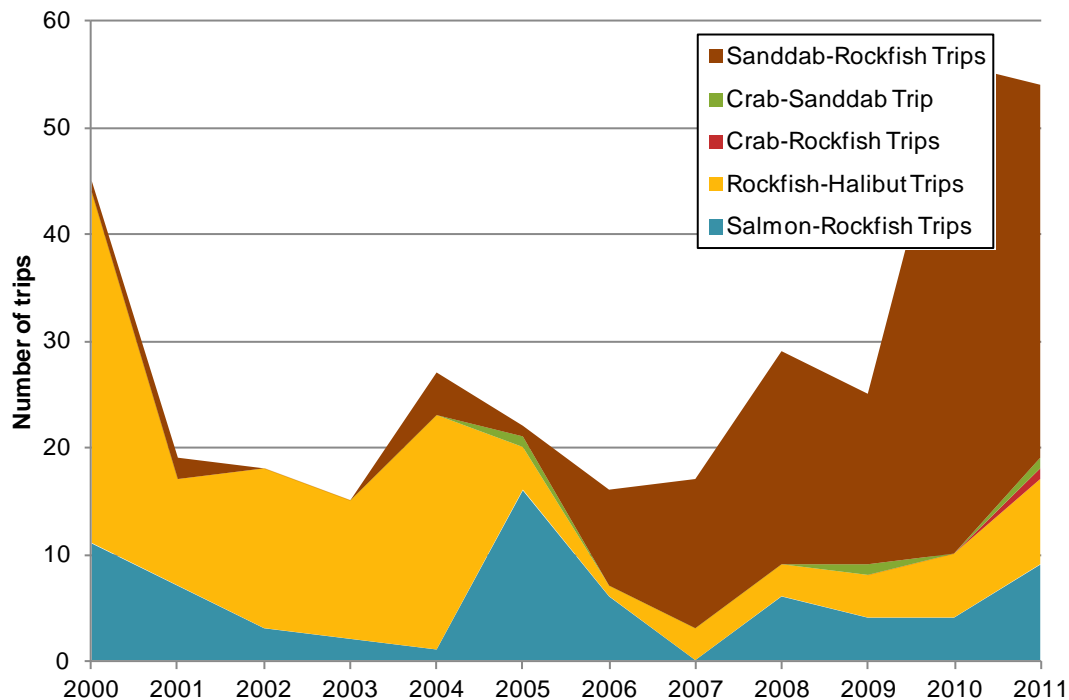
Figure 143. Total number of CPFV trips for each fishery, Morro Bay, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 144. Count of select multiple species CPFV trips, Morro Bay, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

5.3.4. Morro Bay CPFV Fisheries Baseline Characterization

Three of the ten CPFV captain interviews we conducted in the Central Coast Region were from Morro Bay, all of which were both operators and owners. Respondents reported owning CPFV boats for an average of 21.7 years and operating them for an average of 16.3 years. Only one of the respondents indicated they were operating in 2006 and reported making 100% of their income from CPFV operation at that time. Together the three averaged 23.3% of their income from CPFV in 2011, much less than the Central Coast Region average (67.4 percent). Additional information can be found in Table 232 below.

Table 232. CPFV survey response statistics, Morro Bay

	Response	Standard deviation
Individuals interviewed	3	-
Hired captain	—	-
Owner and captain	3	-
Owner only	—	-
Average age	52.7	14.6
Average number of years owning CPFV boat/s	21.7	31.5
Average number of years operating CPFV boat/s	16.3	22.2
Average percent income from CPFV operations in 2011	23.3%	23.1%
Number of those interviewed who were operating in 2006	1	-
Average percent income from CPFV operations in 2006	100.0%	n/a

Source: Current study

n/a indicates standard deviation could not be calculated because only person responded to the question

— indicates that the port/fishery was not sampled or a zero value data point

The individual who was in operation in 2006 cited the reasons for the decline in his/her percentage of total income from CPFV operation was from general economic decline, an increase in operating costs, and also mentioned that the CPFV business provides employment that is very inconsistent throughout the year (Table 233).

Table 233. Cause of change in percent income from CPFV operations from 2006 - 2011, Morro Bay

Response	Number responding
Began business after 2006/wasn't participating	2
Economic decline	1
Increase in regulation	—
Increase in operation cost	1
Decrease in clients	—
Negative public impression of fishing	—
Inability to provide consistent employment	1
Total number responding	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The average gross economic revenue from CPFV operation for respondents in Morro Bay was \$7,500. This was the lowest amount throughout the region. Respondents cited very high overall operating costs (69.5 percent).

Table 234. Average CPFV gross economic revenue (GER) to operating costs, Morro Bay

	Average response	Standard deviation
Total GER 2011	\$7,500	\$707
% GER to crew	0.5%	0.7%
% GER to fuel	30.0%	4.2%
% GER to other operating costs	69.5%	3.5%
Total GER 2006	~	~

Source: Current study

~ indicates no one responded to the question

The individual who was in operation in 2006 cited economic decline, increase in operating costs such as fuel, and having to travel further distances to fish as reasons for his/her decrease in GER from CPFV operations from 2006 to 2011 (Table 235).

Table 235. Cause of change in CPFV gross economic revenue (GER) from 2006 to 2011, Morro Bay

Response	Morro Bay
Began business after 2006	2
Economic decline	1
Increase in regulation	—
Decrease in quality of fish	—
Fishing effort condensed	—
Increase in operation cost	1
Decrease in clients	—
Didn't participate in 2006	—
Traveling farther distances	1
Negative public impression of fishing	—
Number of fisherman responding	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Below in Table 236 are trip statistics from CPFV operations. Consumptive trip and fishing trips and non consumptive trips are trips such as whale watching, leisure cruises, nature cruises, etc.

Table 236. CPFV trip statistics, Morro Bay

	Consumptive trips		Non consumptive trips	
	Response	Standard deviation	Response	Standard deviation
Number of people reporting trips	3	-	2	-
Average number of trips per vessel	9.0	1.4	2.0	n/a
Average number of passengers (per trip)	4.0	—	14.0	15.6
Average price per passengers (per trip)	\$140	\$66	\$95	\$78
Average number of crew (per trip)	1.0	1.7	1.5	2.1

Source: Current study

n/a indicates standard deviation could not be calculated because only person responded to the question

— indicates that the port/fishery was not sampled or a zero value data point

Respondents reported making the majority of their income from rockfish/lingcod fishing and other non consumptive activities (Table 237).

Table 237. CPFV fishery/activity specific data, Morro Bay

	Fishery	Individuals interviewed	Number of days targeting species (2011)		Percent of GER from fishery/activity (2011)	
			Average	Standard deviation	Average	Standard deviation
Fishery	Albacore tuna	3	2.7	2.3	5.0%	5.0%
	California halibut	1	*	*	*	*
	Dungeness crab	—	—	—	—	—
	Humboldt squid	—	—	—	—	—
	Rockfish/lingcod	3	3.5	4.9	49.7%	38.0%
	Salmon	2	*	*	*	*
	Sanddab	—	—	—	—	—
	White sea bass	—	—	—	—	—
Activity	Whale watching	1	*	*	*	*
	^Other	4	18.8	21.2	31.3%	39.7%

Source: Current study

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked for each fishery/activity separately to compare the success of his/her fishery/activity in 2011 to that in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse.

Across all fisheries and activities 'the same' and 'significantly worse' received the most responses. Table 238 below shows responses by fishery.

Table 238. Overall success of CPFV fishery/activity compared to past five years, Morro Bay

		Number responding						
		Number responding	Did not participate in previous seasons	Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
Fishery	Albacore tuna	3	—	—	—	66.7%	—	33.3%
	California halibut	1	*	*	*	*	*	*
	Dungeness crab	—	—	—	—	—	—	—
	Humboldt squid	—	—	—	—	—	—	—
	Rockfish/lingcod	2	—	—	50.0%	50.0%	—	—
	Salmon	2	*	*	*	*	*	*
	Sanddab	—	—	—	—	—	—	—
	White sea bass	—	—	—	—	—	—	—
	Whale watching	1	*	*	*	*	*	*
Activity	^Other	4	—	25.0%	25.0%	25.0%	—	25.0%
All target fisheries/ activities		13	—	15.4%	23.1%	30.8%	—	30.8%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were then asked what factors they felt had contributed to their level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorized, and divided into two types of categories: regulatory and economic as seen in the tables below.

Only one individual gave regulatory factors influencing the success in his/her fishery; the respondent cited inadequate research being conducted to inform policy and loss of fishing area from the Rockfish Conservation Area (RCA).

Table 239. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay

Response	Number responding
	Rockfish/lingcod
MPA impacts	—
Insufficient monitoring/enforcement/communication of MPAs	—
Concentration of fishing effort into smaller areas/over-crowding	—
Inefficiencies in bycatch regulations	—
Inefficiencies/inconsistencies in fishery regulations	—
Inequities in fishery regulations	—
Inadequate research for policy	1
Distress around unintended infractions	—
Rockfish Conservation Area (RCA)	1
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

One respondent commented on environmental factors, that notes rockfish/lingcod populations seemed to be stable (Table 240).

Table 240. Environmental changes/factors influencing success in specific commercial fishery in previous five years, Morro Bay

Response	Number responding		
	Fishery		Activity
	Rockfish/lingcod	Salmon	^Other
Increase in bait fish	—	*	—
Increase in fish/whale abundance	—	*	—
Stable fish abundance	1	*	1
Increase in catch	—	*	—
Decrease in catch	—	*	—
Increase in fish size	—	*	—
Decrease in fish abundance	—	*	—
Decrease in fish size	—	*	—
Protected species overpopulated	—	*	—
Total number responding	1	*	1

Source: Current study

Participants were allowed to give multiples responses

^ Other includes: Funeral services, government charters, recreational diving, and research charters.

— indicates that the port/fishery was not sampled or a zero value data point

5.4. Avila/Port San Luis

Avila/Port San Luis began as a whaling station in the mid-1800s. Harford pier in Port San Luis was built by San Luis Obispo county in 1908 (Pettersen et al. 2010). During the mid-1900s the commercial fishing industry gained momentum focusing, like most other ports in the study region, on sardines (Lisa Wise Consulting, 2008). The commercial port is now owned and managed by the Port San Luis Harbor District and current fishing efforts mainly focus on the nearshore finfish—live—hook & line fishery as seen in Figure 148 and Figure 149. Figure 153 illustrates that ex-vessel revenue levels and pounds landed for nearshore—live—hook & line are currently at peak levels in the study period of 1992-2011. Similar to Morro Bay; the number of fisherman in this fishery fell drastically after 1994 due to the Groundfish Restricted Access Program which set allocation limits for the open access fishery, and remains low likely due to the strict permitting process for this fishery in which fishermen must purchase two state-issued nearshore rockfish permits from existing fishermen in their management region and retire one. During interviews many nearshore finfish—live fishermen expressed frustrations over federal regulations that prevent fishermen from fishing individual quota limits together on one vessel. Fishermen felt being able to fish together would increase safety while fishing and also allow fishermen to share operating costs increasing profit margins.

Similar to the commercial fleet Avila/Port San Luis CPFV operators depend on rockfish for the vast majority of their catch and trips; see Figure 161. In 2011, CPFV operators in Avila/Port San Luis are operating more vessels and bringing more anglers fishing than previously seen during the study period of 2000-2011. However, in 2011 CPFV logbook data showed the least amount of trips per vessel (see Figure 157) in the study period. This may be due to a recent increase in smaller sized or part-time CPFVs beginning to operate in the port. During field work in Avila/Port San Luis field staff noted only one major CPFV operation in the port, however we did not complete an interview with this operation and thus we only present an initial changes section for CPFV operations in Avila/Port San Luis.

5.4.1. Avila/Port San Luis Commercial Fisheries Initial Changes

Among the Central Coast Region ports, Avila/Port San Luis constituted 3.5 percent of total commercial landings and 10.7 percent of total ex-vessel revenues on average annually over the study period. Landings declined over the study period, decreasing 90.6 percent from 1992 to 2011, peaking in 1994 at 5.4 million pounds, see Figure 145. Ex-vessel revenues trends were similar, decreasing 54.5 percent over the same time, peaking in 1995 at approximately \$4 million. The number of fishermen decreased as well by 78.4 percent from 1992 to 2011. Again, all dollar values are presented in 2010 dollars unless otherwise noted.

Figure 146 displays what percentage the eleven fisheries of interest represented of total landings and ex-vessel revenues made in the port over the study period. One of the most significant additional fisheries in Avila/Port San Luis was the groundfish—bottom trawl fishery, which between 1992–2004, averaged 31 percent (or \$757,472) annually of total landings in the port. Another additional fishery was the California halibut-bottom trawl with an annual average of 4.4 percent of total ex-vessel revenues in Avila/Port San Luis over the study period. Additional ex-vessel revenues were made in Avila/Port San Luis from the rock crab fishery.

Figure 147 and Figure 148 display the composition of landings and ex-vessel revenues for select fisheries of interest over 1992 to 2011¹¹. The market squid—seine fishery had the greatest impact in Avila/Port San Luis among the fisheries of interest, constituting 4 percent of total landings over the study period. Still, the nearshore finfish—live—hook & line fishery constituted the majority of landings in this port for the eleven fisheries of interest at 11.2 percent over the study period, and from 2005 to 2011 constituted an annual average of 28 percent of total ex-vessel revenues alone. Of note is that the salmon-troll fishery is of

¹¹ Fisheries of interest were selected for display for compositional landings and ex-vessel revenue figures only if they constituted the top 95 percent of combined landings and ex-vessel revenues for all eleven fisheries of interest in the port over the study period on average. The remaining fisheries that were not selected for display likely wouldn't be visible on the compositional figures had they been included.

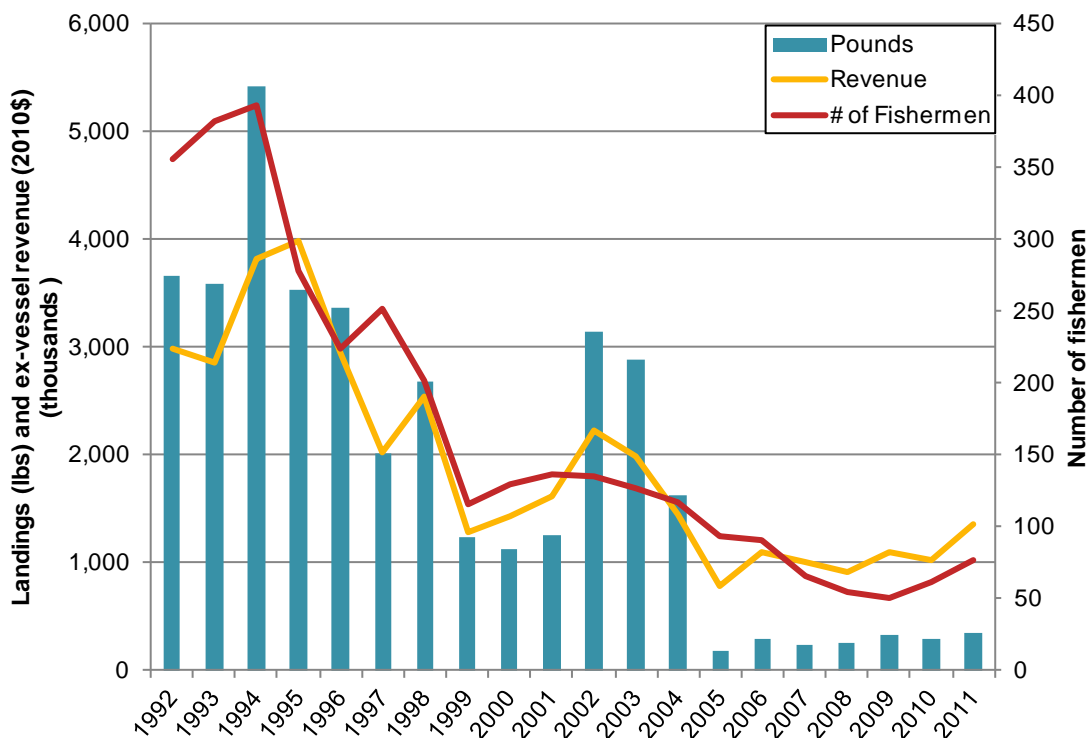
lesser importance as revenue from salmon and reliance on salmon revenue for fishing income is not as dominant as in other ports.

Avila/Port San Luis' ex-vessel revenue portfolio for fisheries of interest over the study period also was primarily dominated by the nearshore finfish–live–hook & line fishery, which averaged 25.4 percent over the study period, but was closer to 50 percent over the last three years. The salmon–troll fishery's significance noticeably declined even before fishery closures set in by 2008 and 2009. The Dungeness crab–trap fishery, contributing 28.9 percent to total ex-vessel revenues in 2006, averaged less than one percent from 2008 to 2011. In fact, in most ports the contribution of the Dungeness crab–trap fishery to total port ex-vessel revenues increased in the last few years of the study area, with Avila/Port San Luis as the exception.

Figure 149 displays the average percent fishing income by fishery in Avila/Port San Luis for the eleven fisheries of interest, displaying changes in how much fishermen rely upon ex-vessel revenue from specific fisheries of interests relative to other fisheries of interest¹². This figure more closely resembles the composition of ex-vessel revenues figure than observed for other ports.

Upon review of landings data in the Avila/Port San Luis fishing community, fishermen indicated that a fish processor went out of business in the port in 2004 which contributed to lower landings in subsequent years. Furthermore, the trawl buyback program implemented in 2003/2004 significantly impacted landings in Avila/Port San Luis as indicated in Figure 146 which shows our study's fisheries of interest dramatically becoming a larger percent of total landings after 2004.

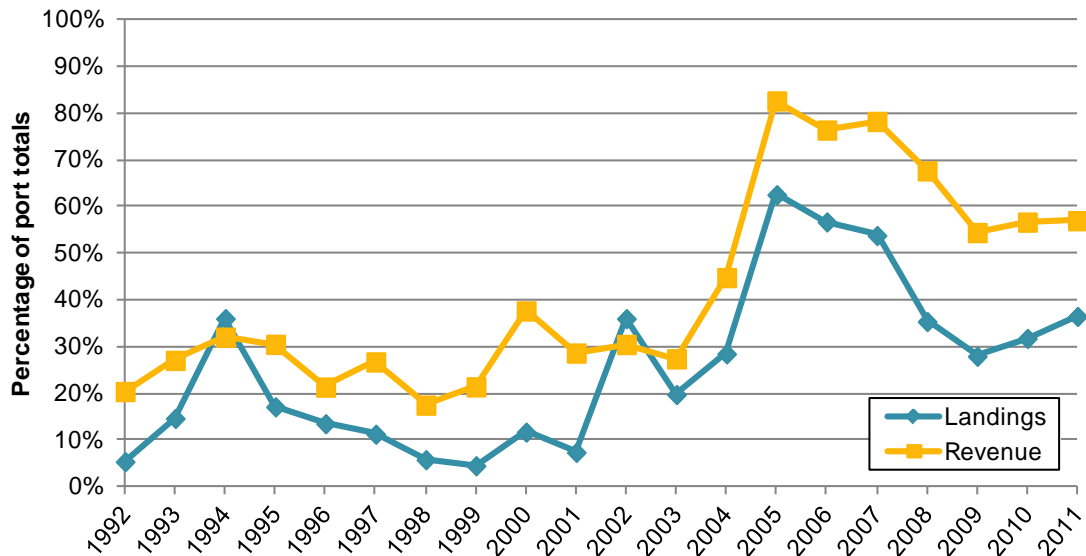
Figure 145. Avila/Port San Luis total commercial landings, ex-vessel revenues, and number of fishermen, all fisheries, 1992–2011



Source: Landings data from CDFG

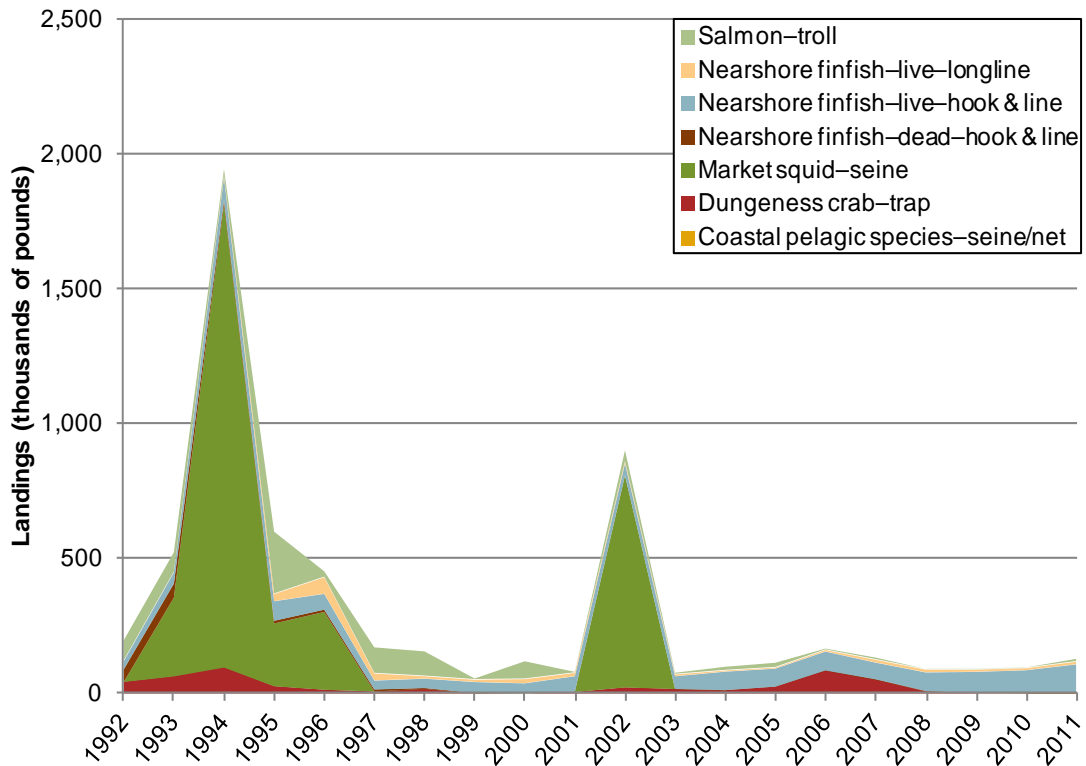
¹² For more information on this figure, please see section 4.1.1.

