



South Coast Fishery Spotlight: Market Squid

The commercial fishery for Market Squid (*Doryteuthis (Loligo) opalescens*) began in the 1860s and has grown into one of California's most lucrative commercial fisheries. **Beginning in the 1990s, the Market Squid fishery has ranked as one of California's most successful fisheries for both landings and ex-vessel revenue, and since 2000 the fishery has consistently occupied one of the top two positions for California's annual [highest grossing fisheries](#).**



This supplemental report provides a general analysis of commercial Market Squid landings from purse seine vessels, reported ex-vessel revenue, and effort before and after marine protected area (MPA) implementation in California's South Coast, 2005/2006 to 2014/2015.

Terms to Know

- **Ex-vessel revenue** is the reported dollar amount paid to fishermen for their landings.
- **The South Coast** includes jurisdictional waters (shore to 3 nautical miles offshore) from Point Conception in Santa Barbara County to the US-MEX border, including ocean waters around offshore islands.
- **The State of the South Coast Report** summarizes the first five years of ecological and socioeconomic conditions of the South Coast after implementation of marine protected areas in January 2012.

Fishery Analysis

As part of the development of the State of the South Coast Report, the California Department of Fish and Wildlife (CDFW) compiled and analyzed reported commercial logbook data (logbook) and commercial market receipt data (Commercial Fisheries Information System [CFIS]), to estimate various metrics for the Market Squid commercial fishery. The two data sources are not identical; however, when possible, were matched by market receipt number to connect total landings CFIS data with effort (number of net sets) as reported in logbooks by vessel captains. **The analysis includes statewide ex-vessel values, and South**

Find Out More!

Vessel captains estimate their catch at-sea, and record this value, along with their effort and other metrics, in their logbook. When they land their catch they receive a landing receipt number verifying the total official landing weight, and ex-vessel value. Landing receipt numbers are not always recorded in the logbook and squid are often caught at night and then landed the next morning. This can make it difficult to link effort from logs to landing receipt since date alone cannot be used to match the metrics. This analysis looks at both effort and landings. Therefore, only logbook records that we could confidently match with landing receipts were included in the results.

To find out complete details on how CDFW performs Quality Control with logbooks and landing receipts please reference CDFW's Market Squid [website](#) and [Fishery Management Plan](#).

Coast ex-vessel values for the commercial fishery which is managed from April 1 through March 31 the following calendar year. Tables 1 and 2 display the reported total landings and the adjusted landings when reported market receipts were matched with reported logbook data. Ex-vessel revenue is adjusted to 2010\$ prices to account for inflation through years (2010 was chosen as the base period for standardizing ex-vessel revenue for each of the Marine Life Protection Act planning regions).

Landings Results

Two distinct Market Squid fisheries operate north and south of Point Conception. Historically, the fishery south of Point Conception provides the majority of state landings and ex-vessel revenue for the state (Table 1 and Figure 1) with the most recent peak in reported landings and ex-vessel revenue occurring in the 2011/2012 fishing season. However, as landings, ex-vessel revenue, and effort decreased in the South Coast starting in the 2012/2013 fishing season these ex-vessel variables remained constant throughout the state as fishing effort shifted north (Table 2 and Figure 2).



Did you know Market Squid landings can be influenced by environmental and market conditions? It's true! For example, fishing effort and catch are known to **decrease** in the South Coast during warm water events like a strong El Niño. Conversely, in years when squid is abundant and creates a market surplus, vessels are put on market-imposed limits created by lower ex-vessel prices.

Table 1- South Coast total reported annual commercial purse seine landings (short tons), ex-vessel revenue (2010\$), effort (sets), and catch-per-unit-effort (CPUE [landings/effort]) for Market Squid, 2005/2006 to 2014/2015 fishing seasons¹.