Figure 146. Fisheries of interest as a percentage of all commercial fisheries landings and ex-vessel revenues in Avila/Port San Luis, 1992–2011



Source: Landings data from CDFG

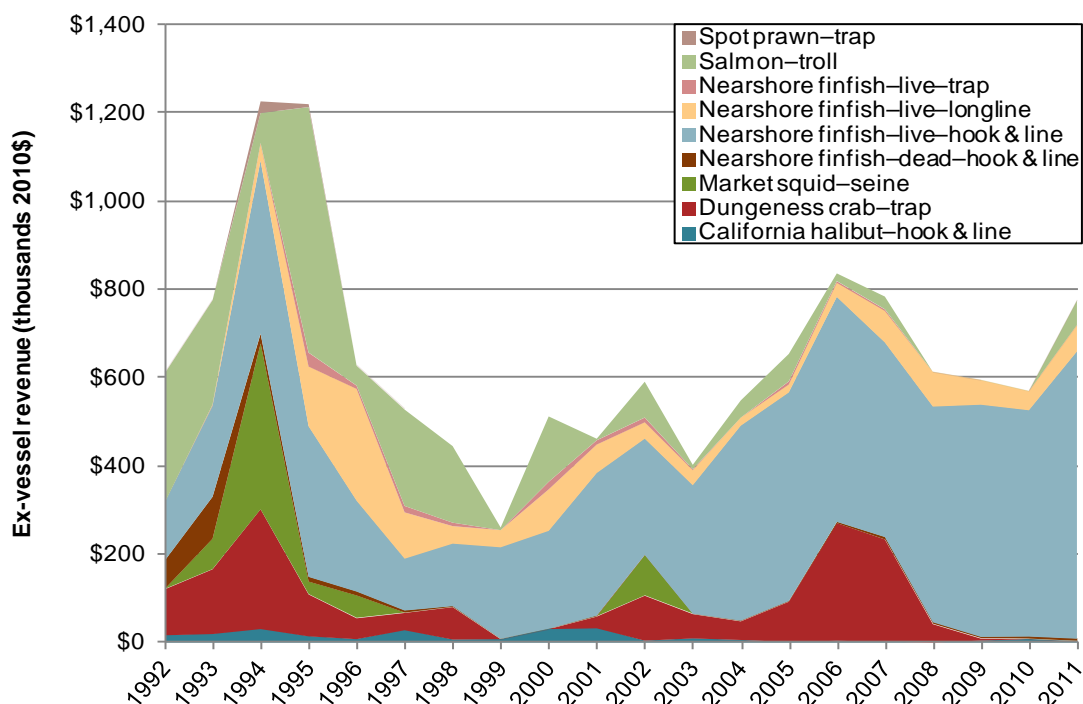
Figure 147. Avila/Port San Luis commercial landings for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

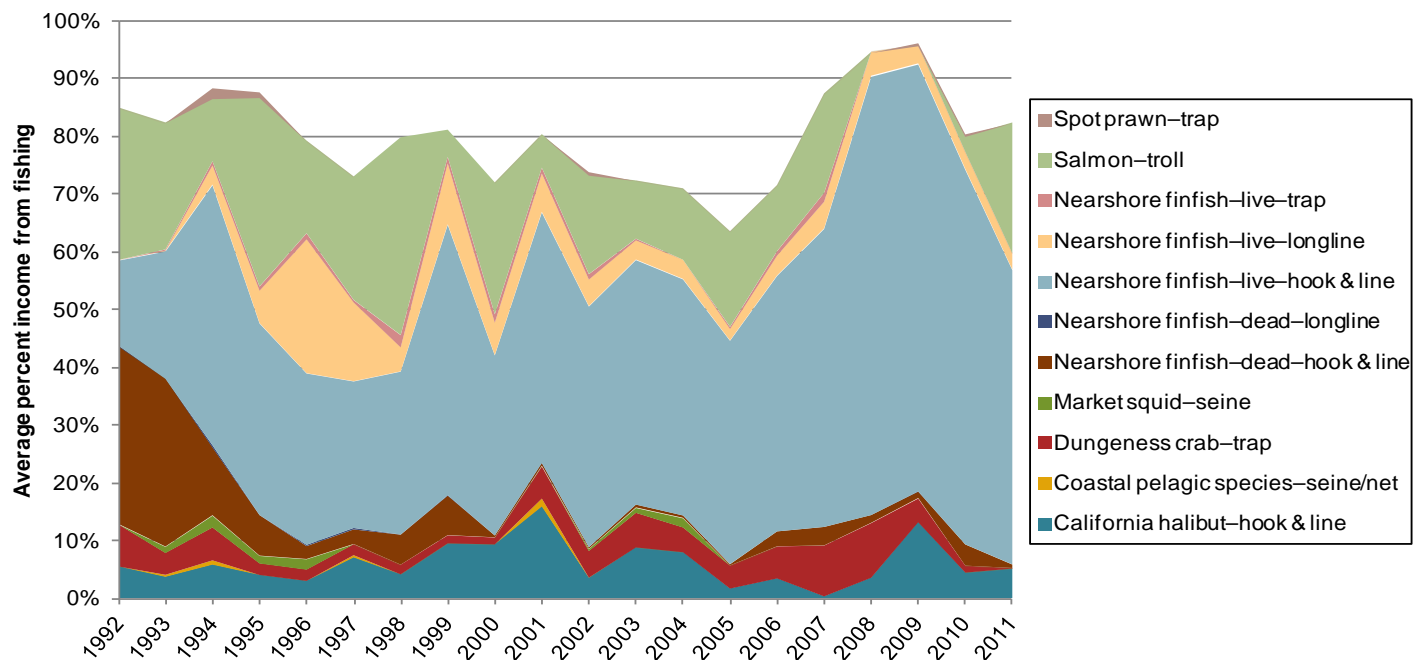
Source: Landings data from CDFG

Figure 148. Avila/Port San Luis commercial ex-vessel revenues for fisheries of interest, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 149. Average percent of individual fishing income from commercial fisheries of interest, Avila/Port San Luis, 1992–2011



Source: Landings data from CDFG

Table 241 displays the percent change in total and average per fishermen ex-vessel revenues for each fishery in the port of Avila/Port San Luis as compared with the respective changes in the Central Coast Region over the study period.

While ex-vessel revenue trends for the nearshore finfish–live–hook & line fishery were more impressive in Morro Bay, this fishery has been more consistently significant in the port of Avila/Port San Luis, where ex-vessel revenues in that port constituted 57.2 percent of total ex-vessel revenues annually for the fishery in the entire Central Coast Region on average. Avila/Port San Luis total nearshore finfish–live–hook & line ex-vessel revenues increased by 191.8 percent from 2000 to 2011, and average ex-vessel revenues per fishermen increased by 342.8 percent over the same time.

In the nearshore finfish–dead–hook & line fishery, ex-vessel revenues in Avila/Port San Luis increased more from 2000 to 2011 than they did in any other port, 705.9 percent from \$719 to \$5,798 respectively. In the Central Coast Region, total nearshore finfish–dead–hook & line ex-vessel revenues increased only 12.4 percent. Average ex-vessel revenues also increased substantially in this port in this fishery at 504.4 percent. The increase is most likely due to a large increase in landings volume over the same time period more than to an increase in price (and the number of fishermen also increased actually over the same time period).

Avila/Port San Luis saw notable increases in total and average per fishermen ex-vessel revenues contrary to Central Coast Regional trends in the nearshore finfish–live–longline fishery. From 2004 to 2007 average ex-vessel revenues per fishermen in the port increased by 1058.6 percent, while decreasing by 0.3 percent in the Central Coast Region overall. This was likely due to a combination of an increase in volume landed, an increase in price, as well as a decrease in the total number of fishermen over the same time period.

Table 241. Avila/Port San Luis: Percent change in total commercial ex-vessel revenue and average ex-vessel revenue per fisherman, select fisheries of interest, 2000–2011

Fishery	Commercial ex-vessel revenue	Percent change			2000–2011
		Pre MPA (2000–2003)	Pre MPA (2004–2007)	Post MPA (2008–2011)	
California halibut–hook & line	Avila/Port San Luis total	-69.4%	-66.3%	*	-91.1%
	Avila/Port San Luis average per fisherman	-38.8%	-32.6%	*	-78.7%
	Central Coast Region total	85.6%	-66.6%	205.2%	103.9%
	Central Coast Region average per fisherman	33.2%	-9.8%	17.8%	23.1%
Dungeness crab–trap	Avila/Port San Luis total	*	450.1%	*	*
	Avila/Port San Luis average per fisherman	*	890.1%	*	*
	Central Coast Region total	313.7%	189.7%	165.3%	864.0%
	Central Coast Region average per fisherman	175.8%	189.7%	107.3%	623.0%
Market squid–seine	Avila/Port San Luis total	–	–	–	–
	Avila/Port San Luis average per fisherman	–	–	–	–
	Central Coast Region total	314.6%	-99.8%	*	217.7%
	Central Coast Region average per fisherman	115.3%	-98.4%	*	114.4%
Nearshore finfish–dead–hook & line	Avila/Port San Luis total	25.9%	271.3%	35.3%	705.9%
	Avila/Port San Luis average per fisherman	-16.1%	340.0%	35.3%	504.4%
	Central Coast Region total	-12.9%	-6.3%	-11.6%	12.4%
	Central Coast Region average per fisherman	42.0%	4.5%	-5.6%	77.2%
Nearshore finfish–live–hook & line	Avila/Port San Luis total	31.0%	-0.2%	33.0%	191.8%
	Avila/Port San Luis average per fisherman	31.0%	35.2%	28.4%	342.8%
	Central Coast Region total	-11.3%	24.8%	15.0%	111.4%
	Central Coast Region average per fisherman	14.0%	40.8%	29.8%	298.8%
Nearshore finfish–live–longline	Avila/Port San Luis total	-63.5%	286.2%	-23.2%	-35.8%
	Avila/Port San Luis average per fisherman	-53.3%	1058.6%	-34.1%	111.0%
	Central Coast Region total	-56.8%	-63.5%	-27.4%	-91.5%
	Central Coast Region average per fisherman	-37.5%	-0.3%	3.8%	-1.9%
Nearshore finfish–live–trap	Avila/Port San Luis total	-87.3%	–	–	–
	Avila/Port San Luis average per fisherman	-74.5%	–	–	–
	Central Coast Region total	-45.9%	-39.6%	-36.7%	-78.9%
	Central Coast Region average per fisherman	-19.8%	-36.8%	21.3%	-29.5%
Salmon–troll	Avila/Port San Luis total	-93.3%	-26.5%	–	-62.5%
	Avila/Port San Luis average per fisherman	-84.1%	6.9%	–	-35.5%
	Central Coast Region total	-77.9%	-66.4%	–	-88.7%
	Central Coast Region average per fisherman	-51.7%	-57.8%	–	-71.0%
Spot prawn–trap	Avila/Port San Luis total	–	–	–	–
	Avila/Port San Luis average per fisherman	–	–	–	–
	Central Coast Region total	101.8%	-8.8%	280.8%	423.9%
	Central Coast Region average per fisherman	101.8%	-29.1%	280.8%	423.9%

Source: Landings data from CDFG

Figure 150 displays the average ex-vessel prices over time for the California halibut–hook & line and nearshore finfish–live–hook & line fisheries. Over the study period, the average ex-vessel price per pound for the California halibut–hook & line fishery was \$4.39 and was \$5.67 for the nearshore finfish–live–hook & line fishery. From 1992 to 2011, the ex-vessel prices for each fishery experienced increases of 54.6 and 43.7 percent respectively.

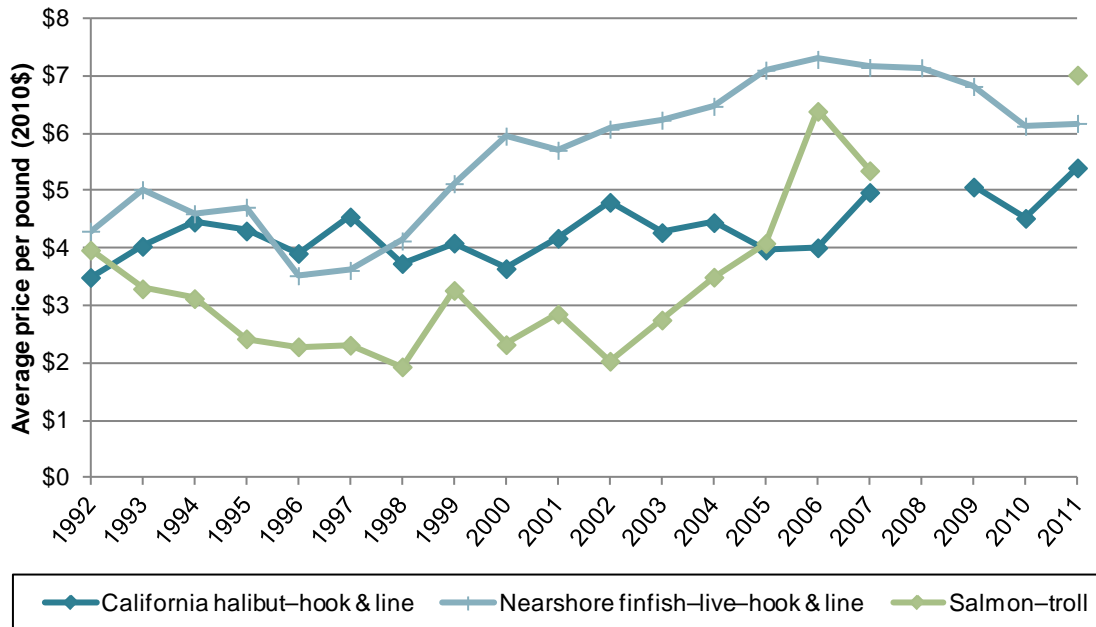
Figure 151 displays the landings, ex-vessel revenues, and number of fishermen for the California halibut–hook & line fishery of Avila/Port San Luis over the years 1992–2011. All three declined overall, by 89.3 percent for landings, 83.5 percent for ex-vessel revenues, and 72.2 percent for number of fishermen from 1992 to 2011. Peak values were in 2000 for landings (8,311 pounds), 2011 for ex-vessel revenues (\$32,065), and 1994 for fishermen (57). The average California halibut–hook & line fisherman in Avila/Port San Luis made a total of 4 landings per year, over which he landed an average annual total of 127 pounds for \$538 in ex-vessel revenue per year, see Figure 152. Unlike all other ports for this fishery in the region, Avila/Port San Luis California halibut–hook & line fishermen made less on average in 2011 than their counterparts did in 1992.

Figure 153 displays the landings, ex-vessel revenues, and number of fishermen for the nearshore finfish–live–hook & line fishery of Avila/Port San Luis over the years 1992–2011. The port made more landings in this fishery than did any of the other Central Coast Region ports over the study period, and experienced the greatest increases. Landings and ex-vessel revenues considerably rose over the study period, and were 242.1 and 391.5 percent higher respectively in 2011 than in 1992. At the same time, the number of fishermen decreased 61.8 percent from 1992, meaning fishermen in this fishery were making almost 12 times in 2011 as those in 1992 on average. The average fisherman made an annual total of 21 landings each year, landing an annual average total of 1,344 pounds for \$8,362 in ex-vessel revenue each year in Avila/Port San Luis, see Figure 154.

Avila/Port San Luis constituted the lowest salmon–troll ex-vessel revenues across the Central Coast Region ports over the study period. Similarly, in the port itself, the salmon–troll fishery averaged less to total ex-vessel revenues in the Avila/Port San Luis relative to its contribution to other ports, only 4.4 percent of total ex-vessel revenues. Landings and ex-vessel revenues peaked in 1995 at 228,690 pounds and \$554,866 respectively, see Figure 155, though annually averaged 37,532 pounds and \$101,821 respectively over the study period. The number of salmon–troll fishermen in the port was highest in 1993 at 99 fishermen; in 2011, 18 fishermen made landings in the port.

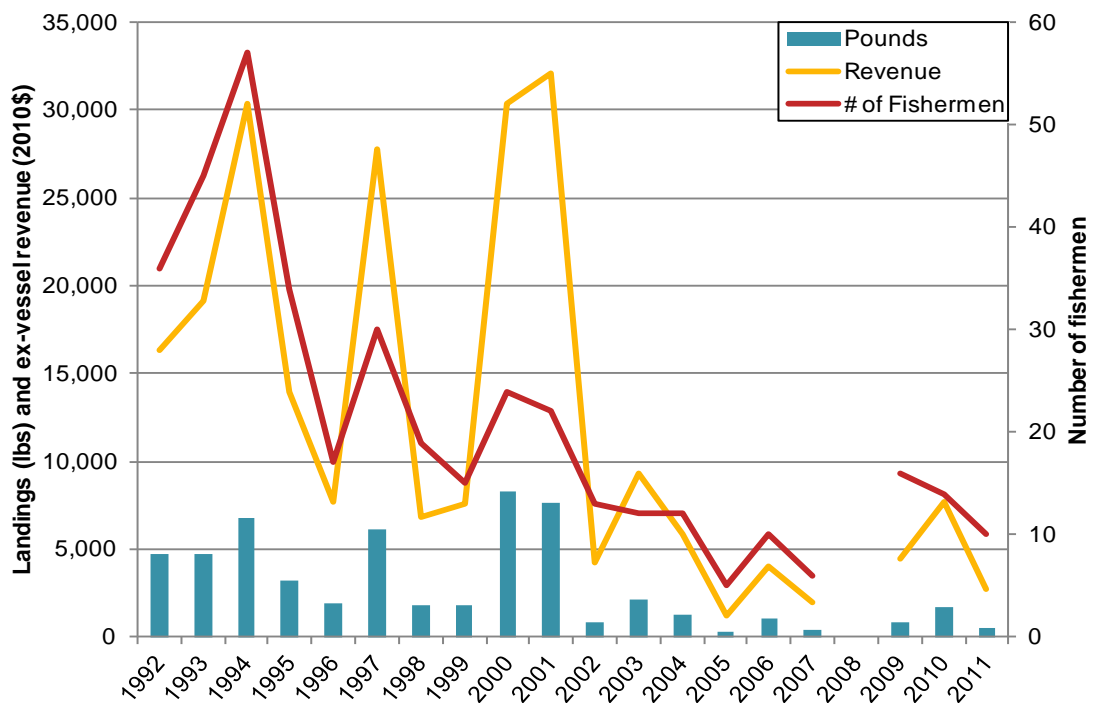
The average salmon–troll fishermen in Avila/Port San Luis made a total of 5 landings per year over which he landed a total of 745 pounds for \$2,156 in ex-vessel revenue per year on average, see Figure 156. Among Central Coast Region ports, salmon–troll fishermen in Avila/Port San Luis had the lowest average landings and ex-vessel revenues numbers. Per fisherman, average landings and ex-vessel revenues were highest in 1995 at 2,659 pounds and \$6,452 respectively.

Figure 150. Average ex-vessel prices over time, target commercial fisheries, Avila/Port San Luis, 1992–2011



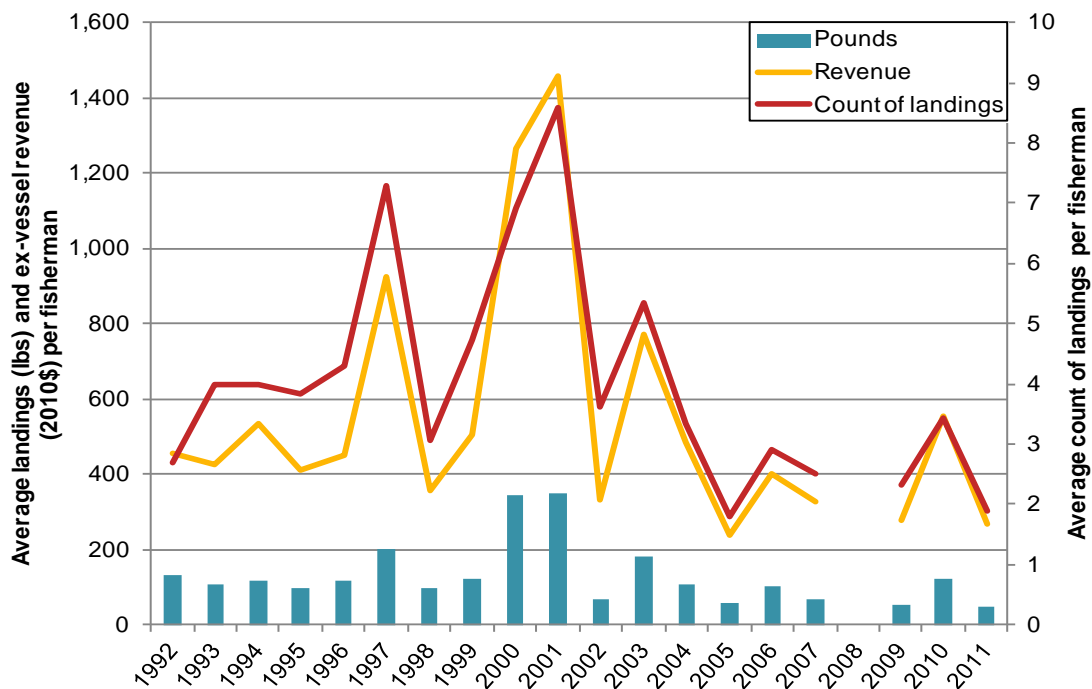
Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

Figure 151. California halibut-hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Avila/Port San Luis, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG

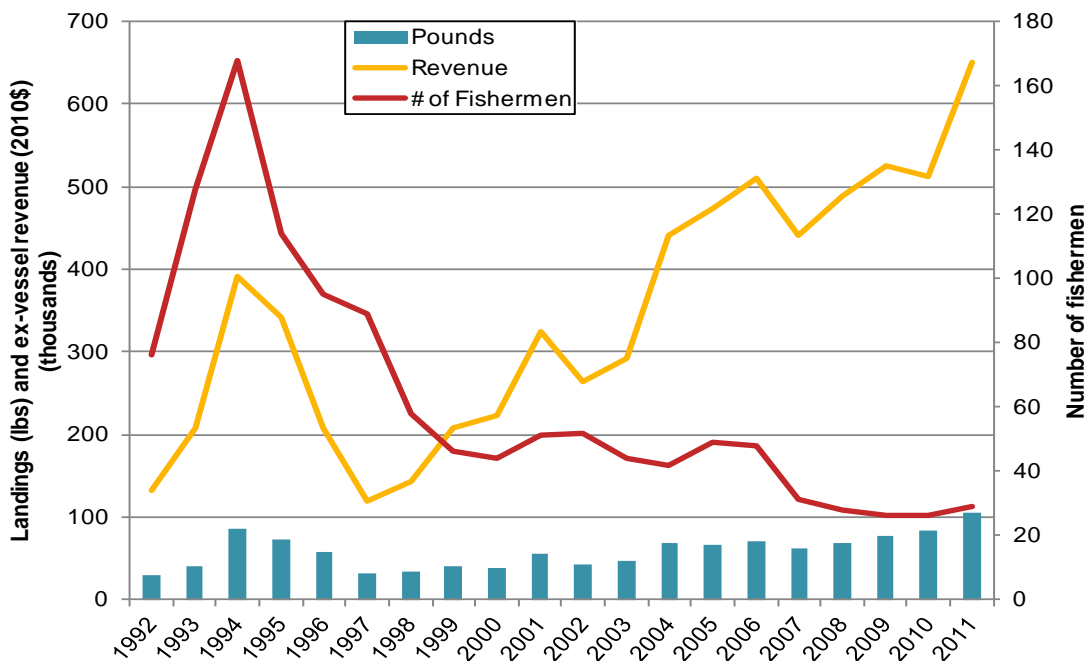
Figure 152. California halibut–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Avila/Port San Luis, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

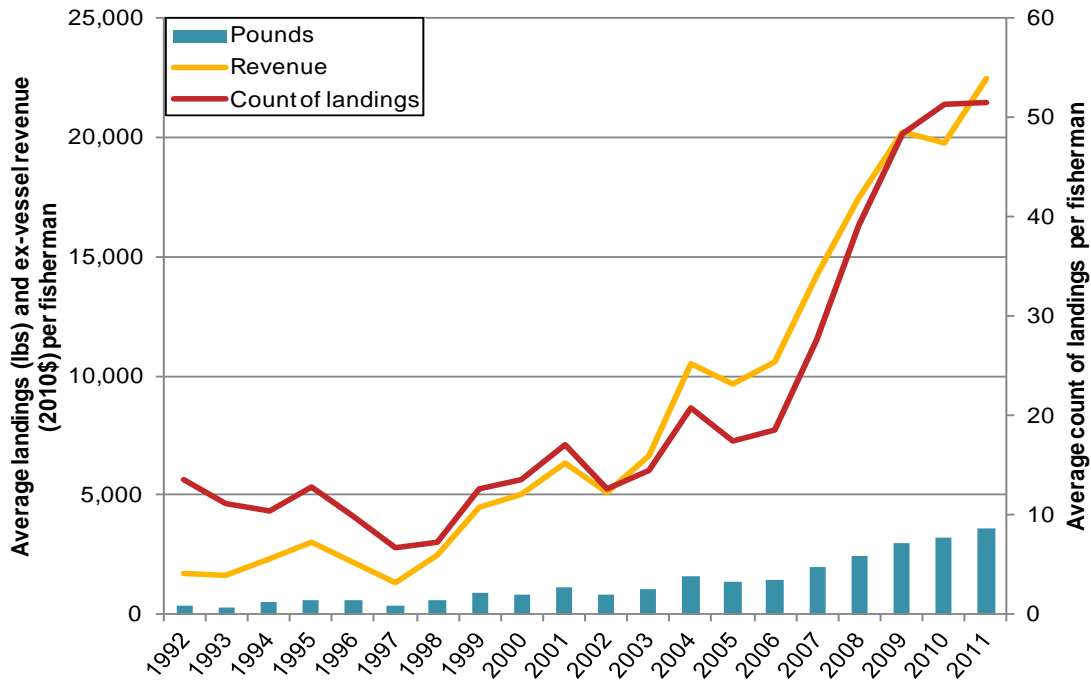
Source: Landings data from CDFG

Figure 153. Nearshore finfish–live–hook & line: Commercial landings, ex-vessel revenues, and number of fishermen, Avila/Port San Luis, 1992–2011



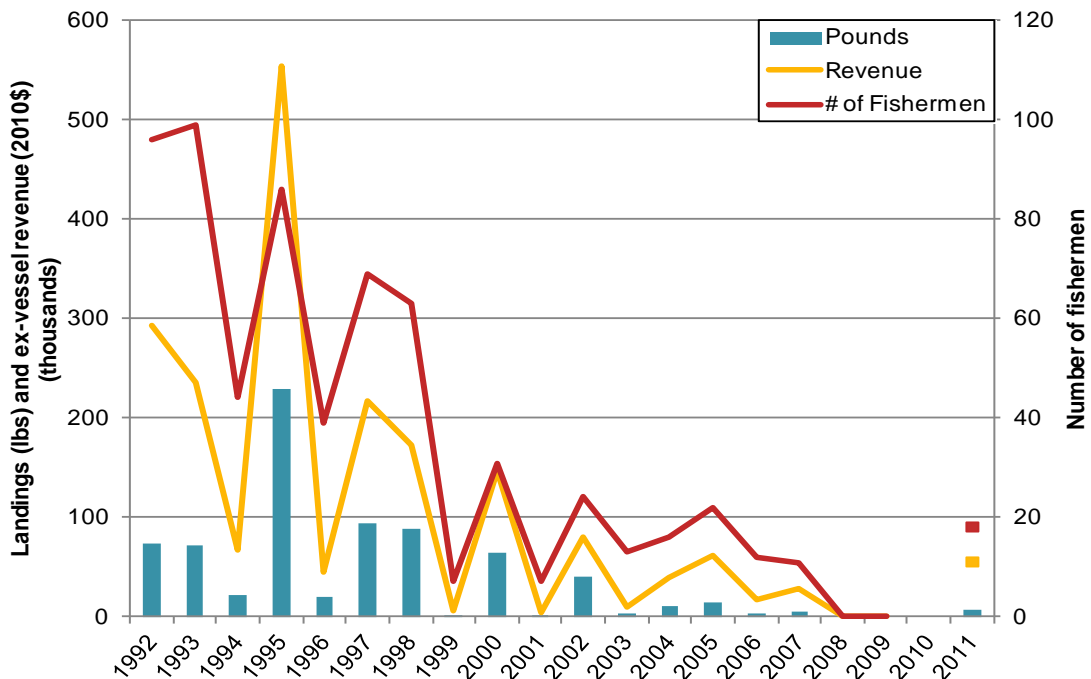
Source: Landings data from CDFG

Figure 154. Nearshore finfish–live–hook & line: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Avila/Port San Luis, 1992–2011



Source: Landings data from CDFG

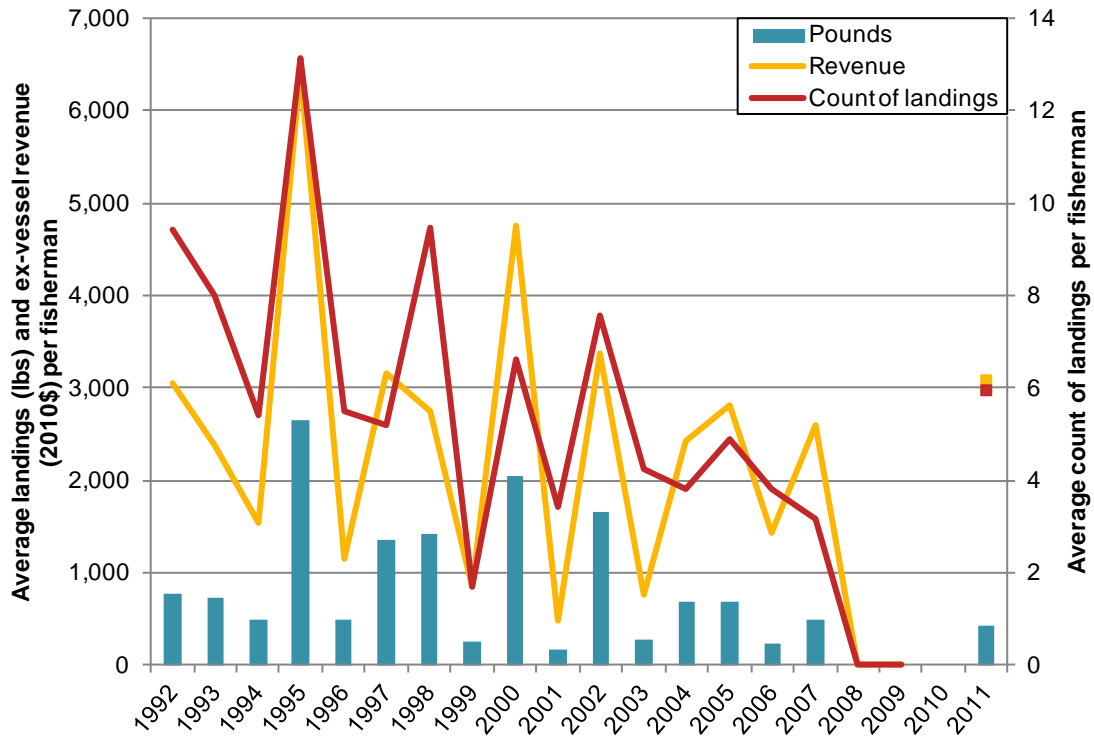
Figure 155. Salmon–troll: Commercial landings, ex-vessel revenues, and number of fishermen, Avila/Port San Luis, 1992–2011



Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.

Source: Landings data from CDFG

Figure 156. Salmon–troll: Average pounds landed, ex-vessel revenue, and count of landings per fisherman, commercial fishing, Avila/Port San Luis, 1992–2011



*Note: Some data was suppressed in the creation of this figure due to confidentiality constraints.
Source: Landings data from CDFG*

5.4.2. Avila/Port San Luis Commercial Fisheries Baseline Characterization

As seen in Table 242 and Table 243 we interviewed four fishermen with an average age of 58 years. All four fishermen participated in nearshore finfish – live fishery. Three of these four fishermen use hook and line gear and one uses longline gear. Avila/Port San Luis is the only port that reported landings 2011 using the longline gear type. Additionally, it is the only port in the region where the nearshore finfish – live fishery is the major fishery of all target fisheries.

Table 242. Number of commercial fishermen interviews conducted and ex-vessel landings value, non spatial survey, Avila/Port San Luis

Fishery	2011 Landings revenue (2010\$)	Total number of individuals in 2011 landings revenue	Number interviewed
California halibut – hook & line	\$2,697	10	1
Coastal pelagic species – seine/net	—	—	—
Dungeness crab – trap	*	1	—
Market squid – seine	—	—	—
Nearshore finfish – live – hook & line	\$650,598	29	3
Nearshore finfish – live – longline	\$60,374	7	1
Nearshore finfish – live – trap	—	—	—
Nearshore finfish – live	\$710,972	36	4
Salmon–troll	\$55,348	18	—
Spot prawn – trap	—	—	—
All target fisheries		46	4

Source: California Department of Fish and Game, Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Table 243. Average age and years experience commercial fishing, Avila/Port San Luis

Fisheries	Age		Years experience	
	Average	Standard deviation	Average	Standard deviation
California halibut – hook & line	*	*	*	*
Coastal pelagic species – seine/net	—	—	—	—
Dungeness crab – trap	—	—	—	—
Market squid – seine	—	—	—	—
Nearshore finfish – live	58.0	9.1	25.5	16.0
Salmon – troll	—	—	—	—
Spot prawn – trap	—	—	—	—
All target fisheries (unique individuals)	58.0	9.1	25.5	16.0

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

In Avila/Port San Luis, fishermen reported that on average in 2006 that 51.3 percent of their income came from commercial fishing. On average in 2011 75.5 percent of their income came from commercial fishing. Based on each individual's percent change, the four fishermen averaged a 480 percent increase in the percentage of income derived from commercial fishing. As indicated by the large standard deviation (946.7 percent) responses were greatly varied. One nearshore finfish–live fisherman reported a large increase in percent income from commercial fishing due to obtaining a nearshore rockfish permit and focusing full time on commercial fishing.

With this outlier removed Avila/Port San Luis reports an average of 66.7 percent in 2006 (with a standard deviation of 49.3 percent) and 67.3 percent in 2011 (with a standard deviation of 48.2 percent). This results in an average increase of 6.7 percent (with a standard deviation of 11.5 percent) increase from commercial fishing over the study period.

Table 244. Percent change in income from overall commercial fishing from 2006-2011, Avila/Port San Luis

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut – hook & line	*	*	*	*	*	*
Coastal pelagic species – seine/net	—	—	—	—	—	—
Dungeness crab – trap	—	—	—	—	—	—
Market squid – seine	—	—	—	—	—	—
Nearshore finfish – live	51.3%	50.7%	75.5%	42.6%	480.0%	946.7%
Salmon–troll	—	—	—	—	—	—
Spot prawn – trap	—	—	—	—	—	—
All target fisheries (unique individuals)	51.3%	50.7%	75.5%	42.6%	480.0%	946.7%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

After reporting the percent of their income from commercial fishing for 2006 and 2011, fishermen who reported a change were asked to describe factors to which they attributed this change. This was posed as an open-ended question and respondents were encouraged to speak freely as the interviewer took notes on key aspects that were mentioned. After the interview, the notes were coded and summarized into the categories which are shown below in Table 245. The individual who mentioned increased regulations was referring to other fisheries he participated in which were heavily regulated before 2006 and thus his overall commercial fishing income decreased dramatically in 2006 while increasing in 2011 (Table 245).

Table 245. Cause of change in percent income from commercial fishing from 2006 - 2011, Avila/Port San Luis

Response	Number responding
	Nearshore finfish – live
Increased regulation	1
Intensified fishing efforts	—
Had additional job or source of income	—
Found additional job or source of income	—
Change in fish abundance	—
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

One respondent indicated a source of additional income, stating he has both business/office work and retirement funds (Table 246).

Table 246. Other sources of income other than commercial fishing in 2011, Avila/Port San Luis

Response	Number responding	
	California halibut – hook & line	Nearshore finfish – live
Skilled labor	*	—
Investments/retirement/social security	*	1
Business/office work	*	1
Other maritime occupation	*	—
Total number responding	1	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

As in the other ports in the Central Coast Region, nearshore finfish – live fishermen in Avila/Port San Luis indicated an increase in operating costs (9.6 percent) from 2006 to 2011. Respondents reported a higher percent of revenue to operating costs compared to the average for the fishery across the region. However, fishermen in the nearshore finfish—live fishery in Avila/Port San Luis experienced on average a lesser percentage of change over the time period (Table 247).

Table 247. Percent change in overall commercial fishing operating costs from 2006 - 2011, Avila/Port San Luis

Fisheries	2006		2011		Percent change (average)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut – hook & line	*	*	*	*	*	*
Coastal pelagic species – seine/net	—	—	—	—	—	—
Dungeness crab – trap	—	—	—	—	—	—
Market squid – seine	—	—	—	—	—	—
Nearshore finfish – live	47.0%	4.8%	53.3%	53.3%	9.6%	17.0%
Salmon – troll	—	—	—	—	—	—
Spot prawn – trap	—	—	—	—	—	—
All target fisheries (unique individuals)	47.6%	3.9%	52.6%	7.6%	7.4%	16.9%

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

All individuals who reported a change in operating costs between 2006 and 2011 cited different reasons for the change. One indicated he had large costs such as the purchase of a vessel in 2006, one noted he had only fished a few days in 2006 for personal reasons, and another indicated a decrease in fishing grounds was forcing him to travel longer and fish less. In addition to an increase in costs he also mentioned having to spend more time on the water, taking away from time with his family.

Table 248. Cause of change in percent of gross economic revenue used towards overall operating costs, commercial fishing, Avila/ Port San Luis

Response	Number responding	
	California halibut – hook & line	Nearshore finfish – live
Large capital investment	*	1
Decrease in fishing income	*	—
Decrease in fishing grounds	*	1
Increase in fishing expenses	*	—
Fishing less in 2006	*	1
Fishing less in 2011	*	—
Total number responding	1	3

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

The average nearshore finfish – live fishermen has one crew member who receives an average of 12.5 percent of the boats gross economic revenue (GER) per trip. Additional information is found below in Table 249.

Table 249. Additional commercial fishery specific data, Avila/Port San Luis

Fisheries	Years experience in fishery		Number of crew per trip		Percent GER to crew		Percent GER to fuel	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
California halibut – hook & line	*	*	*	*	*	*	*	*
Coastal pelagic species – seine/net	—	—	—	—	—	—	—	—
Dungeness crab – trap	—	—	—	—	—	—	—	—
Market squid – seine	—	—	—	—	—	—	—	—
Nearshore finfish – live	16.8	7.9	1.0	—	12.5%	8.7%	14.3%	5.1%
Salmon–troll	—	—	—	—	—	—	—	—
Spot prawn – trap	—	—	—	—	—	—	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Additionally, for each fishery they participated in fishermen were asked if they had added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. If they had answered yes to any of these questions, they were additionally asked an open-ended question as to why added or dropped that fishery since 2006 or if they did not fish that fishery in 2011. These questions were asked to investigate if fishermen have entered fisheries to diversify their fishing portfolio or if they had left fisheries and the factors driving those decisions. Furthermore, some fishermen may not drop a fishery entirely and participate in the fishery on and off across the years. If this was the case we also sought to investigate the reasoning behind this situation such as fishery closures or regulatory complications.

One respondents reported adding a fishery since 2006 (Table 250) citing that he was new to commercial fishing overall (Table 251).

Table 250. Commercial fisheries added/dropped since 2006 or not fished in 2011, Avila/Port San Luis

Fisheries	Number responding	Added	Dropped	Not fished in 2011
California halibut – hook & line	1	*	*	*
Coastal pelagic species – seine/net	—	—	—	—
Dungeness crab – trap	—	—	—	—
Market squid – seine	—	—	—	—
Nearshore finfish – live	4	25.0%	—	—
Salmon–troll	—	—	—	—
Spot prawn – trap	—	—	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Table 251. Reason for adding/dropping a fishery since 2006 or not fishing a fishery in 2011, commercial fishing, Avila/Port San Luis

Responses	Number responding	
	California halibut – hook & line	Nearshore finfish – live
Started commercial fishing	*	1
Change in fish population	*	—
Diversify fisheries	*	—
Was able to obtain permit	*	1
High costs	*	—
Total number responding	1	2

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Fishermen were asked for each fishery separately to compare the success of his/her fishery in 2011 to the success of his/her fishery in the last five years. As shown in the table below, respondents were given the option of responding in one of the following categories: 1) significantly better; 2) somewhat better; 3) the same; 3) somewhat worse; and 4) significantly worse.

Of the four out of five respondents who answered this question, two indicated the nearshore finfish—live fishery was the same, while one indicated it was significantly better and another indicated was somewhat worse. The individual who indicated it was better had obtained an additional permit that made it more economical to fish nearshore finfish – live.

Table 252. Overall success in specific commercial fishery compared to previous five years, Avila/Port San Luis

Fisheries	Number responding	Did not participate in previous seasons	Percent response				
			Significantly better	Somewhat better	The same	Somewhat worse	Significantly worse
California halibut – hook & line	1	*	*	*	*	*	*
Coastal pelagic species – seine/net	—	—	—	—	—	—	—
Dungeness crab – trap	—	—	—	—	—	—	—
Market squid – seine	—	—	—	—	—	—	—
Nearshore finfish – live	4	—	25.0%	—	50.0%	25.0%	—
Salmon–troll	—	—	—	—	—	—	—
Spot prawn – trap	—	—	—	—	—	—	—

Source: Current study

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

Respondents were then asked what factors they felt had contributed to the level of success in his/her fishery. This question was asked in an open ended manner and responses were later coded, categorize, and divided into four types of categories: regulatory, environmental, economic, and other as seen in the tables below.

All respondents from Avila/Port San Luis indicated they felt fishery regulations were inequitable and inefficient—citing the desire to have multiple fishermen fish on the same vessel to increase safety while fishing and to share operating costs. Additionally, fishermen mentioned the nearshore finfish permitting system, which makes it difficult for someone to enter the nearshore rockfish fishery. Fishermen also mentioned that because the deeper nearshore permits are non-transferrable those permits are becoming fewer and fewer.