Season	Reported Landings: CFIS		Matching Receipts: CFIS and Logbooks			
	Reported Landings	Ex-vessel Revenue	Reported Landings from CFIS	Ex-vessel Revenue from CFIS	Effort from logbooks	CPUE
2005/2006	74,763	\$41,803,532	60,158	\$33,711,370	4,319	13.93
2006/2007	37,121	\$19,027,345	32,423	\$16,703,254	2,945	11.01
2007/2008	49,494	\$29,642,648	46,454	\$27,869,147	4,238	10.96
2008/2009	38,981	\$27,027,753	33,018	\$22,880,533	3,850	8.58
2009/2010	89,424	\$46,470,685	72,118	\$37,538,825	5,151	14.00
2010/2011	106,594	\$52,722,043	84,571	\$41,951,099	4,450	19.00
2011/2012	111,612	\$54,017,869	89,502	\$43,408,275	4,703	19.03
2012/2013	80,328	\$45,638,871	60,502	\$34,315,353	4,483	13.50
2013/2014	83,750	\$50,615,703	67,262	\$40,659,760	4,077	16.50
2014/2015	50,691	\$29,141,180	44,048	\$25,374,003	3,015	14.61

Table 1



These data come from the South Coast.

¹2015/2016 fishing season data not available at time of report.

Table 2

Table 2- California statewide total reported annual commercial purse seine landings (short tons), ex-vessel revenue (2010\$), effort (sets), and catch-per-unit-effort (CPUE [landings/set]) for Market Squid, 2005/2006 to 2014/2015 fishing seasons¹.

Season	Actual Landings: CFIS		Matching Receipts: CFIS and Logbooks			
	Reported Landings	Ex-vessel Revenue	Reported Landings from CFIS	Ex-vessel Revenue from CFIS	Effort from logbooks	CPUE
2005/2006	77,898	\$43,494,667	66,187	\$37,019,295	5,120	12.93
2006/2007	37,878	\$19,397,266	33,851	\$17,432,307	3,110	10.88
2007/2008	49,750	\$29,799,011	47,686	\$28,600,389	4,349	10.96
2008/2009	39,944	\$27,699,045	34,811	\$24,136,469	4,090	8.51
2009/2010	90,518	\$47,159,132	75,230	\$39,261,659	5,428	13.86
2010/2011	130,374	\$64,547,292	103,966	\$51,585,406	5,842	17.80
2011/2012	129,370	\$62,638,685	107,594	\$52,219,517	6,041	17.81
2012/2013	101,948	\$58,043,542	81,558	\$46,385,808	5,452	14.96
2013/2014	111,448	\$67,569,252	93,829	\$56,865,245	5,433	17.27
2014/2015	114,443	\$67,717,103	104,972	\$62,186,404	6,903	15.21



These data come from the entire State of California.

¹2015/2016 fishing season data not available at time of report.

Fishery Landings

Interestingly, the 2014/2015 season marked the first time [directed Market Squid catch and landings occurred in Eureka](#) in northern California; this season had above average sea surface temperatures in the South Coast. In addition, the proportion of statewide landings that occurred in both the Monterey Bay, which has a history of squid landings, and north of the Monterey Bay, which is north of the area usually targeted by the squid fleet, increased in the 2014/2015 season compared to the seasons that preceded it. Thus, supporting the case

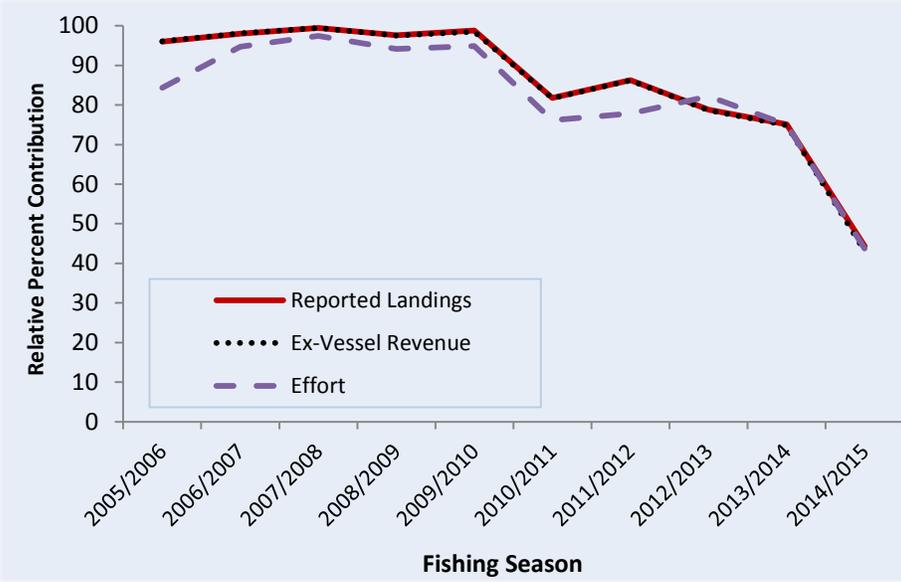


Figure 1. Relative percent contribution of South Coast Market Squid reported landings (short tons, CFIS), ex-vessel revenue (2010\$, CFIS), and effort (total sets, logbooks) to statewide landings, ex-vessel revenue, and effort, 2005/2006-2014/2015 fishing seasons. Data: matched receipts from CFIS and logbook data; CFIS data extracted 7/27/2016.

for Market Squid’s preference for cooler waters, but also indicating that fishing effort may have shifted to areas not previously targeted as a result of environmental conditions (Figure 2).

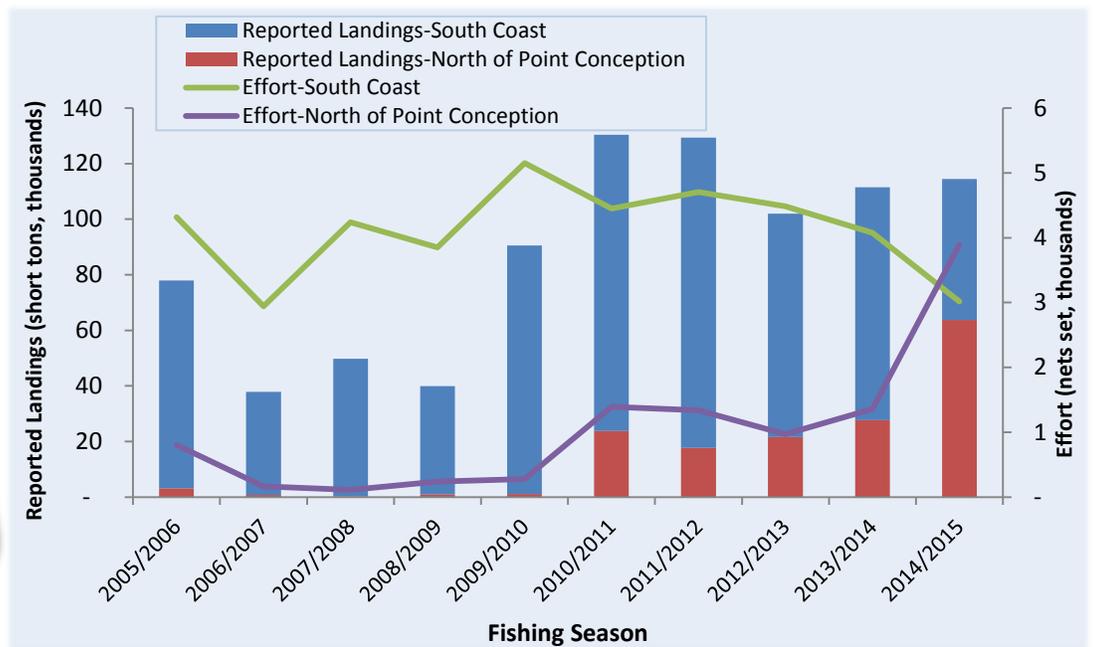


Figure 2. Total reported seasonal commercial purse seine landings (short tons) and effort (number of net sets) for Market Squid 2005/2006 to 2014/2015 fishing seasons; 2015/2016 fishing season data not available at time of report. Data source: CDFW logbook data (effort) and CFIS data (landings); CFIS data extracted 7/27/2016.