Table 253. Regulatory changes/factors influencing success in specific commercial fishery in previous five years, Avila/Port San Luis

Response	Number responding	
	California halibut – hook & line	Nearshore finfish – live
MPA impacts	*	3
Insufficient monitoring/enforcement/communication of MPAs	*	—
Trawlers impacting nearshore fleet	*	—
Quota limit issues	*	1
Concentration of fishing effort into smaller areas/over-crowding	*	1
Less competition	*	—
Inefficiencies in bycatch regulations	*	1
Inefficiencies/inconsistencies in fishery regulations	*	3
Inequities in fishery regulations	*	4
Loss of historical fishery knowledge	*	1
Inadequate research for policy	*	1
Inequities in obtaining fishery permits	*	2
Insufficient regulation on land-based impacts to fisheries	*	—
Lack of influence on policy/regulation development	*	1
Insufficient communication of fishery regulations	*	—
Populations recovering from fishing gear ban	*	—
Distress around unintended infractions	*	—
Increased number of fishermen participating in the fishery	*	—
Increased personal fishing effort	*	1
Rockfish conservation area (RCA)	*	1
Total number responding	*	4

Source: Current study

Participants were allowed to give multiples responses

* indicates data were collected but cannot be shown due to confidentiality constraints

— indicates that the port/fishery was not sampled or a zero value data point

One individual indicated that a lack of infrastructure at the port has made it harder to land and process fish in Avila/Port San Luis. A few additional economic factors are listed below in Table 254.

Table 254. Economic changes/factors influencing success in specific commercial fishery in previous five years, Avila/Port San Luis

Response	Number responding
	Nearshore finfish – live
Increased number of fishermen participating in the fishery	—
Increase in operating costs	—
Increase in fish price	—
Decrease in fish price	1
Market flooded	—
Longer season allowed increase in catch	—
Increased demand for fish	—
Decrease in demand for fish	—
Increased personal fishing effort	1
Increased number of outside vessels fishing in local grounds	—
Lack of port infrastructure	1
Increase in travel distance	—
Total number responding	2

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

Lastly, one Avila/Port San Luis fishermen indicated that there is a lack of outreach to the community in terms of fisheries research and regulation.

Table 255. Other changes/factors influencing success in specific commercial fishery in previous five years, Avila/Port San Luis

Responses	Nearshore finfish – live
Increase in fishing experience	—
Loss of generational fishing knowledge	—
Fisherman's knowledge not valued	—
Lack of outreach to fishing community	1
Loss of cultural fishing heritage	1
Total number responding	1

Source: Current study

Participants were allowed to give multiples responses

— indicates that the port/fishery was not sampled or a zero value data point

5.4.3. Avila/Port San Luis CPFV Fisheries Initial Changes

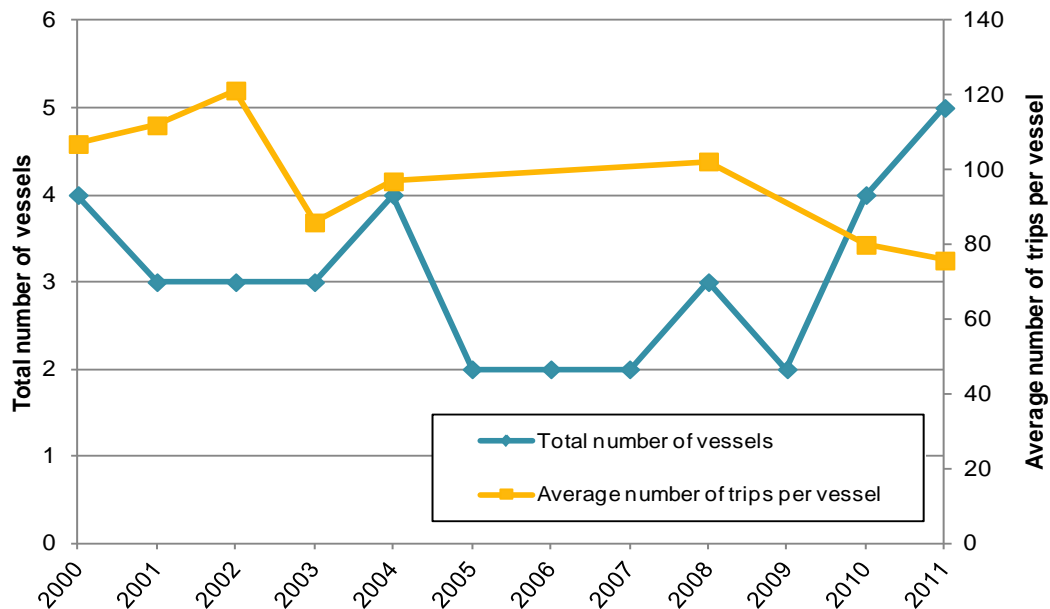
This section provides a summary and analysis of California Department of Fish and Game (CDFG) CPFV logbook data from 2000 to 2011 to provide historical trends and initial changes in CPFV fishing characteristics since MPA implementation. Trips into the Central Coast Region by CPFV operators from ports outside the Central Coast region were not included in the analyses provided. The following types of information listed below are found in the port level section:

1. Total number of vessels, anglers, and trips
2. Average number of anglers per trip and per vessel
3. Average number of trips per vessel
4. Total number of fish caught for select species/fisheries
5. Total number of trips for each species/fishery
6. Total number of trips for multiple species/fishery combo trips
7. Percent change in total number of vessels, trips, and anglers in pre and post MPA periods

CPFV operators are required to complete and submit a log to the CDFG for each fishing trip. This log includes information on the catch (number caught by species) and effort (number of anglers) for each trip as well as the port of departure and the Fish and Game Block in which most of the fishing occurs. Only a certain number of species are listed on the log. Operators can write in species that are not listed, or combine species into a group species category such as "Unidentified Rockfish." Some species, such as several of the nearshore rockfishes, are listed on the log, but operators may still choose to put these into a group category. Consequently, species summaries are provided at the most accurate level, which for the nearshore rockfish is the group rockfish. For a more detailed description of how CPFV logbook data was utilized in this analysis please see section 4.5.

Between 2000 and 2004, three to four vessels operated out of Avila/Port San Luis (Figure 157). This number dropped to two in 2005 and then fluctuated between two and three vessels until 2010 when the number rose to four. In 2011, five vessels were operating out of this port. The average number of trips per vessel and the total number of trips showed some fluctuations, but overall decreased, with trips decreasing by 11 percent between 2000 and 2011 (Figure 158). Conversely, the average number of anglers increased slightly over the study period. Both the total number of anglers and the average number of anglers per vessel showed fluctuations during the first couple of years, but their overall trends after that were different (Figure 159). The total number of anglers in 2008 and 2010 were lightly lower than 2004, but in 2011 this number was 6 percent higher than 2000. The average number of anglers per vessel in 2008 was higher than 2004, but 2010 was lower and the average number in 2011 was the lowest of all available values.

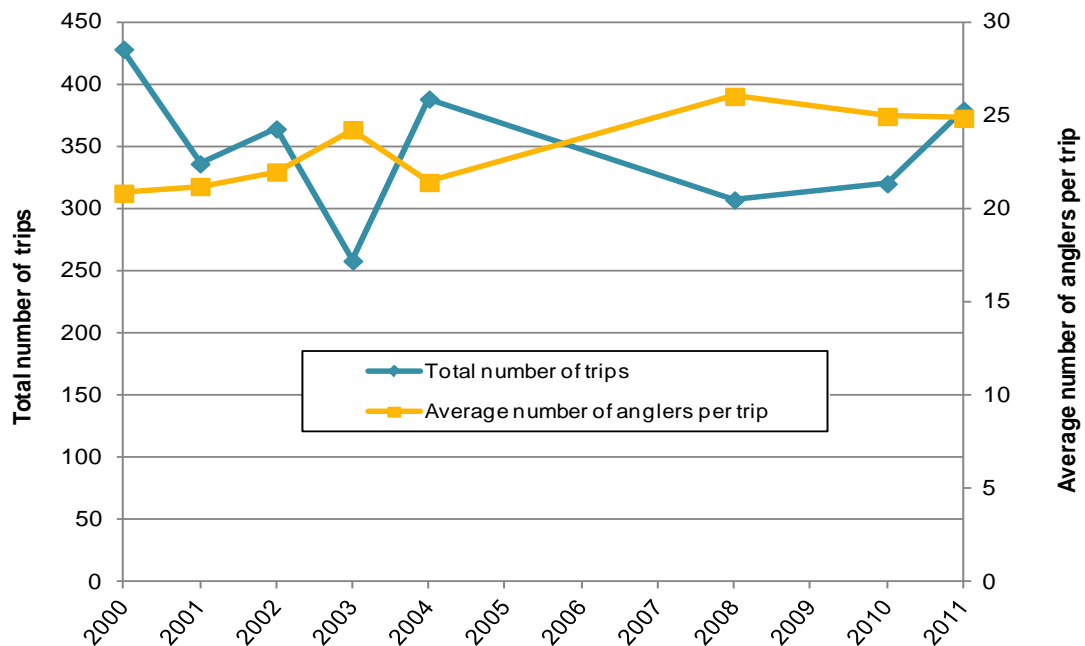
Figure 157. Total number of CPFV vessels and average number of trips per vessel, Avila/Port San Luis, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

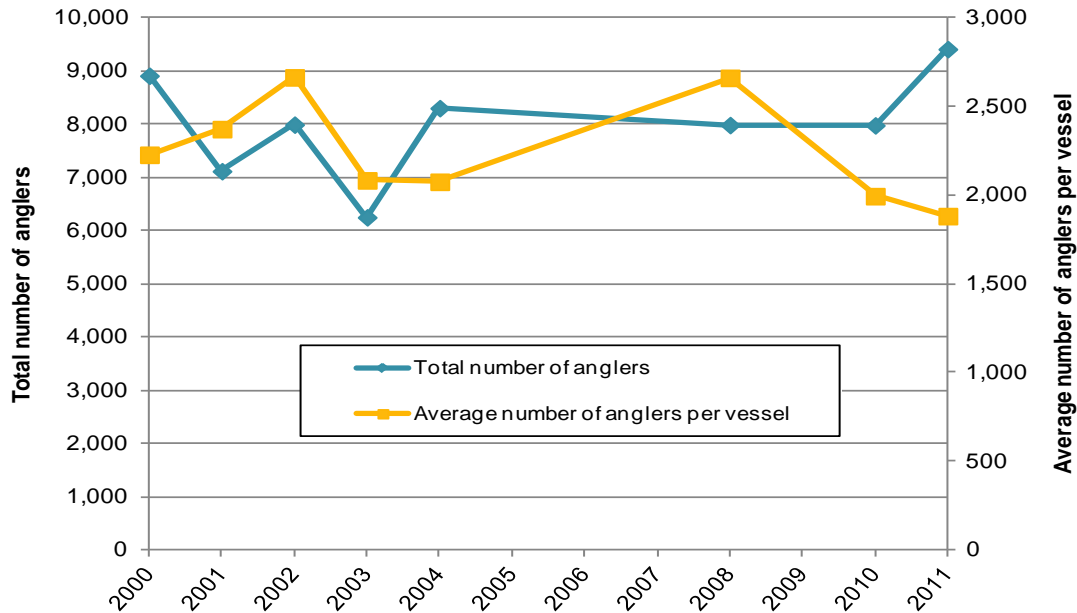
Figure 158. Total number of CPFV trips and average number of anglers per trip, Avila/Port San Luis, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 159. Total number of CPFV anglers and average number of anglers per vessel, Avila/Port San Luis, 2000-2011



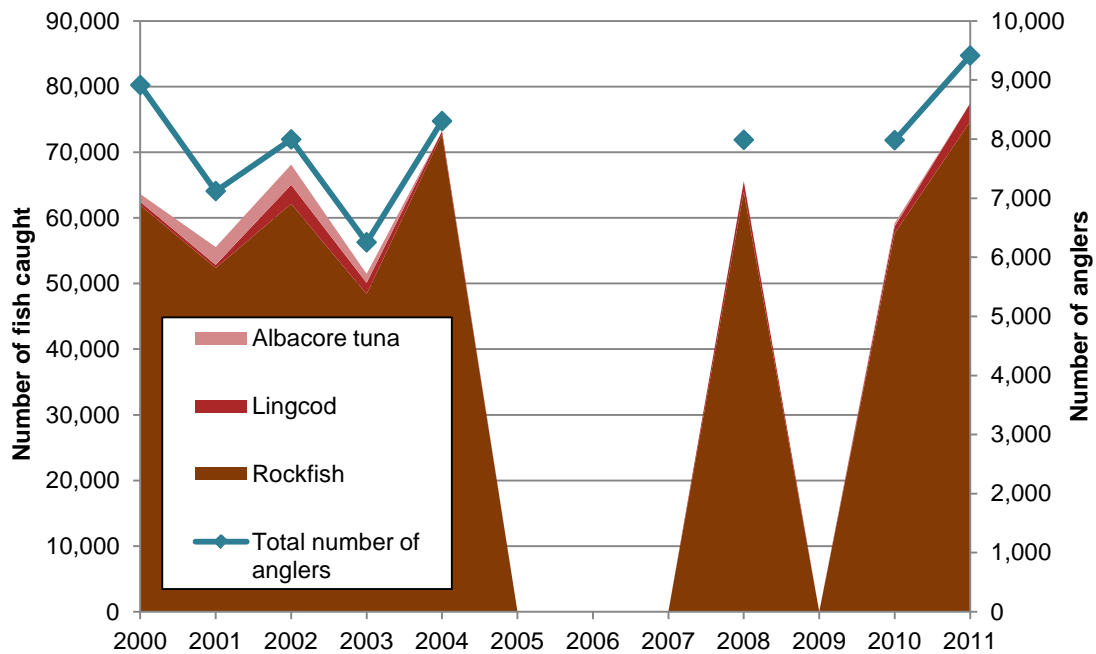
Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

The trend in the number of fish caught was somewhat similar to the total number of anglers (Figure 160). Catch fluctuated between 2000 and 2004, and increased between 2010 and 2011. Overall, the number of fish caught increased 26 percent between 2000 and 2011.

Rockfish was the predominant component of the catch for the years where catch values were available (Figure 160). Up until 2003, albacore tuna also was an important component of the catch. A small amount of lingcod was also taken during these earlier years as well as in 2010 and 2011. Most of the trips for the years with available values took rockfish. In 2000, these trips comprised 82 percent of the combined fishery trips while in 2011 they comprised 88 percent (Figure 161). The remaining trips (those considered to be other than rockfish) between 2000 and 2004 primarily took albacore tuna, salmon, and California halibut. In addition to these species, the remaining trips in 2010 and 2011 took crab (primarily Dungeness crab). Very few sanddab trips were observed, even in 2010 and 2011. Salmon-rockfish and rockfish-halibut trips were observed for all years with available values (Figure 162). In addition, crab-rockfish trips became more common during 2010 and 2011.

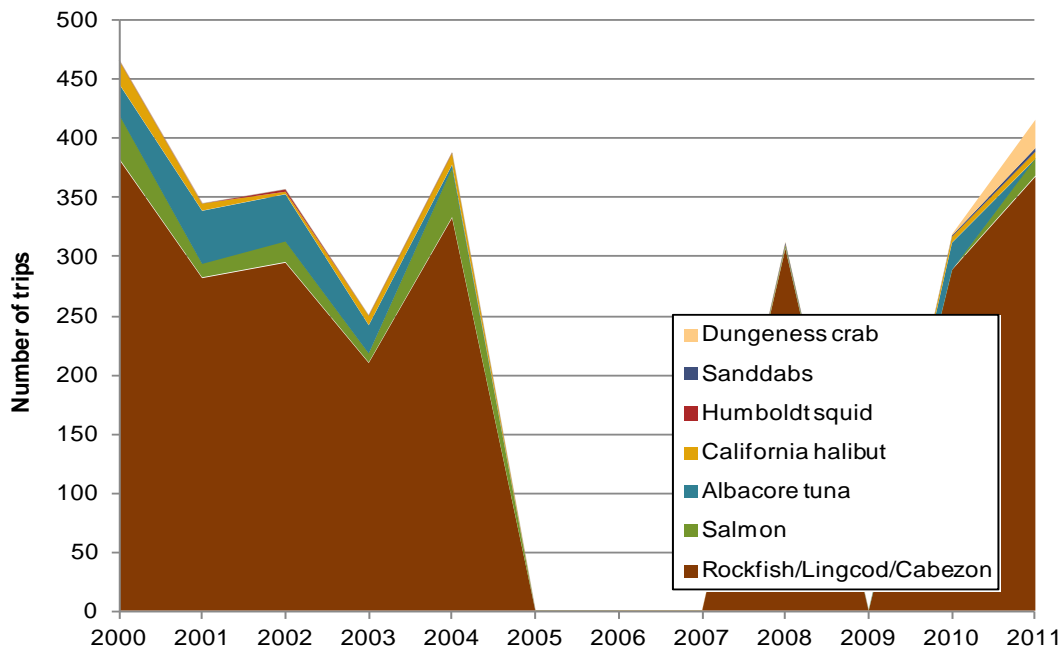
Figure 160. CPFV total number of fish caught for each fishery, Avila/Port San Luis, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

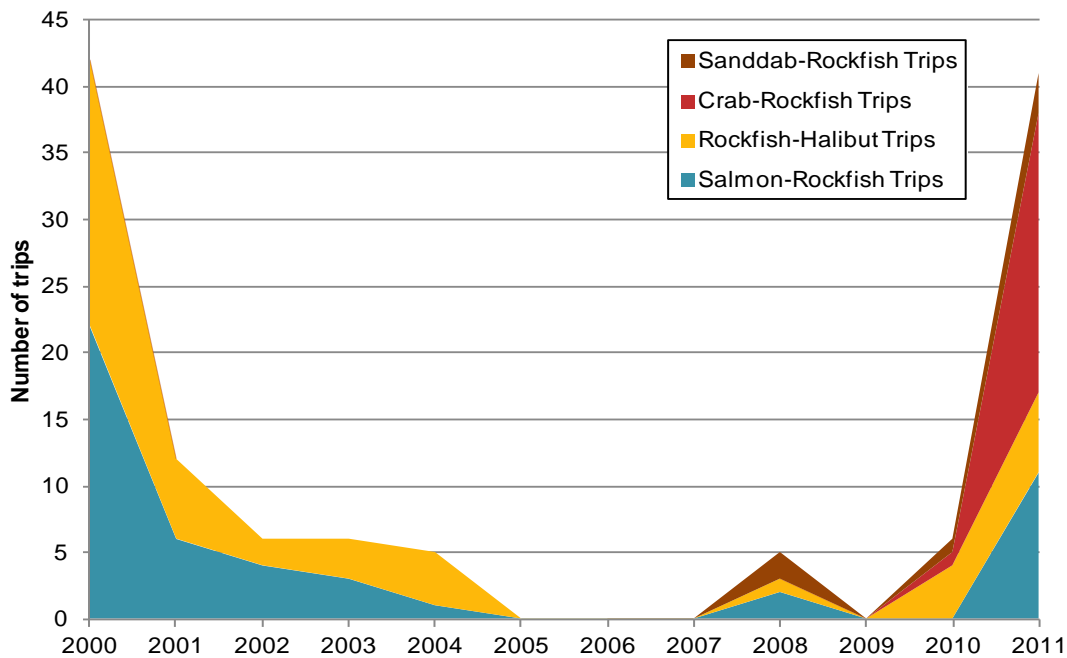
Figure 161. Total number of CPFV trips for each fishery, Avila/Port San Luis, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

Figure 162. Count of select multiple species CPFV trips, Avila/Port San Luis, 2000-2011



Source: CDFG CPFV logbook data

Zero values or no value for a particular year indicates the data were suppressed to protect confidential data

A CPFV baseline characterization section was not developed for the port of Avila/Port San Luis as we did not interview any CPFV operators in this port.

6. Central Coast Port Level Rocky Habitat Analysis

The loss of rocky habitat to area-based regulations that prohibit fishing activities such as the Rockfish Conservation Areas (RCA) and MPAs are commonly mentioned by fishermen as having significant impact on fishing patterns, the concentration of competing fishing effort, and the ability to maintain a profitable fishery. With the analysis provided below we attempted to measure the loss of rocky reef from area-based regulations/closures and investigate possible relationships with ex-vessel revenue trends in the commercial fishing ports of the Central Coast Region.

To investigate how area-based regulations may have reduced the amount of habitat available to fishermen, specifically commercial fishermen who fish for nearshore finfish species (e.g., rockfish) with fixed gear (e.g., hook and line or longline gear), we conducted two analyses (please see Table 256) at various travel distances (search radii). The first analysis (analysis A) examined the percent loss of rocky habitat from the implementation of the RCA and MPAs separately and combined. The second analysis (analysis B) examined the percent loss of rocky habitat from the implementation of MPAs given the available rocky habitat available after the RCA was implemented. It should be noted that all Central Coast MPAs (both State Marine Reserves and State Marine Conservation Areas) do not allow commercial take of nearshore finfish species and thus all Central Coast MPAs were used in this analysis.