Market Squid and MPAs

MPA Implementation

While there is a correlation between MPA implementation in the South Coast (implemented January 2012) and decreased landings, ex-vessel revenue, and effort for Market Squid, causation is not implied. **The implementation of the South Coast MPAs coincided with a shift in environmental conditions affecting Market Squid distribution.**

Eastern Pacific ocean waters have been warming since 2012; this includes the growth of an anomalous mass of warm water from 2013-2014 in the Pacific Northwest known as “The Blob”, and the strong El Niño event from 2015-2016, which rivaled two of the strongest, most recent, El Niño’s on record (1982-1983 and 1997-1998). [Research](#) has found that **squid reproduction is depressed during years with anomalously warm waters**, with subsequent years experiencing an increase in squid abundance. Fluctuations in landings and ex-vessel revenue in the South Coast have occurred; however, CPUE has remained relatively stable in the South Coast and state (Tables 1 and 2).

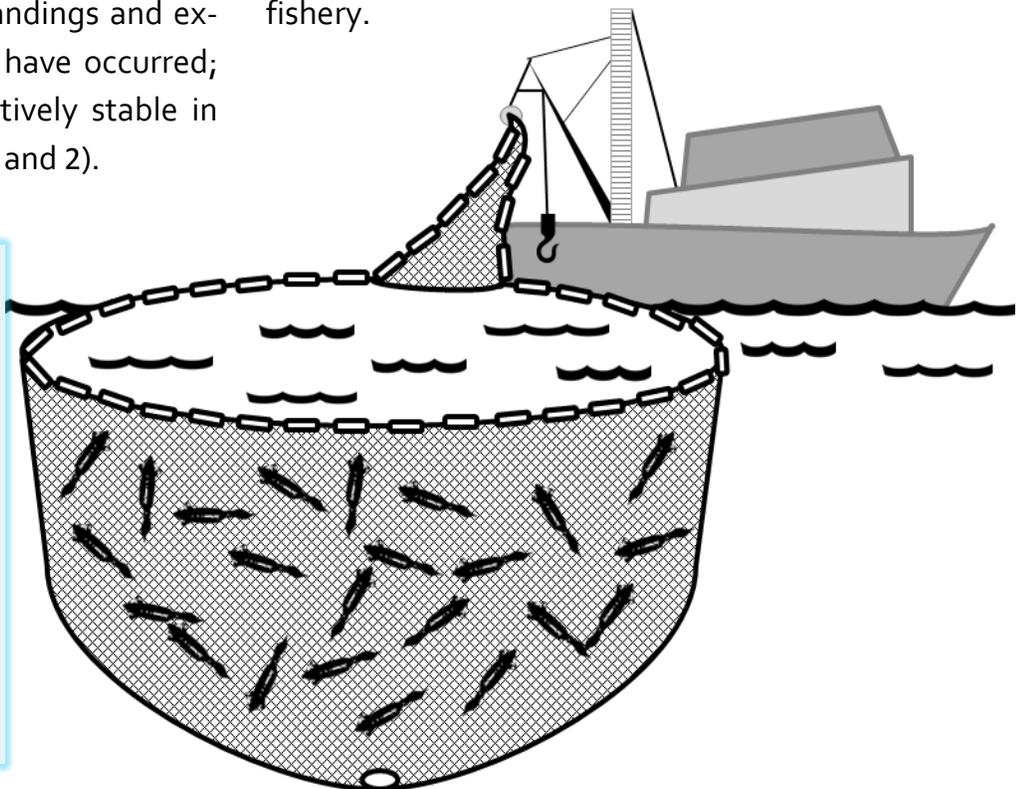
What’s a Purse Seine?

It’s a round haul net with a “purse” line to close the bottom of the net. One end is attached to a skiff and the deploying vessel encircles the squid. The other end of the net is brought to the deploying vessel and the purse line is drawn, closing the bottom of the net to prevent squid from escaping.

MPA Benefits

Market squid is a highly mobile species, with adults offered little protection from established “no-fishing” areas within MPAs. However, **MPAs protect a substantial amount of essential fishery habitat for Market Squid in way of spawning grounds.**

Market Squid [prefer to spawn](#) on soft bottom substrate with water temperatures between 50-60°F. When these two criteria are met Market Squid also have a preferred depth range of 20-70m. This means the **South Coast MPAs protect, at a minimum, 14.6% of available Market Squid spawning grounds within no-take MPAs** (Figure 3). While the relative contribution of these MPAs to Market Squid spawning success and recruitment is not yet known, monitoring both CPUE and landings through time could provide a greater understanding of relative MPA impacts to the fishery.