The rocky habitat dataset was developed from combining two data sets. The rocky habitat data set for state waters (within 3 nautical miles from shore) was developed by the Seafloor Mapping Lab at California State University, Monterey Bay and is entitled 'Predicted Nearshore Benthic Substrates of California'. A coarser dataset was used for federal waters developed by the Center for Habitat Studies at Moss Landing Marine Laboratories entitled 'U.S. West Coast Geological Seafloor Habitat Characterization for Essential Fish Habitat (EFH)'. The non-trawl commercial Rockfish Conservation Area boundaries which was

implemented in 2002-2003 on the west coast of the United States to reduce the incidental catch of overfished rockfish species such as the darkblotched rockfish (*Sebastes crameri*), canary rockfish (*Sebastes pinniger*), and bocaccio (*Sebastes paucispinis*) were obtained from NOAA NMFS. For the Central Coast Region the non-trawl commercial RCA boundaries are between 30-150 fathoms. The MPA network boundaries implemented in September 2007 were obtained from CDFG. The analyses were conducted for several search radii (ranging from 3 to 100 nautical miles) which originate from each commercial fishing port in the Central Coast Region. For reference, based on feedback from the nearshore finfish Central Coast fishing community, a typical fishing trip currently may range from 20-40 nautical miles one way. Trips may have traversed longer distance or have involved multiple day trips before the RCA was implemented.

For analysis A an initial area (square miles) of rocky reef was calculated within a 'fishable area' for each port. This 'fishable area' was defined as any areas shallower than 150 fathoms or the outside boundary of the RCA. Feedback we received from the fishing community that without defining a 'fishable area' the search radii would capture rocky habitat in areas that are too deep for fishermen to use hook and line gear. Furthermore, most fishermen in the nearshore finfish fishery pursue a live fish fishery in which fishermen typically do not fish deeper than approximately 10-13 fathoms to decrease trauma to fish bladders and increase the likelihood of fish remaining alive for sale. However, in the past, before the RCAs were implemented, commercial nearshore finfish fishermen may have fished further out than the currently allowed 30 fathoms using longline gear. Without knowing the historical depth limits in which commercial fishermen pursued nearshore finfish with longline or hook and line gear we utilized the outside boundary (150 fathoms) of the RCA as our boundary to define a 'fishable area'. For analysis B, the amount of rocky reef remaining after the RCA was implemented was calculated and then from that a percent loss was calculated from MPAs implementation.

Table 256. Rocky habitat analysis results

Port	Search radius (nm)	Rocky habitat within search fishable area radius (square miles)	Analysis A			Analysis B
			Percent rocky habitat loss to RCA	Percent rocky habitat loss to MPAs	Percent rocky habitat loss to RCA and MPAs	Post RCA: Percent rocky habitat loss to MPAs
Santa Cruz	3	7.2	0.0%	1.3%	1.3%	1.3%
	10	25.5	12.1%	15.7%	27.7%	17.8%
	20	53.4	37.6%	26.9%	64.5%	43.1%
	30	80.4	35.7%	27.3%	63.0%	42.5%
	40	117.8	44.2%	20.1%	64.3%	36.0%
	50	139.4	46.0%	22.8%	68.7%	42.2%
	60	144.0	44.6%	22.9%	67.5%	41.4%
	70	164.7	40.1%	22.4%	62.5%	37.4%
	80	194.7	46.7%	19.8%	66.6%	37.2%
	90	225.8	48.1%	18.1%	66.2%	34.9%
	100	261.2	48.5%	20.0%	68.4%	38.8%
Moss Landing	3	0.0	0.0%	0.0%	0.0%	0.0%
	10	8.6	56.8%	42.7%	99.5%	98.9%
	20	55.3	34.9%	25.2%	60.2%	38.8%
	30	77.6	36.2%	25.9%	62.2%	40.6%
	40	101.9	41.0%	28.5%	69.5%	48.3%
	50	117.0	38.4%	25.9%	64.3%	42.0%
	60	148.3	43.4%	22.3%	65.7%	39.3%
	70	159.5	45.2%	20.9%	66.1%	38.2%
	80	173.2	41.9%	22.2%	64.1%	38.2%

	90	196.1	41.8%	21.8%	63.7%	37.5%
	100	224.6	46.1%	19.3%	65.4%	35.7%
Monterey	3	1.5	2.0%	41.1%	43.2%	42.0%
	10	33.6	45.0%	32.8%	77.8%	59.7%
	20	56.8	43.1%	38.2%	81.2%	67.0%
	30	94.3	42.7%	24.9%	67.6%	43.5%
	40	103.8	39.0%	29.2%	68.2%	47.9%
	50	112.1	37.6%	27.0%	64.6%	43.3%
	60	154.1	46.7%	19.7%	66.4%	36.9%
	70	163.3	44.4%	21.8%	66.2%	39.2%
	80	170.6	42.9%	22.1%	65.0%	38.7%
	90	188.9	39.7%	21.4%	61.1%	35.5%
	100	216.9	43.8%	20.9%	64.7%	37.2%
Morro Bay	3	0.5	0.0%	0.0%	0.0%	0.0%
	10	7.7	18.4%	19.8%	38.2%	24.2%
	20	18.7	16.7%	21.6%	38.3%	25.9%
	30	26.1	13.4%	22.2%	35.6%	25.7%
	40	46.7	20.5%	18.6%	39.1%	23.3%
	50	55.1	20.7%	18.6%	39.4%	23.5%
	60	65.7	17.9%	18.8%	36.7%	22.9%
	70	70.6	17.6%	17.8%	35.3%	21.5%
	80	101.6	24.1%	22.9%	47.0%	30.1%
	90	150.1	26.9%	22.4%	49.3%	30.7%
	100	194.9	31.0%	20.8%	51.8%	30.2%
Avila/Port San Luis	3	0.9	0.0%	0.0%	0.0%	0.0%
	10	7.1	12.0%	28.0%	40.0%	31.9%
	20	14.4	13.2%	14.3%	27.5%	16.5%
	30	32.8	9.4%	17.7%	27.2%	19.6%
	40	39.8	8.2%	22.0%	30.2%	23.9%
	50	54.9	15.1%	20.5%	35.7%	24.2%
	60	65.9	17.8%	18.0%	35.8%	21.9%
	70	83.6	15.0%	20.2%	35.2%	23.8%
	80	122.2	24.0%	16.8%	40.8%	22.1%
	90	161.9	28.5%	18.5%	47.1%	25.9%
	100	216.6	41.6%	15.6%	57.2%	26.7%

Source: Current study

At a 40 nautical mile search radius, the ports of Santa Cruz, Moss Landing, and Monterey have the most available area of rocky habitat (117.8; 101.9; 103.8 square miles respectively) compared to the ports of Morro Bay and Avila/Port San Luis (46.7 and 39.8 square miles respectively). However, as seen in Figure 164, the nearshore finfish fishery is not significant in the port of Santa Cruz. Similarly, Moss Landing had moderate landings, even switching over to the live fish fishery until 2003 when ex-vessel revenue declined and has stayed relatively low since. Conversely, Monterey had relatively high revenues from the nearshore finfish-dead fishery and switched over to the live fish fishery in the mid 1990's. However, similar to Moss Landing, after 2003, Monterey had only moderate landings with yearly revenue stabilizing below 2003 revenue levels. This decline in revenue in the nearshore finfish fishery across all ports except Avila/Port San Luis could be attributed to both the loss of rocky habitat to the RCA and also the implementation of the Nearshore Fishery Management Plan (NFMP) which restricted access to the

nearshore finfish fishery by issuing a reduced number of permits and set quota limits lower than historical levels. These management measures were both implemented in 2003.

The habitat analysis results support the trends observed in the landings data in that at the 40 nautical mile search radius the RCA removed access to 39.0 percent and 41.0 percent of rocky habitat for fishermen from Moss Landing and Monterey respectively—the second and third highest loss in the region. Whereas Morro Bay and Avila/Port San Luis lost 20.7 percent and 15.1 percent of rocky habitat respectively to the RCA. However, as mentioned above Morro Bay and Avila/Port San Luis had approximately less than half of the rocky habitat area compared to Santa Cruz, Moss Landing, and Monterey within their 40 nautical mile search radius. Despite their smaller rocky habitat area available, the ports of Morro Bay and Avila/Port San Luis lost considerably less percent of area to the RCA with 20.5 percent and 8.5 percent loss respectively.

The Central Coast MPAs were implemented in 2007 and analysis results show that the ports of Moss Landing and Monterey lost 48.3 percent and 48.9 percent of remaining rocky habitat area available post-RCA. Since MPA implementation, revenue levels in Moss Landing have declined steadily while revenue levels in Monterey have remained relatively stable. The ports of Morro Bay and Avila experience a smaller percent of rocky habitat area loss with 23.3 percent and 23.9 percent loss to MPAs. In the port of Morro Bay, revenue levels declined immediately after the MPAs were implemented however revenue levels have been increasing from 2010 to 2011. In the port of Avila, revenue levels have been increasing steadily since 2002.

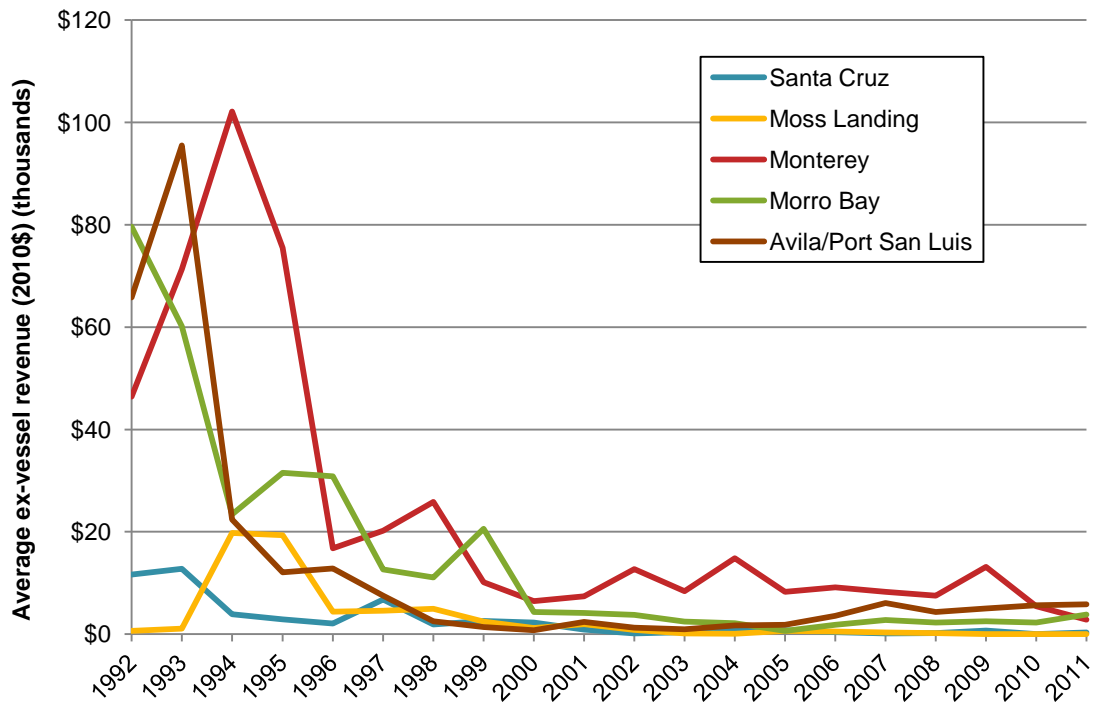
Santa Cruz lost the highest percent of rocky habitat (44.2 percent) at the 40 nautical mile search radius, however, during the years analyzed (1992–2011) the port did not support a significant nearshore finfish fishery even though analysis results show that the port has the largest area of rocky habitat in the region.

The results of this rocky habitat analysis examined along with historical fishery ex-vessel revenue trends exemplify the compounding factors which interplay to affect fishery revenue levels. With the RCA and the reduction in fishery effort by the NFMP in 2003 it is difficult to tease out the effects of each separately. Furthermore, with the MPAs implemented in 2007 along with further reduction of nearshore fishery permits each year, it again is difficult to tease out the effects separately or if there was a significant effect at all if fishing effort in the fishery had been reduced to low levels already. However, in Avila/Port San Luis, despite these management measures the nearshore finfish-live fishery has been gaining in revenue since the RCA, NFMP, and MPAs were implemented.

Upon consultation with members of the fishing community, possible explanations provided are that the immediate nearshore areas surrounding Santa Cruz lack quality rocky habitat. Fishermen indicated that most of the quality rocky habitat areas are located in or near the canyons in Monterey Bay, or outside of the Monterey Bay coastline. Several of these areas were designated as part of the RCA (e.g., Soquel Canyon) or MPAs (e.g., Ano Nuevo). Furthermore, Monterey has had moderate nearshore finfish landings as their port location is in close proximity to quality rocky habitat areas just west of Monterey, however, some of this area was designated as MPAs in 2007. In Avila/Port San Luis habitat quality was again mentioned as a key factor attributed to the port being a viable and successful nearshore finfish-live fishery.

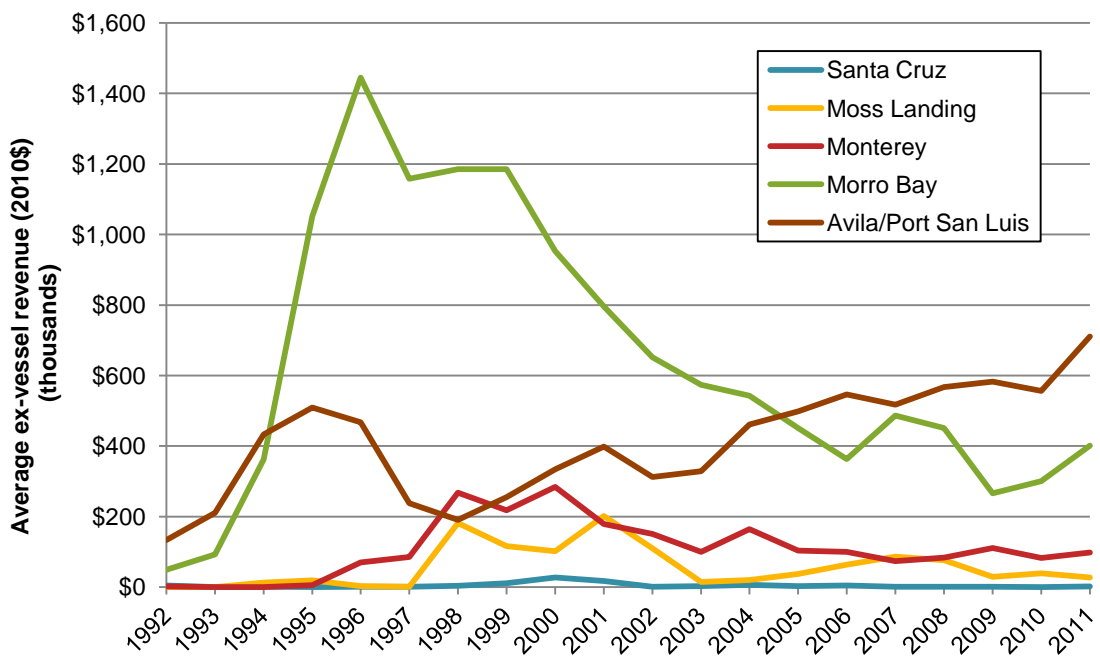
To improve this analysis in the future, spatial data on rocky habitat and habitat quality based on direct observation using seafloor mapping technology could provide better information in which to further examine the relationship between how spatial fishing closures may/may not have affected local fishery ex-vessel revenue levels.

Figure 163. Nearshore finfish—dead (hook & line and longline combined) commercial ex-vessel revenues by Central Coast Region ports, 1992–2011



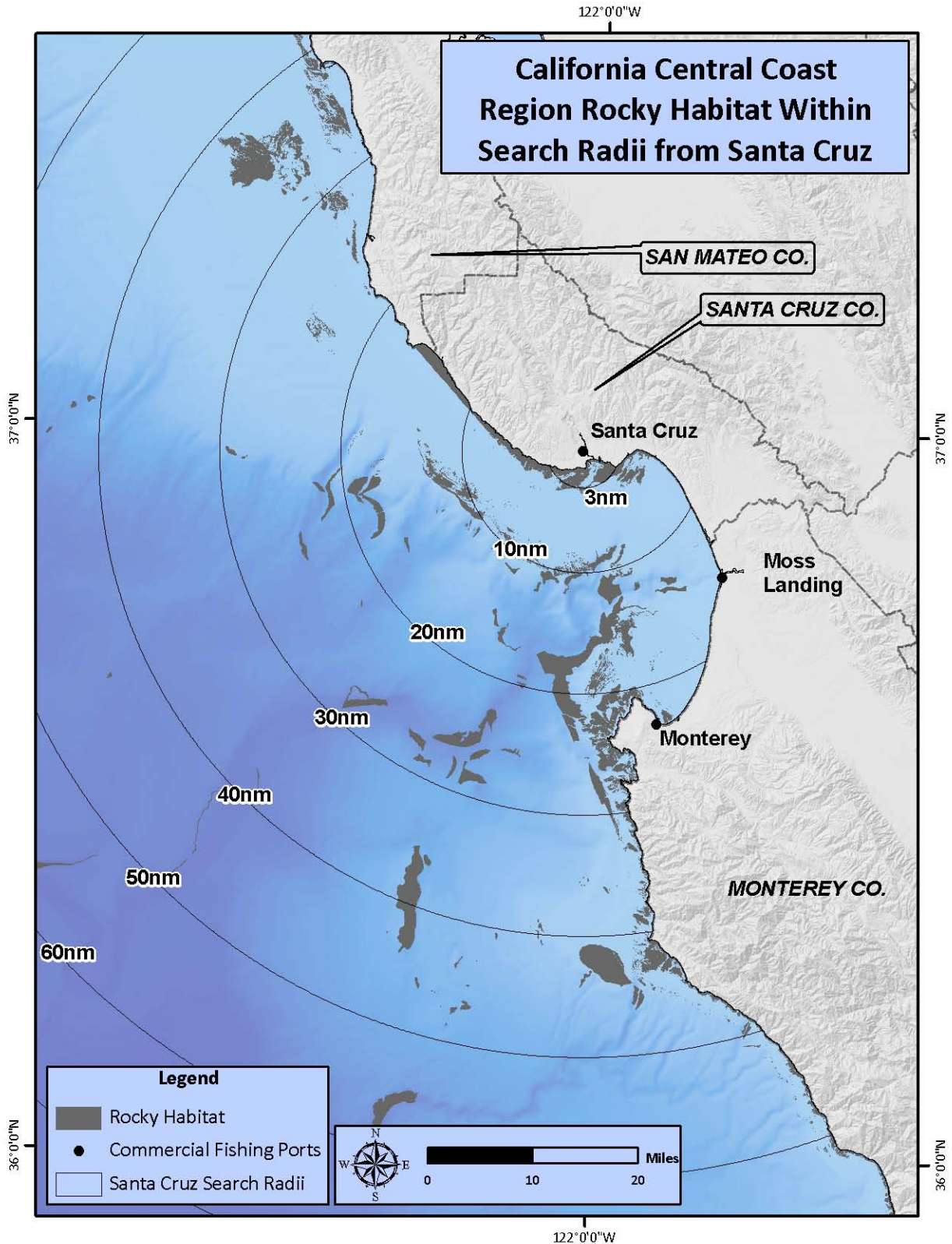
Source: Landings data from CDFG

Figure 164. Nearshore finfish—live (hook & line, longline, and trap combined) commercial ex-vessel revenues by Central Coast Region ports, 1992–2011

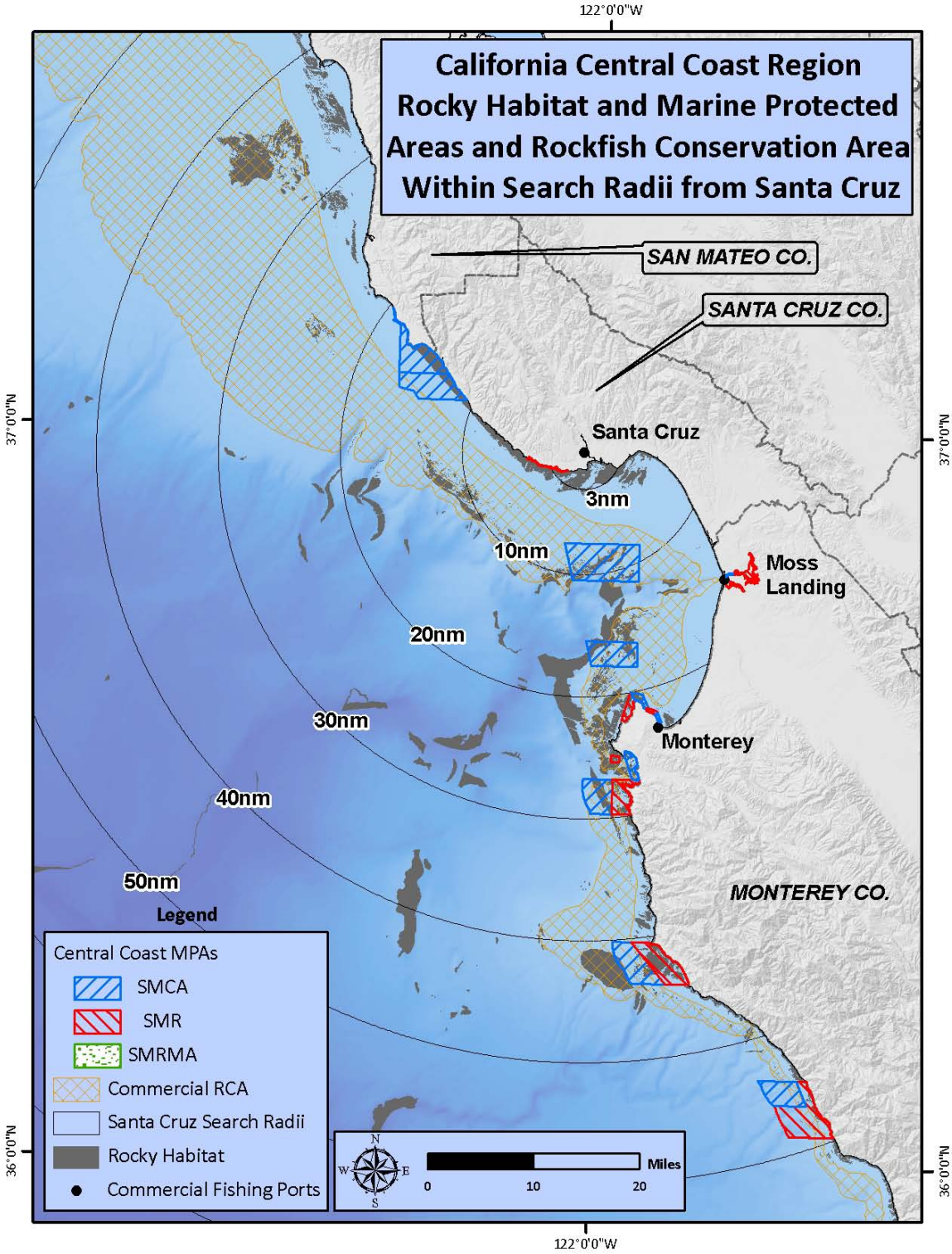


Source: Landings data from CDFG

Map 20. Central Coast Region rocky habitat analysis search radii, Santa Cruz



Map 21. Central Coast region rocky habitat analysis, RCA and MPA boundaries



7. Central Coast Region and Port Level Spatial Change Analyses

In this section we present an effort to examine change in the spatial extent and relative value of fishing areas for the Central Coast Region commercial fishing sector. Ecotrust conducted commercial fishermen interviews in 2005 as part of the MLPA planning process and the data collected established a pre-MPA data set on fisheries uses and values across the region. Since then our methods for data collection and analysis were updated and improved upon based on feedback received from the fishing community and peer-review. Based on this new methodology the pre-MPA dataset collected in 2005 was re-analyzed at the port-fishery level and weighted individual spatial fishing data sets using an average annual (2000-2004) ex-vessel revenue for each fishery and summarized to 100 square meter cell sizes. Previously, spatial data were only analyzed at the region level at the 200 square meter cell size and each fisherman was given equal weight. Furthermore, during the 2005 study fishermen were asked to map fishing grounds based on their cumulative experience whereas in the post-MPA dataset, fishermen were asked to map fishing ground based on the 2011 fishing season. The datasets that we examined for the spatial change analyses can be found in Table 257. It is important to note that the fisheries from two ports, Santa Cruz and Moss Landing, did not meet the minimum threshold of three fishermen in both survey efforts and were not included in the analyses. For maps of the pre-MPA datasets please see Appendix A

Table 257. Count number of fishermen and percent of 2011 ex-vessel commercial fishing landings represented in interviews, spatial change analysis target fisheries, pre and post MPA

Ports	Fishery	Count of fishermen interviewed		Percent of average annual ex-vessel revenue represented (2000-2004)	Percent of 2011 ex-vessel revenue represented
		Pre MPA	Post MPA	Pre MPA	Post MPA
Central Coast Region	California halibut - hook & line	26	4	26.8%	13.4%
	Dungeness crab - trap	9	3	25.0%	32.4%
	Market squid - seine	9	4	30.7%	27.6%
	Nearshore finfish - live - hook & line	29	8	27.5%	13.4%
	Nearshore finfish - live - trap	7	4	36.8%	35.3%
	Spot prawn - trap	4	3	84.7%	98.3%
Monterey	Market squid - seine	8	4	40.7%	22.0%
Morro Bay	Nearshore finfish - live - hook & line	16	3	23.0%	13.5%
	Nearshore finfish - live - trap	6	3	40.2%	46.5%
Avila/Port San Luis	Nearshore finfish - live - hook & line	18	4	40.1%	13.9%

Source: Current study and landings data from CDFG

Note: The spot prawn fishery maps are not publically available as these data were withheld to protect confidential data

Ecotrust conducted four analyses to examine spatial change in the commercial fishing sector in an effort to determine if there has been a spatial shift in fishing patterns and measure where and how much of a shift has occurred. It is important to emphasize that only the relative value surface (also known as a 'heat map') that was developed for the pre and post-MPA datasets were used in these analyses. In other words, ex-vessel revenue was not applied to the 'heat map' value surfaces, however ex-vessel revenue was used to weight and the aggregation of individual fishing grounds. This was done to reduce the number of variables which would influence analysis results. Thus, results are simply an examination of

changes in the values/importance of fishing areas to a fishery—not spatial changes in revenue across the two datasets.

As is the case with all analyses, a larger sample size or greater participation rate would improve the results and emerging trends could be more rigorously tested. However, through these analyses we demonstrate the possible types of analyses that may be conducted across a spatial fishing data sets collected over time. The results of these analyses below illustrate the change in valued areas—giving a clear depiction of where spatial shift has occurred with our raster math analysis results. Analysis results also show that at the region level, the spot prawn-trap fishery has experienced the most spatial change whereas the nearshore finfish-live-hook & line fishery has experienced the least. Lastly, across all fisheries, analysis results indicates a decrease in the overall footprint of fishing grounds (percent volume contour analysis) and on average a reduction in average distance travelled (Euclidian distance analysis).

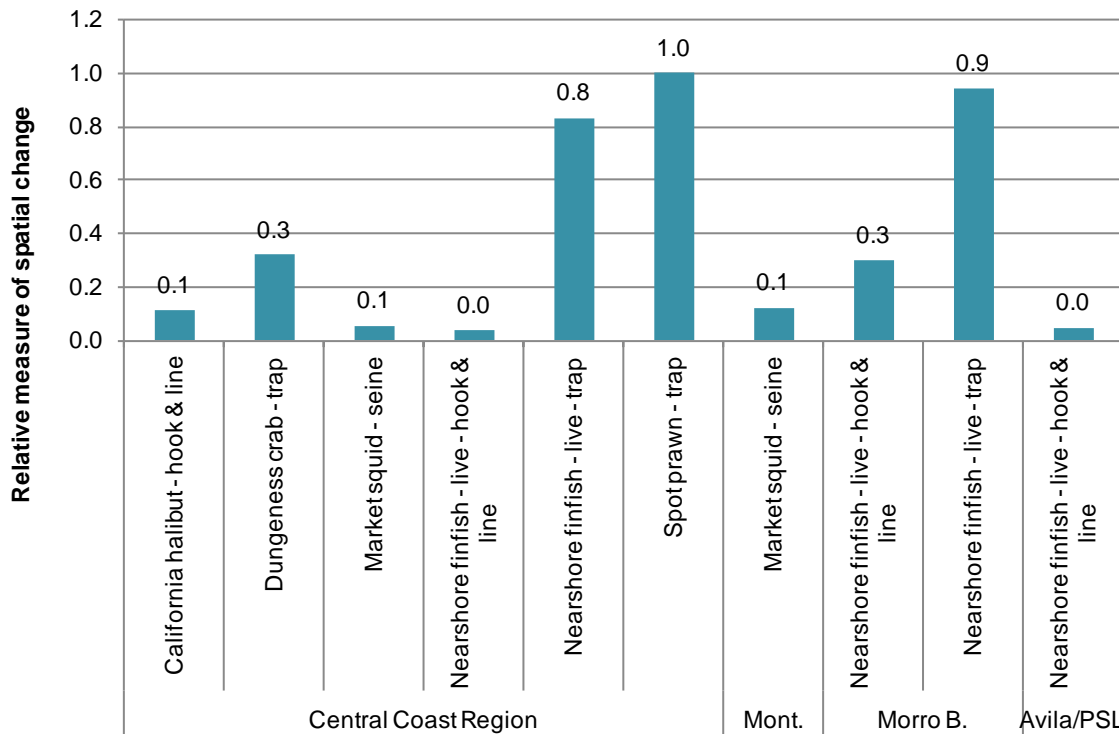
We'd like to note again that the pre-MPA data set was collected in 2005 and was collected based on cumulative fishing experience of areas important to their fishery and thus the fishing areas mapped may have reach beyond the typical distance individual fishermen may travel to in a given year. Furthermore, the limited number of fishermen interviewed for the post-MPA data set should be emphasized when interpreting the reliability of these analysis results. However, even though we interviewed significantly less people in the post-MPA data set we generally represented relatively similar percentages in ex-vessel revenue (Table 257). This may be due to the decline in the number of commercial fishermen in the region from 2005 to 2011 (Figure 8). Furthermore, as the number of fishermen decline it may be possible that fishermen are not fishing as far as they used to as the pressure on fishing grounds closer to port are reduced over time. That is not to say that at times fishermen may need to travel longer distances to reach fishing grounds that are more productive or fished less often as indicated in the sections which discuss how MPAs may have affected an individual's fishing patterns.

7.1.1. Sum of Squares: Measuring spatial coincidence

The sum of squares analysis is a simple quantitative analysis to measure spatial coincidence. By using the sum of squares we can show if there has been a shift or if some spatial variability has occurred between the pre-MPA and post-MPA surveys for each port-fishery and region-fishery combination. To conduct this analysis we used a snap grid, which is a raster layer that provides the over arching spatial extent and a common structure to build our raster layer products. The snap grid gave us the structure to perform a cell by cell (100 meter square cell size) comparison. Each dataset was also analyzed as a relative dataset, which supplied a common index of values allowing us to make direct comparisons between the raster layers.

To calculate the sum of squares values, the pre MPA and post-MPA relative values were subtracted from each other for each 100 meter square cell. This difference in values for each cell was then squared and summed together ($x = \sum(a-b)^2$). The resulting values were then normalized and charted for comparison (see Figure 165). The higher values indicate less spatial coincidence (more spatial change) between the pre-and post-MPA data sets; whereas the lower values indicate more spatial coincidence (less spatial change).

Figure 165. Spatial change analysis results of spatial coincidence, pre and post MPA



Source: Current study

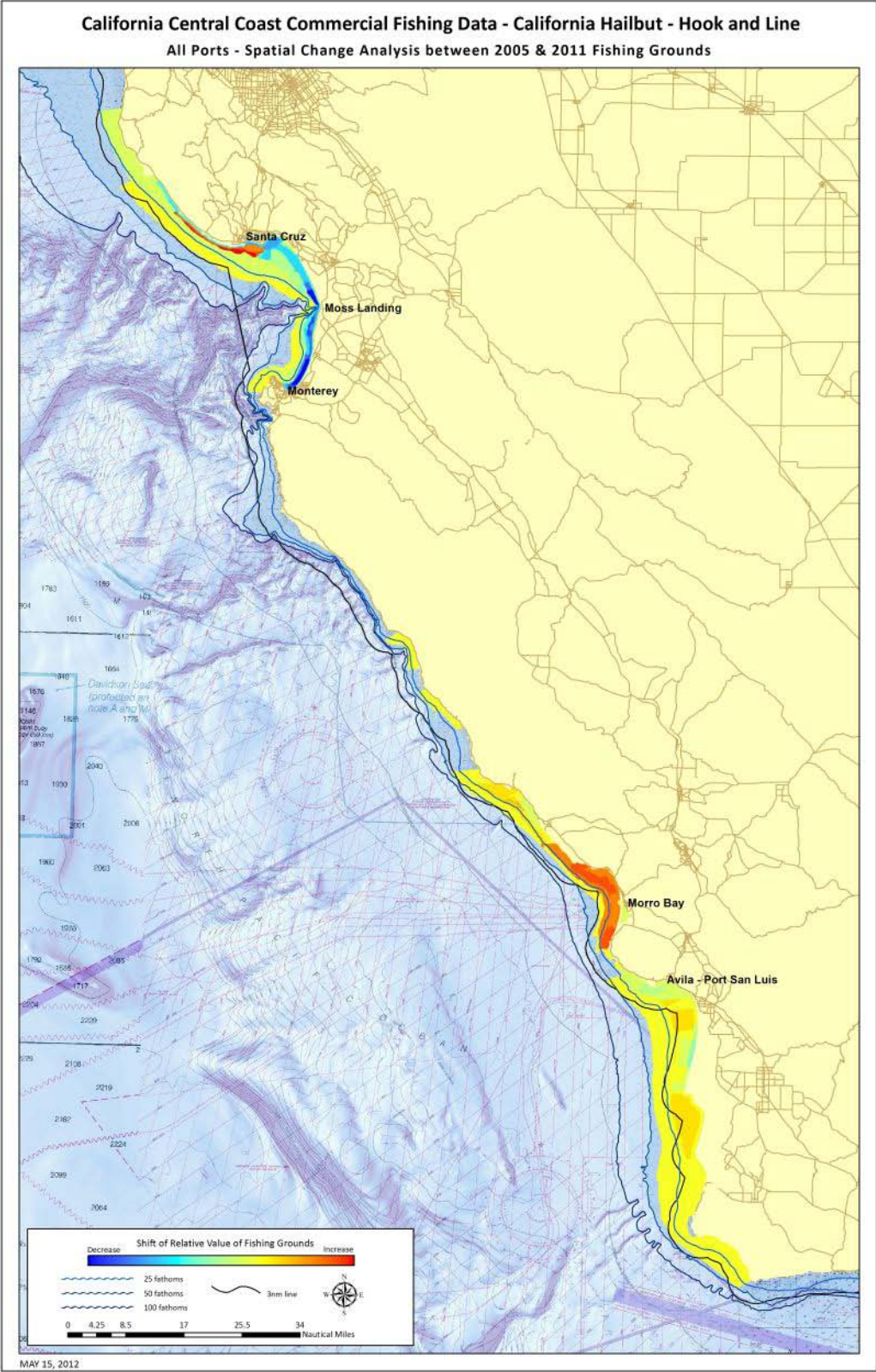
The results presented in Figure 165 show that all of the fisheries in our analysis have some amount of spatial change in value. Spot prawn-trap at the region level and nearshore finfish-live-trap in both the region and Morro Bay level saw a significant shift in spatial coincidence.

Four of the fisheries examined have a relatively low amount of spatial shift. These fisheries were California halibut-hook & line, market squid-seine, and nearshore finfish-live-hook & line at the region level; and nearshore finfish-live-hook & line for Avila/Port San Luis. Three other fisheries, Dungeness crab-trap at the region level; market squid-seine for Monterey; and nearshore finfish-live-hook & line for Morro Bay fall in the middle having seen a fair amount of shift but not as significantly as others. As previously mentioned this analysis measured the spatial coincidence between the surveys and helps us to determine if a spatial shift occurred. Subsequent analyses will help to establish how much shift and where the shift has occurred.

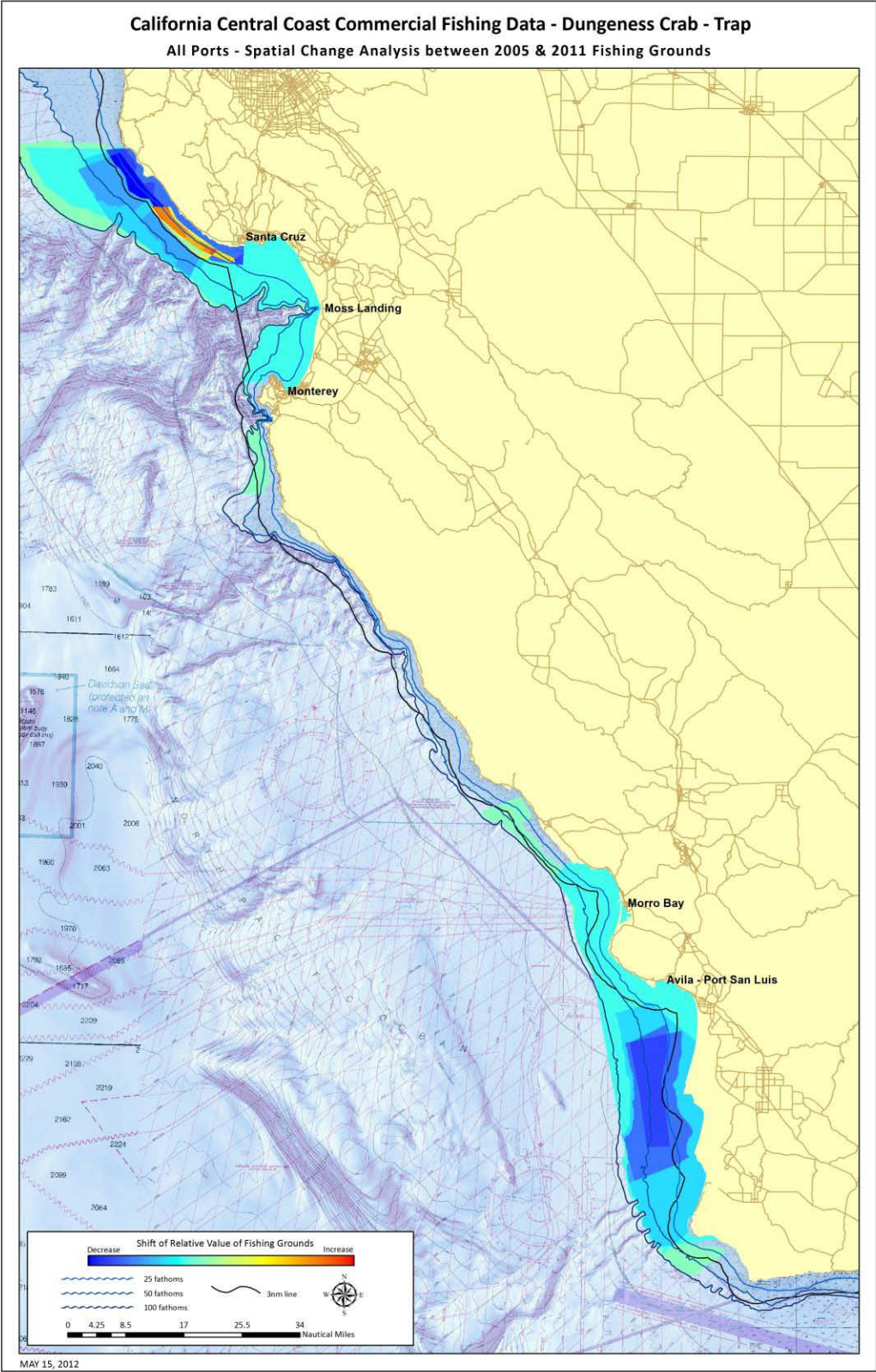
7.1.2. Raster Math Maps: Identifying spatial change in value

This analysis utilized the raster math functions in ArcGIS to calculate the difference between the pre-MPA and post-MPA data. To conduct this analysis we also used a snap grid, which is a raster layer that provides the over arching spatial extent and a common structure to build our raster layer products. The snap grid gave us the structure to perform a cell by cell (100 meter square cell size) comparison. Each dataset was also analyzed as a relative dataset, which supplied a common index of values allowing us to make direct comparisons between the raster layers. Below these series of maps illustrate the location in which fishing grounds have increased or decreased in relative value between the two survey efforts.