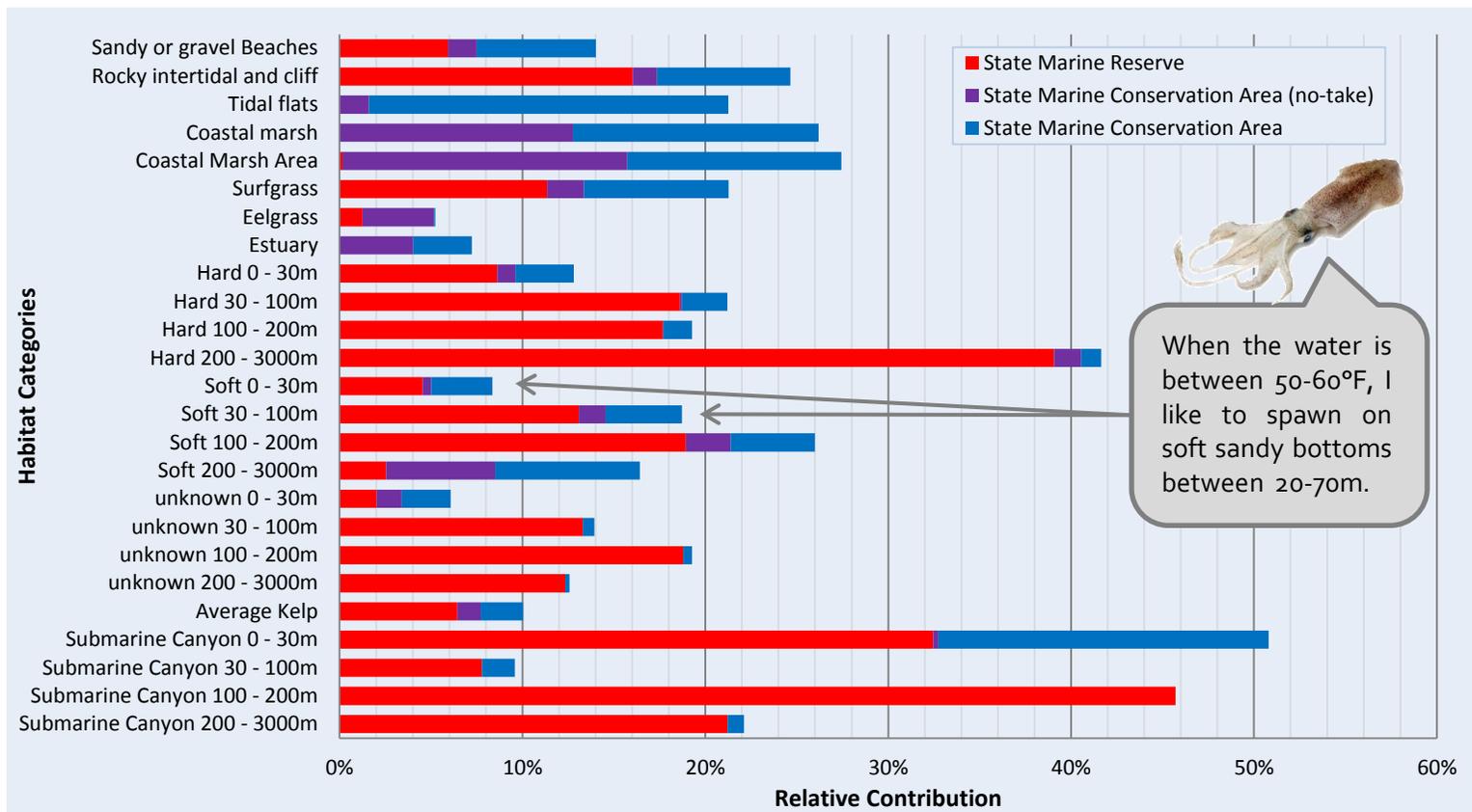


Figure 3. Relative percent contribution of MPA habitats to South Coast habitats. Habitat categories within MPAs that are associated with Market Squid include two depth categories: Soft 0-30m and Soft 30-100m.

Acknowledgements

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