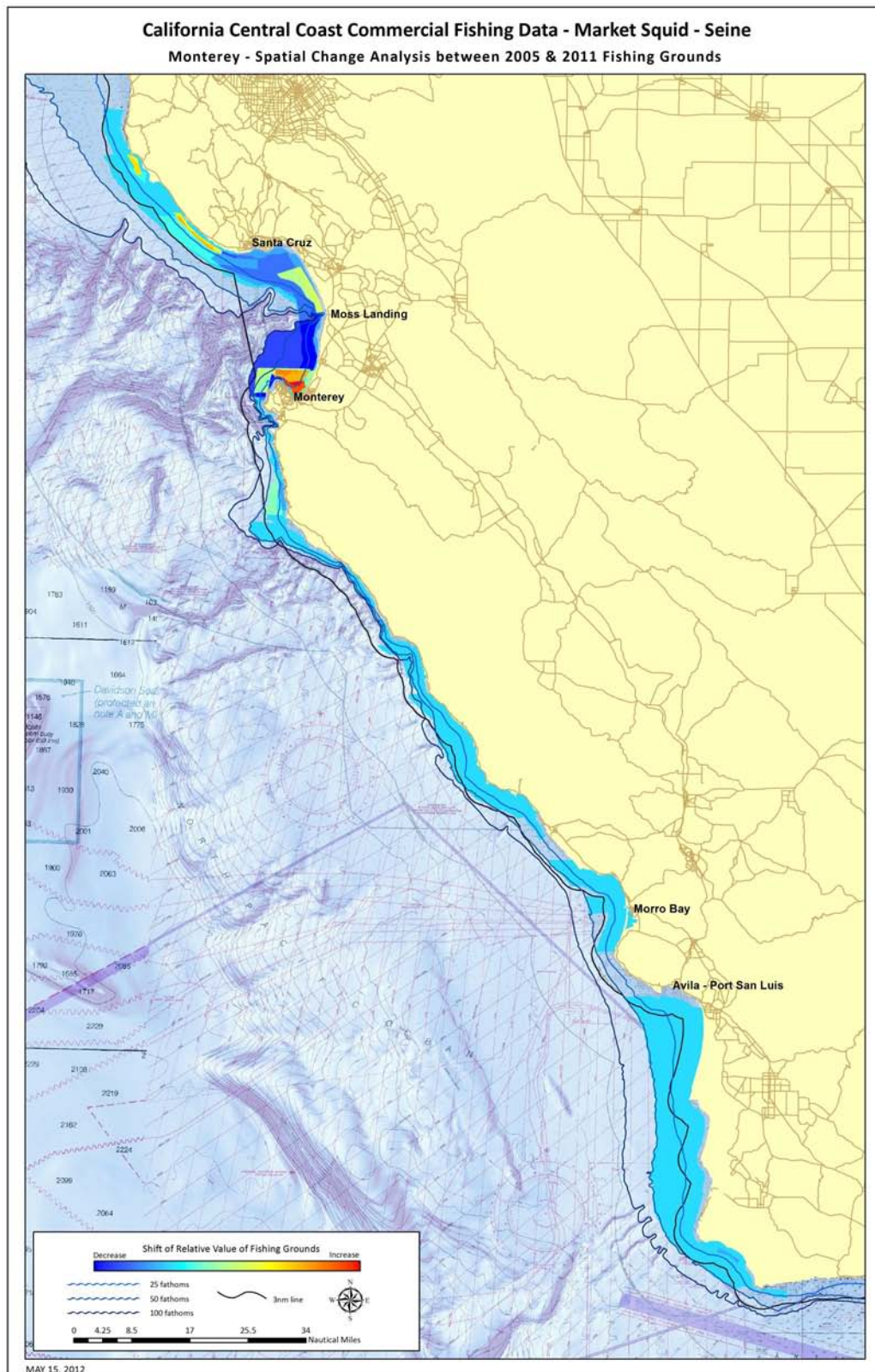
Map 22. California halibut—hook & line spatial change map, Central Coast Region



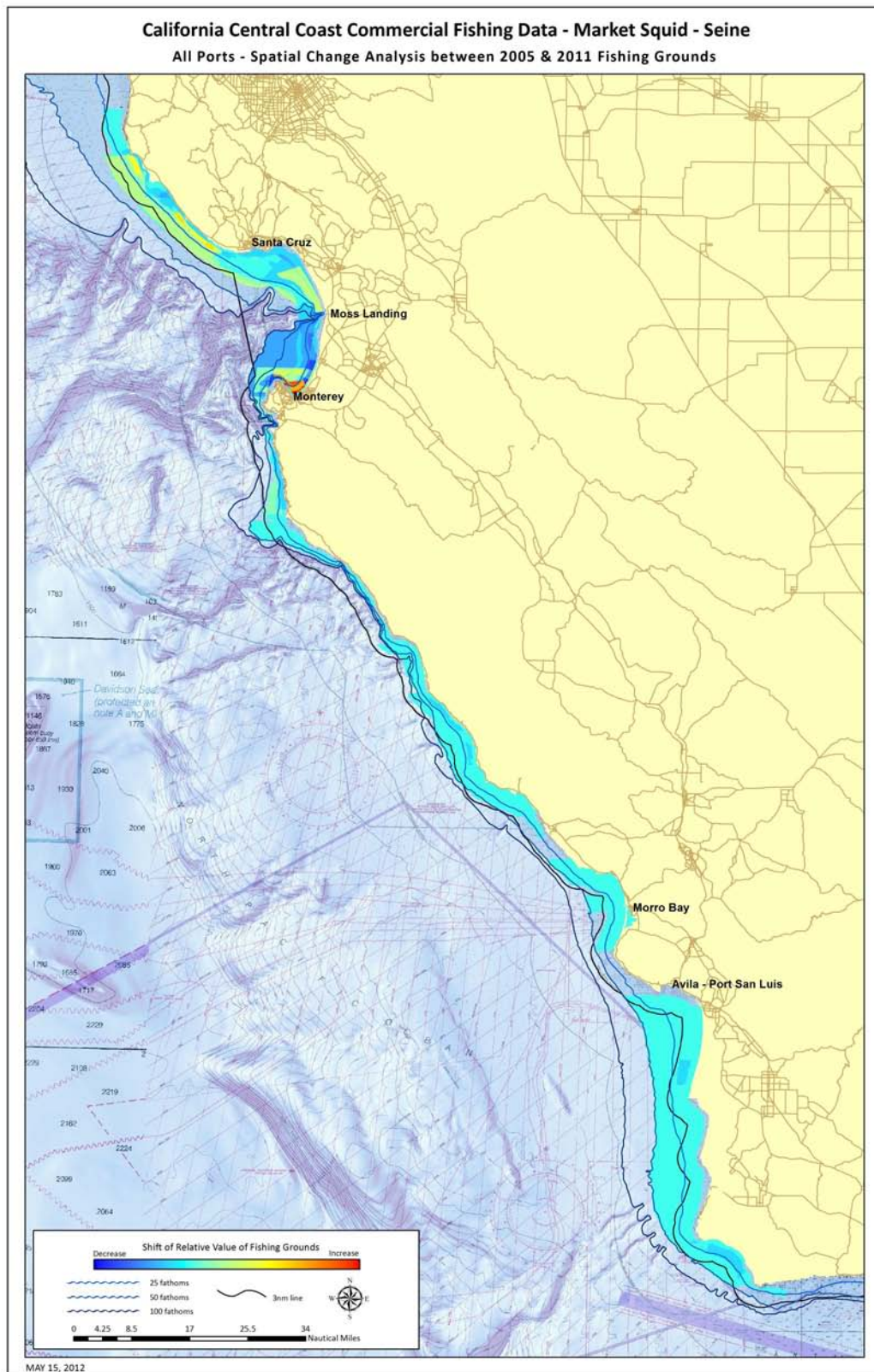
Map 23. Dungeness crab—trap spatial change map, Central Coast Region



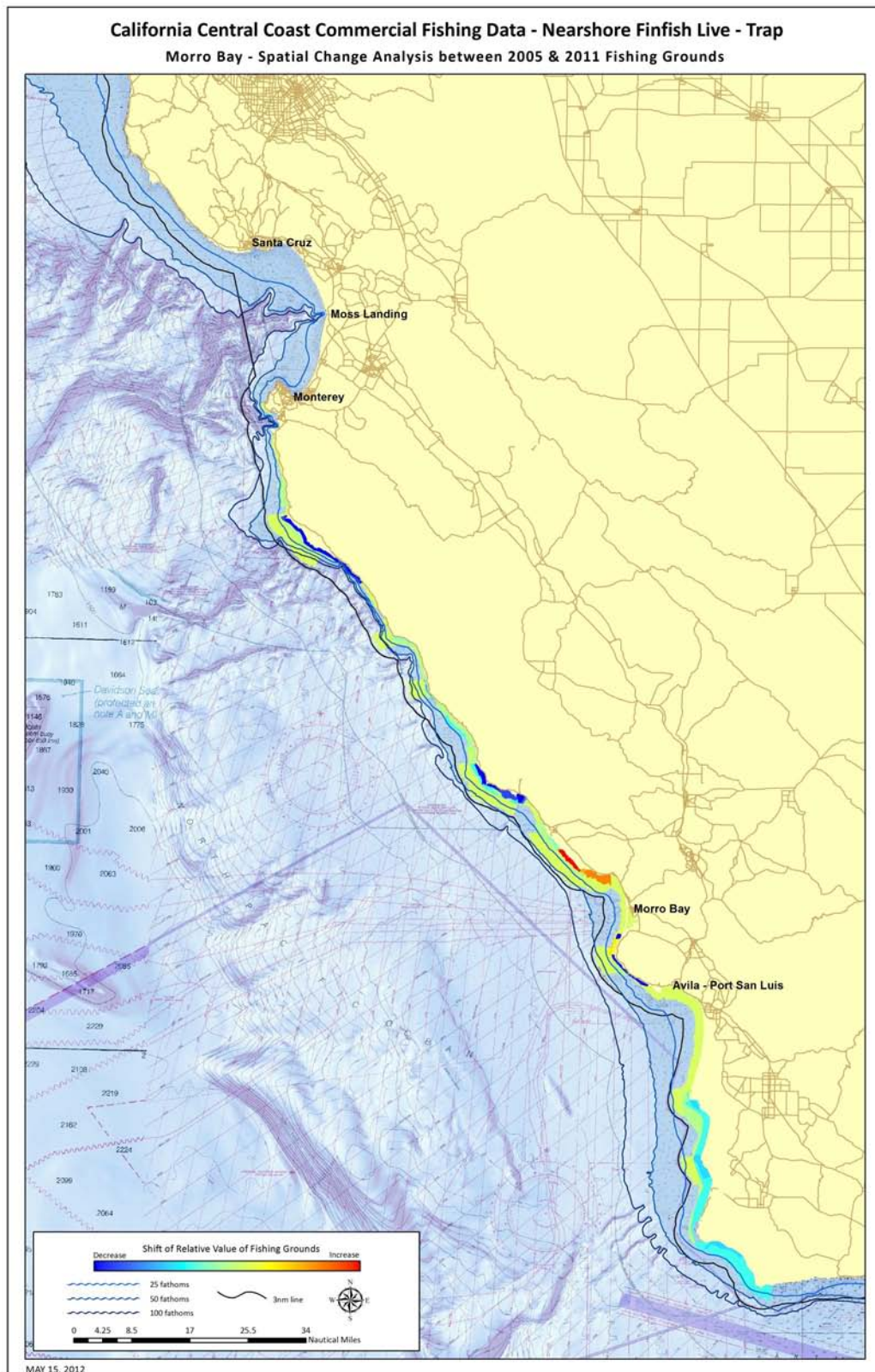
Map 24. Market squid—seine spatial change map, Monterey



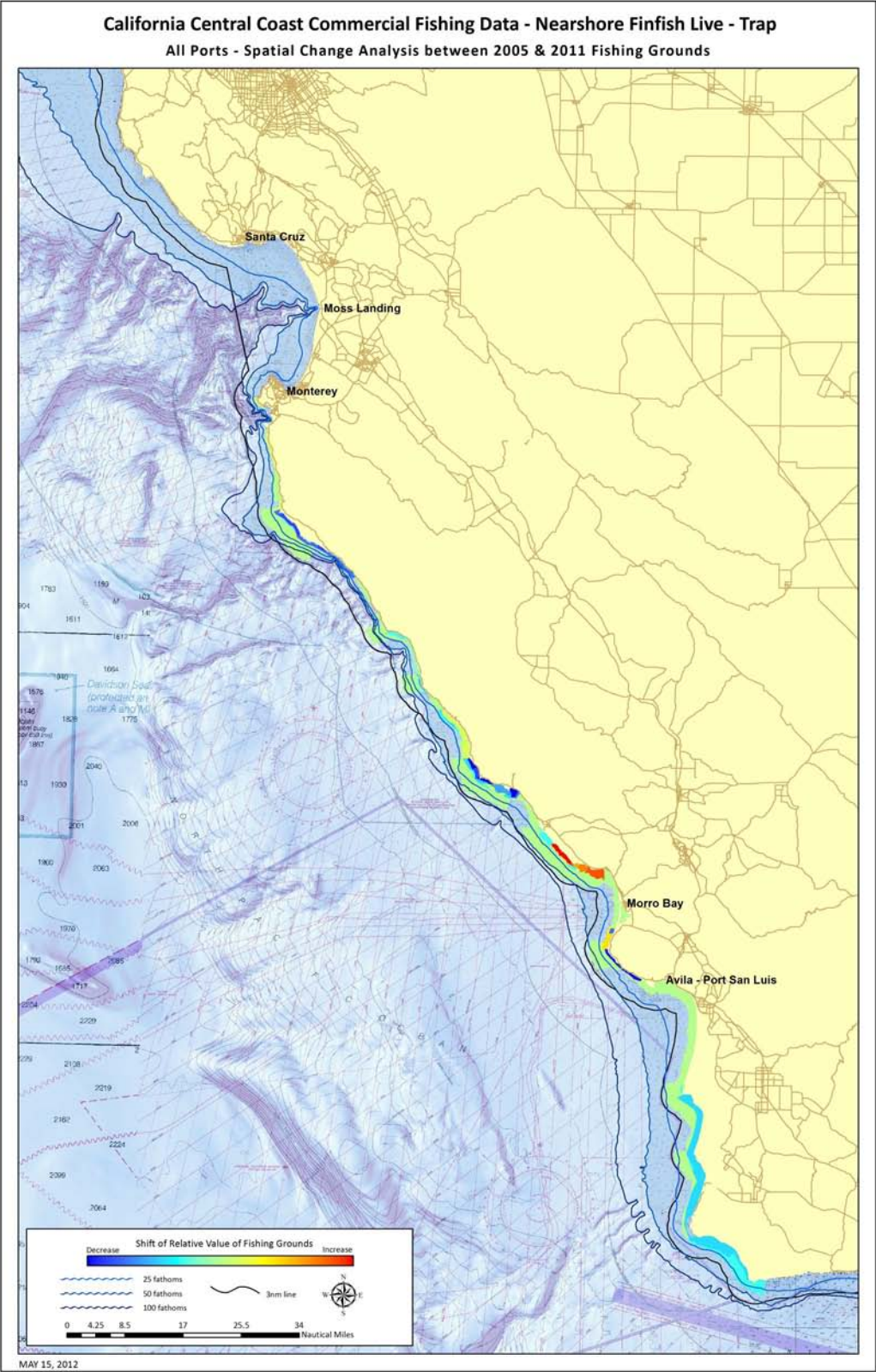
Map 25. Market squid—seine spatial change map, Central Coast Region



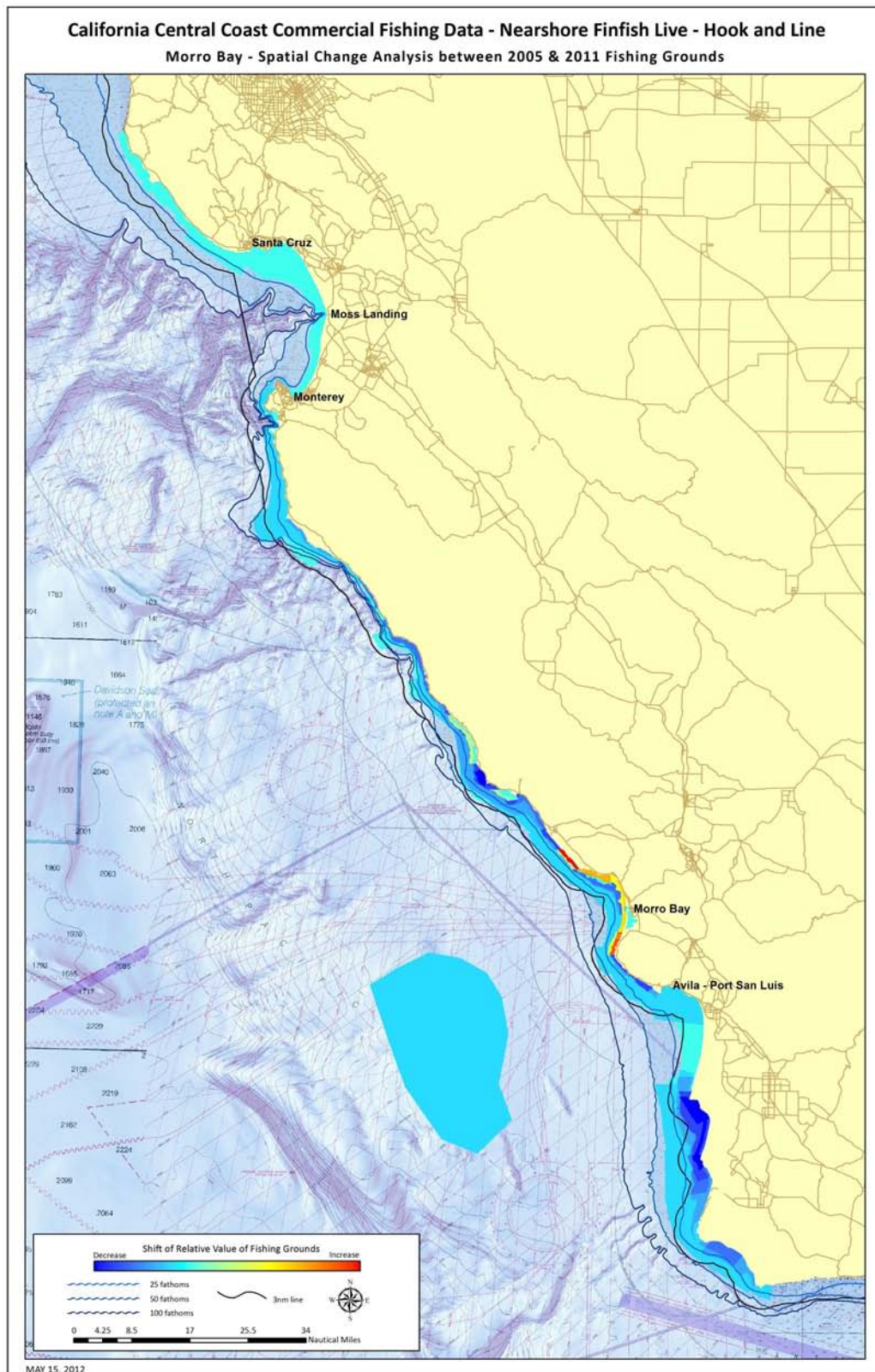
Map 26. Nearshore finfish—live—trap spatial change map, Morro Bay



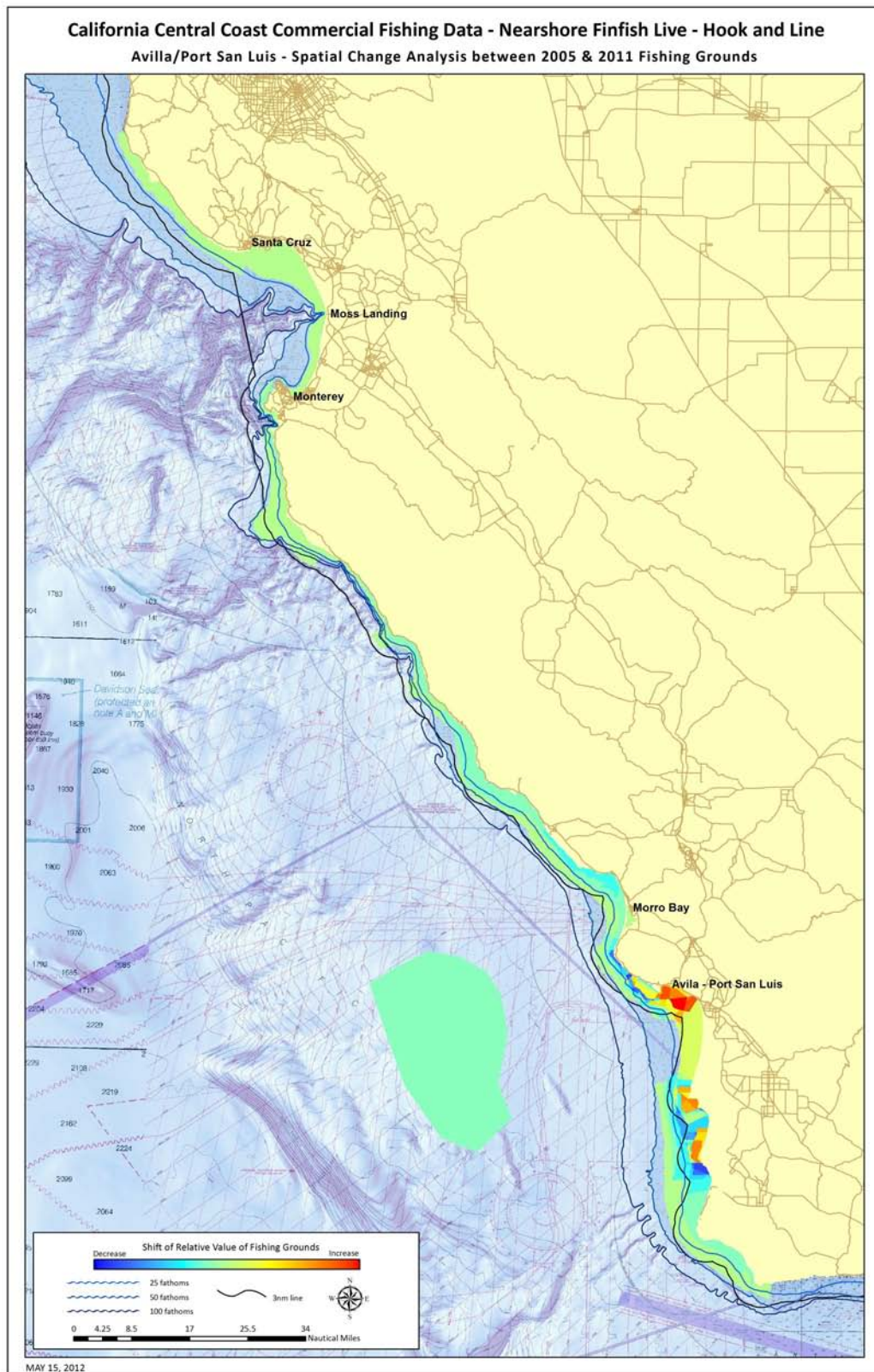
Map 27. Nearshore finfish—live—trap spatial change map, Central Coast Region



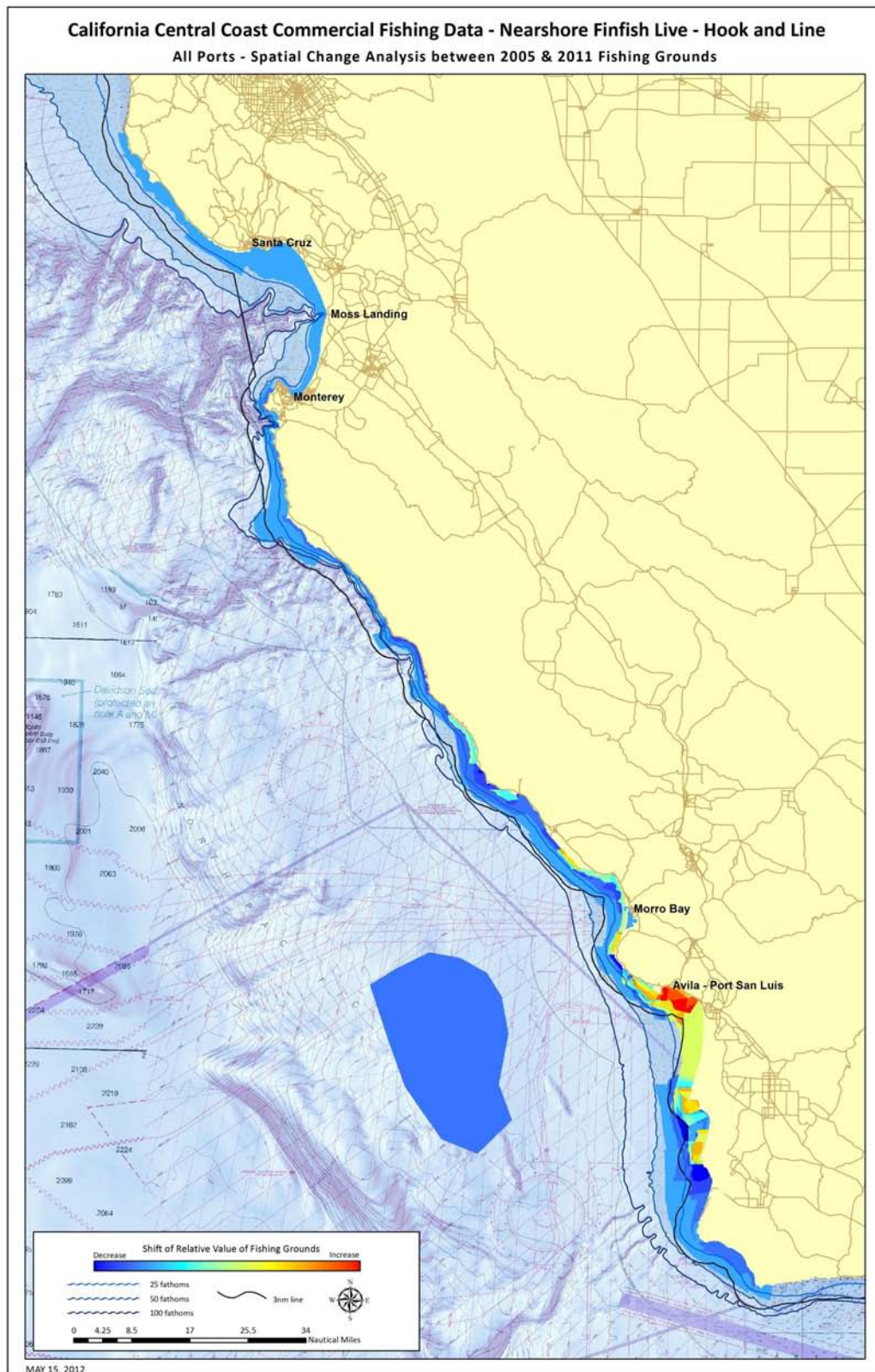
Map 28. Nearshore finfish—live—hook & line spatial change map, Morro Bay



Map 29. Nearshore finfish—live—hook & line spatial change map, Avila/Port San Luis



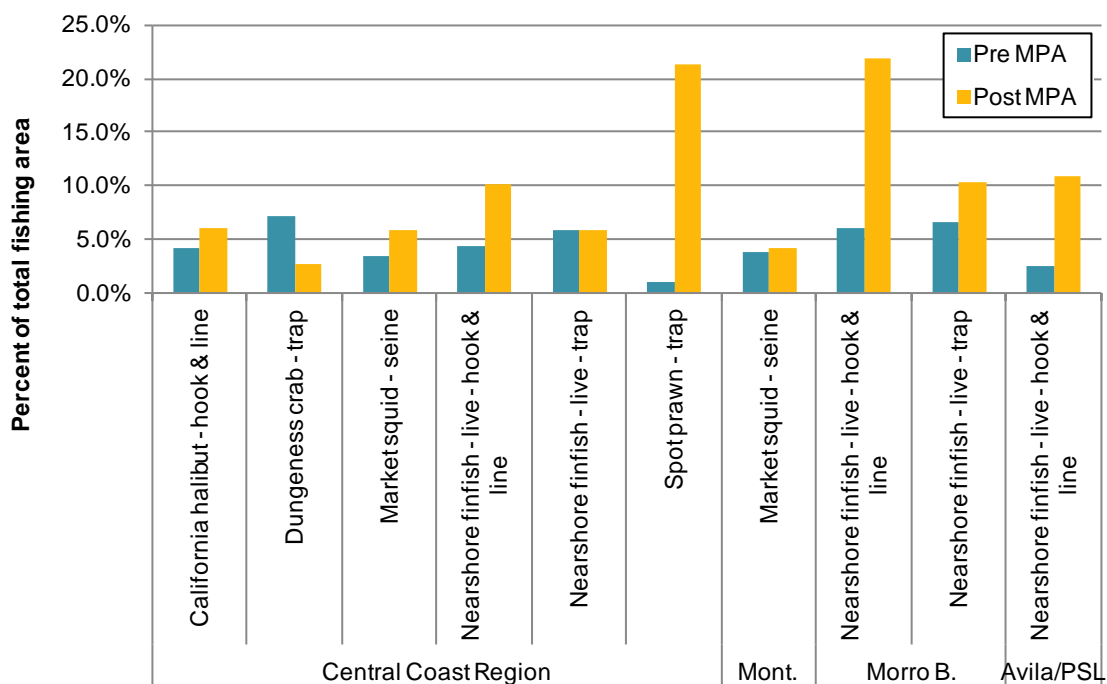
Map 30. Nearshore finfish—live—hook & line spatial change map, Central Coast Region



7.1.3. Percent Volume Contour: Measuring changes in value concentration

A percent volume contour (PVC) represents the boundary of the area that contains x% of the volume of a probability density distribution such as a kernel density¹³. These contours are optimized for area, so that they capture the smallest area possible for the desired percentage. For our purposes the kernel density layers represent the density distribution of value or importance of a fishery and the PVC lines capture an optimized area containing our target percentage. For this analysis we compared the 25 percent contour for both the pre and post-MPA port-fishery region-fishery combinations. This means we compared the smallest area that contained 25 percent of the value of the fishery. Figure 166 below compares the pre and post-MPA surveys. A smaller percentage of area indicates a concentrating of effort whereas a larger percentage shows a dilution. To provide some context for this analysis we also compared the overall area of the fishing grounds between the surveys (Figure 167). Taking both into consideration we see that the overall area of fishing grounds has decreased but the most important grounds are a larger proportion of the fishing area. This result suggests that the areas being most intensely fished are either growing in size or have reduced in size—but have not reduced the same percent as the overall area of fishing grounds. Also, overall fishermen are not travelling as far as they used to as the overall fishing footprint is decreasing in size.

Figure 166. Spatial change in top 25 percent value concentration area between pre and post MPA



Source: Current study

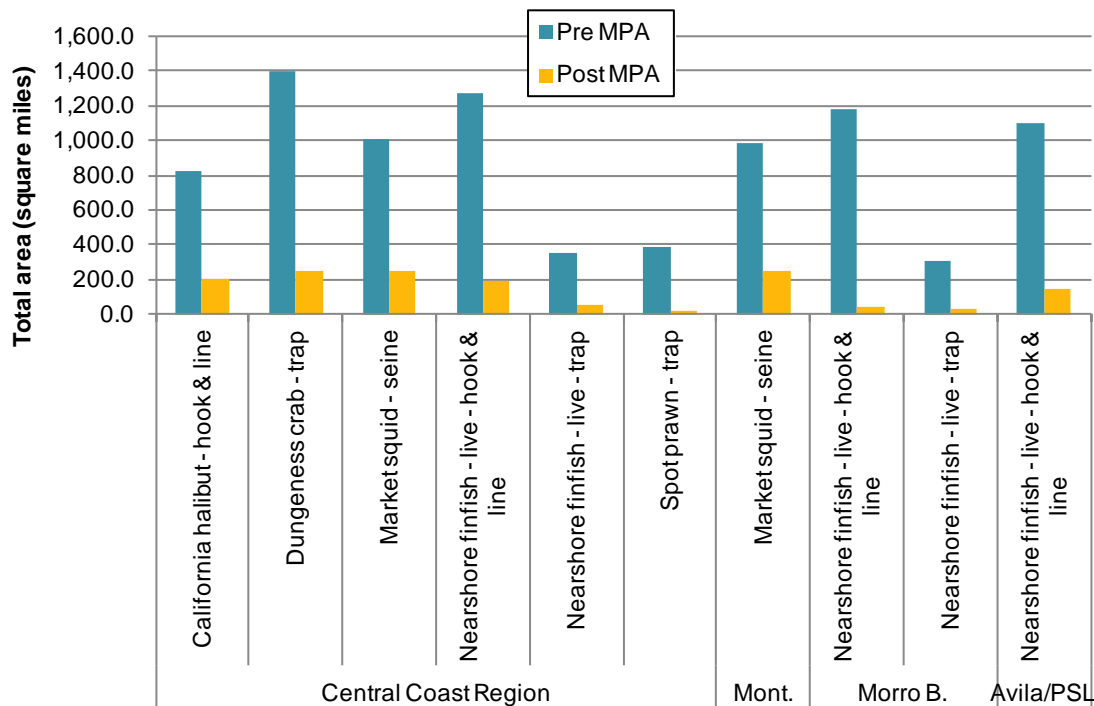
¹³ Kernel analysis is a nonparametric statistical method for estimating probability densities from a set of points.

Table 258. Spatial change analysis results of top 25 percent value concentration, pre and post MPA

Port	Fishery	Percent area of total fishing area	
		Pre MPA	Post MPA
Central Coast Region	California halibut - hook & line	4.2%	6.1%
	Dungeness crab - trap	7.2%	2.7%
	Market squid - seine	3.4%	5.9%
	Nearshore finfish - live - hook & line	4.3%	10.2%
	Nearshore finfish - live - trap	5.9%	5.9%
	Spot prawn - trap	0.9%	21.3%
Mont.	Market squid - seine	3.8%	4.2%
Morro B.	Nearshore finfish - live - hook & line	6.0%	21.9%
	Nearshore finfish - live - trap	6.6%	10.3%
Avila/PSL	Nearshore finfish - live - hook & line	2.4%	10.8%

Source: Current study

Figure 167. Spatial change in total fishing area footprint between pre and post MPA



Source: Current study

Table 259. Spatial change analysis results on total fishing area footprint, pre and post MPA

Port	Fishery	Total fishing area footprint (square miles)	
		Pre MPA	Post MPA
Central Coast Region	California halibut - hook & line	820.0	203.3
	Dungeness crab - trap	1,397.9	254.5
	Market squid - seine	1,008.2	253.8
	Nearshore finfish - live - hook & line	1,275.8	188.0
	Nearshore finfish - live - trap	351.9	52.4
	Spot prawn - trap	384.2	13.2
Mont.	Market squid - seine	987.3	253.9
Morro B.	Nearshore finfish - live - hook & line	1,186.5	40.8
	Nearshore finfish - live - trap	308.8	27.8
Avila/PSL	Nearshore finfish - live - hook & line	1,094.8	147.2

Source: Current study

7.1.4. Euclidean Distance: Measuring change in fishing distances

This analysis is a measure of the distance from port to higher value fishing grounds. Using the 25 percent PVC area described in the previous analysis as the high value fishing grounds, we measured the Euclidean distance¹⁴ from each port to the port specific 25 percent PVC area for each fishery. This distance (in miles) was measured by averaging the distance from each port to the centroid of each raster cell within the 25 percent PVC area. The distance was calculated for both the pre and post MPA surveys (see Table 260).

The Euclidean distance analysis provides us more information on how much of a spatial shift we are observing between the two datasets. The change in distance that this analysis provided gives us an idea of how effort and resources (e.g., fuel) are being expended for fishing. Between the pre and post MPA data sets, an emerging trend shows that the distances from a port to the port-fishery area of importance (25 percent PVC area) have decreased between the surveys by anywhere from 30-70 percent. We see this with all four port-fishery combinations we tested, which were market squid–seine in Monterey, nearshore finfish–live–hook & line and nearshore finfish–live–trap in Morro Bay, and nearshore finfish–live–hook & line in Avila/Port San Luis.

¹⁴ The Euclidean distance is a straight line distance.

Table 260. Spatial change analysis results on distance to port, pre and post MPA

Port	Fishery	Survey	Distance to port (miles)
Monterey	Market squid - seine	Pre MPA	5.7
		Post MPA	2.1
Morro Bay	Nearshore finfish - live - hook & line	Pre MPA	20.6
		Post MPA	8.7
	Nearshore finfish - live - trap	Pre MPA	39.3
		Post MPA	9.7
Avila-Port San Luis	Nearshore finfish - live - hook & line	Pre MPA	17.4
		Post MPA	13.5

Source: Current study

8. LESSONS LEARNED AND FUTURE RECOMMENDATIONS

This section reflects on several methodological and process lessons we learned and recommendations on data to be collected to inform future iterations and/or applications socioeconomic MPA monitoring efforts.

8.1. Lessons Learned

Outreach efforts to port communities were initiated at the project's inception and continued throughout the project. Building trust and collaborating with fishing communities were important measures of success for our project; however, due to several factors such as: distrust in how information will be used; concerns around the project's funding source; dissatisfaction with the MPA network planning process and its outcome; concerns around Ecotrust's methodology used to map fishing ground during the 2005 study; and unclear benefits of participating in the project, many fishermen were reticent to participate in the project.

This presented a difficult challenge to the project, and the nature of these concerns listed above was difficult to address in a limited timeline. Despite this, Ecotrust networked within the fishing community and attended fishermen meetings to disseminate information and answer questions as to how Ecotrust's methodology has improved since the 2005 study, the intentions of the project, and to the extent possible explain how data will be used to inform the 5-year management review of the Central Coast MPA network. Furthermore, Ecotrust spent extensive efforts to keep the fishing community informed of project progress to develop transparency in our work and re-build relationships in the Central Coast Region. We hope to continue and maintain these relationships into the future. We hope through engaging the Central Coast fishing community in this way MPA monitoring is now strengthened through this effort. This strengthened engagement, at a minimum, provides the foundation for future or long-term support for MPA monitoring.

In future projects, these issues of trust, project intentions, incentives to participate, and how data will be used may be better be addressed up front with strategic joint outreach efforts with state agencies responsible for MPA monitoring and review efforts to engage fishermen early on, acknowledge and address to the extent possible their concerns, and incorporate fishermen in the overall MPA monitoring process. Meaningfully incorporating fishermen into MPA monitoring efforts such as project design, data review/analysis, and data dissemination are important to build trust and transparency as well as empower fishermen and foster a sense of ownership and legitimacy over the data, information, and process which may potentially impact their livelihood.

An additional lesson learned is to access a comprehensive list of CPFV operators so that small-scale CPFV operators may be interviewed as well. Using the sampling methodology implemented in this project, larger CPFV operations were found, however, to ensure all CPFV operators are given the opportunity to participate in monitoring efforts a list of operators and contact information could potentially be obtained through the CDFG.

8.2. Recommendations on Key Monitoring Metrics

Below are Ecotrust's recommendations for key metrics to monitor within the commercial fishing and CPFV sectors. To inform the existing monitoring plan structure we included the key monitoring metrics recommended for consumptive uses detailed in the North Central Coast and South Coast MPA monitoring plans and added additional metrics with an associated rationale.

8.2.1. Commercial Fishing Sector

Table 261. Recommendations for key monitoring metrics in the commercial fishing sector

Metric	Purpose	Source
Landings (pounds and ex-vessel revenue)	This metric is to monitor how many pounds of fish are being caught and how much revenue is being generated in key fisheries. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CDFG commercial landings data
Operating costs (average yearly percentages)	This metric is to monitor how operating costs may be changing over time. This may be increases/decreases in fuel costs, equipment costs, maintenance costs, crew costs, etc. From this information changes in net revenue for individual fishermen may be calculated. These operating cost percentages may also be used to help estimate secondary economic impacts upon commercial fishing support industries. It is recommended that operating costs be collected at the fishery level as some fisheries are more equipment intensive or require less/more fuel and crew.	Survey data
Total number of fishermen landing in key fisheries	This metric is to monitor how many fishermen are participating in key fisheries each year. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CDFG commercial landings data
Total number of trips in key fisheries	This metric is to monitor how many total trips fishermen are taking in key fisheries each year. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CDFG commercial landings data
Landings (pounds and ex-vessel revenue) and trips per fisherman	This metric is to monitor how landings (pounds and revenue) and fishing effort may be changing at the individual fisherman level for key fisheries	CDFG commercial landings data
Spatial value of fishing areas	This metric is to monitor changes in how coastal/ocean areas are being utilized and valued by fishermen. Data may be analyzed with previous spatial data sets to determine spatial shifts in the value of fishing areas for key fisheries	CDFG commercial landings data
Catch per unit effort (CPUE)	This metric is to monitor the average amount effort expended by fishermen in key fisheries. This data may be calculated by examining pounds/ex-vessel revenue per trip for key fisheries and	CDFG commercial landings data
Price per pound	This metric is to monitor changes in the average ex-vessel price received by fishermen in key fisheries. This metric may be calculated on average by dividing ex-vessel revenue by pounds landed.	CDFG commercial landings data
Average percent of fishing revenue from key fisheries	This metric is to monitor changes in the average proportion individual fishermen rely upon a fishery for their fishing income. This metric may be calculated by examining and averaging across the ex-vessel revenue portfolio of individual fishermen who make landings in a given port or region.	CDFG commercial landings data
Attitudes and perceptions	This information is to monitor and collect contextual information that may help identify key fishery issues and factors driving the change observed in the metrics listed above.	Survey data/focus groups

8.2.2. CPFV Sector

Table 262. Recommendations for key monitoring metrics in the CPFV sector

Metric	Purpose	Source
Landings (number of fish caught)	This metric is to monitor how many fish are being caught in key CPFV fisheries. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CDFG CPFV logbook data
Average annual gross revenue from CPFV operations	This metric is to monitor how gross economic revenue levels may be changing over time	Survey data
Average percent of revenue from key fisheries/activities	This metric is to monitor changes in the average proportion of CPFV operator gross economic revenue relies upon a specific fishery/activity.	Survey data
Operating costs (average yearly percentages)	This metric is to monitor how operating costs may be changing over time. This may be increases/decreases in fuel costs, equipment costs, maintenance costs, crew costs, etc. From this information changes in net revenue for individual CPFV operators may be calculated. These operating cost percentages may also be used to help estimate secondary economic impacts upon CPFV support industries.	Survey data
Total number of CPFV vessels operating	This metric is to monitor how many vessels are operating, each year. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CDFG CPFV logbook data
Total number of CPFV fishing trips	This metric is to monitor changes in the number of CPFV fishing trips that are being conducted each year as this is an indicator of economic conditions. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CDFG CPFV logbook data
Total number of anglers	This metric is to monitor how many anglers are taking CPFV trips each year as this is an indicator of economic conditions. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CDFG CPFV logbook data
Catch per unit effort (CPUE)	This metric is to monitor the average amount of fish caught per unit of effort. This metric is useful in helping determine changes in fish abundance or the success of fishing trips which is related to customer satisfaction. This metric may be calculated by dividing the number of fish caught (landings) by the number of trips or the number of anglers.	CDFG CPFV logbook data
Number of anglers per trip	This metric is to monitor the average number of anglers participating in each CPFV fishing trip as this is an indicator of economic conditions. This metric may be calculated by dividing the total number of anglers by the total number of trips. This data may be analyzed at the port, region, and state scales so that nested comparisons may be made of trends over time.	CDFG CPFV logbook data
Spatial value of fishing area	This metric is to monitor changes in how coastal/ocean areas are being utilized and valued by CPFV operators. Data may be analyzed with previous spatial data sets to determine spatial shifts in the value of fishing areas for key fisheries	Survey data
Attitudes and perceptions	This information is to monitor and collect contextual information that may help identify key CPFV issues and factors driving the change observed in the metrics listed above.	Survey data/focus groups

9. CONCLUSION

The intention of this report was to provide a baseline characterization and description of initial changes since MPA implementation of key target fisheries and ports of the commercial fishing and CPFV sectors in the California Central Coast Region. It should be noted that in this report we do not account for the secondary economic effects of changes in fishing revenue and how that may affect support industries such as fish processors/buyers, port workers, crew, and the tourism economy which benefits and may rely on the business of CPFV passengers. Indeed, these industries are vital to the success and health of fishing communities and are important to account for in future monitoring efforts.

It is difficult to discern the effects of MPAs on fishing communities as they are confounded by a multitude of factors such as other regulatory constraints (e.g., area based closures, quota limits, and limited entry fisheries) and general economic downturn, environmental variability/change, market variability, and increasing competition for marine space. However, advancing our understanding of how humans utilize, value, and rely upon marine space will be critical to unraveling these interconnections as well as monitor how MPAs are benefitting or impacting fishing communities into the future. This information may then be used in adaptive management measures to improve the performance of MPAs towards meeting ecological and socioeconomic goals. Similarly, it is our hope that the data collected/compiled and lessons learned through this project will be applied to future MPA monitoring efforts to build a time series data set on how human uses and the socioeconomic health of fishing communities are changing over time. Such a robust and longitudinal dataset that provides both socioeconomic characterization and spatial fishing patterns on consumptive human uses could be used for a wide array of marine spatial planning application including the monitoring of MPAs.

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