

# Spiny Lobster Fishery Management Plan Harvest Control Rule

## Annual Review for 2016-17

### California Department of Fish and Wildlife

#### Marin Region Invertebrate Project

The California Fish and Game Commission (Commission) adopted the [California Spiny Lobster Fishery Management Plan](#) (FMP) in April 2016. The FMP requires California Department of Fish and Wildlife (Department) to monitor and assess the California lobster stock every year using reference points based on three types of commercial fishery-dependent data (analysis of recreational catch can be found [here](#)):

1. Catch
2. Catch-per-unit-effort (CPUE)
3. Average weight

The threshold for the catch-based reference point is exceeded when the average catch of the three most recent seasons divided by the average catch of the ten most recent seasons is less than or equal to 0.9. Similarly, the CPUE-based reference point threshold is exceeded if the average CPUE of the three most recent seasons divided by the average CPUE of the ten most recent seasons is less than or equal to 0.9. These reference points are designed primarily to detect trends in catch and CPUE. Both values can fluctuate from year to year due to socioeconomic, environmental, and biological factors (e.g., catch might drop during economic downturn due to diminishing demand while the lobster stock is still healthy). These annual fluctuations often do not reflect problems that warrant management responses. Averaging catch and CPUE from the three most recent seasons for the reference point numerator serves to smooth those fluctuations.

The third reference point is calculated using a model to translate average weight in the commercial catch to a [spawning potential ratio](#) (SPR). The threshold for the SPR is set to the average SPR between 2000 and 2008, when the fishery was considered productive and sustainable according to the 2011 stock assessment. When a threshold is crossed, the Department must investigate the underlying causes and address any fishery or stock sustainability issues using a set of management tools prescribed by the FMP.

#### 2016-17 Status of the HCR

None of the thresholds were exceeded in the 2016-17 fishing season (Table 1). The stock's SPR value improved slightly compared to the previous season. Both catch and CPUE decreased, but not to an extent that would cause the thresholds to be crossed. Based on these findings, the Department has determined that no management response is necessary at this time.

**Table 1. Status of the Harvest Control Rule Reference Points**

Reference Point	Threshold	2016-17 Season Value	Result
Catch	0.9	1.05	No Action Necessary
CPUE	0.9	0.95	No Action Necessary
SPR	25	35	No Action Necessary

## 2016-17 Commercial Lobster Catch

Landings for the 2016-17 season totaled 669,301 lbs. This is a decrease from the 2015-16 season total of 794,724 lbs, as well as the lowest landings in the past ten fishing seasons (Figure 1). The abundance of lobster and their catchability are thought to be correlated with the Pacific Decadal Oscillation (PDO), with warm water associated with higher catch.<sup>i,ii</sup> The drop in catch during a warm water year is thus running counter to Department's expectation. However, this lower catch does not deviate drastically from other recent seasons. The average total landings of California spiny lobster in the past ten seasons is 769,435 lbs, while the average total landings in the past three seasons is 807,725 lbs. This yields a catch reference point value (catch index) of 1.05, and suggests that the fishery is still in a stable condition (Figure 1).

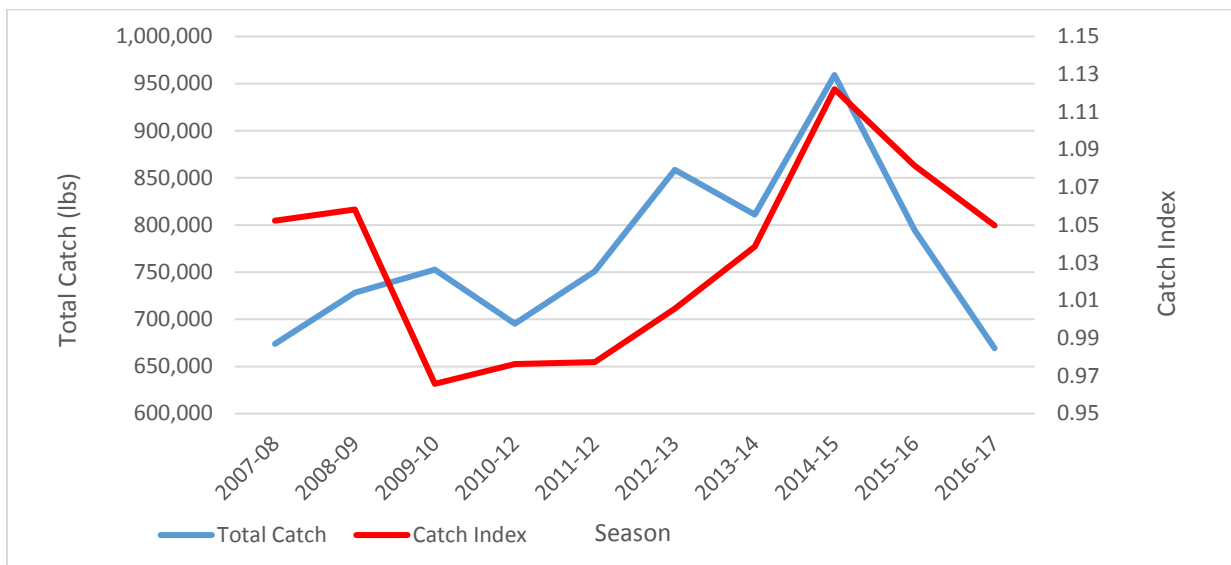


Figure 1: Total Catch and Catch Index (3 year average/10 year average) for each Commercial Fishing Season from 2007-2017 (Source: Department Landings Data); Catch Index Threshold Is 0.9.

There are several distinct hot spots such as San Diego and the northern Channel Islands that are relatively more productive than the rest of the coast (Figure 2). Overall, more catch originated from the northern Channel Islands in the 2016-17 commercial season than the rest of southern California. Comparison between seasons suggests that a geographical shift in catch may be occurring. Total statewide landings for any given season have historically been split relatively equally in thirds between Santa Barbara & Ventura County ports, Los Angeles & Orange County ports, and San Diego County ports. In the 2016-17 season, however, Santa Barbara and Ventura County ports landed approximately half of the state's lobster catch (Figure 3).

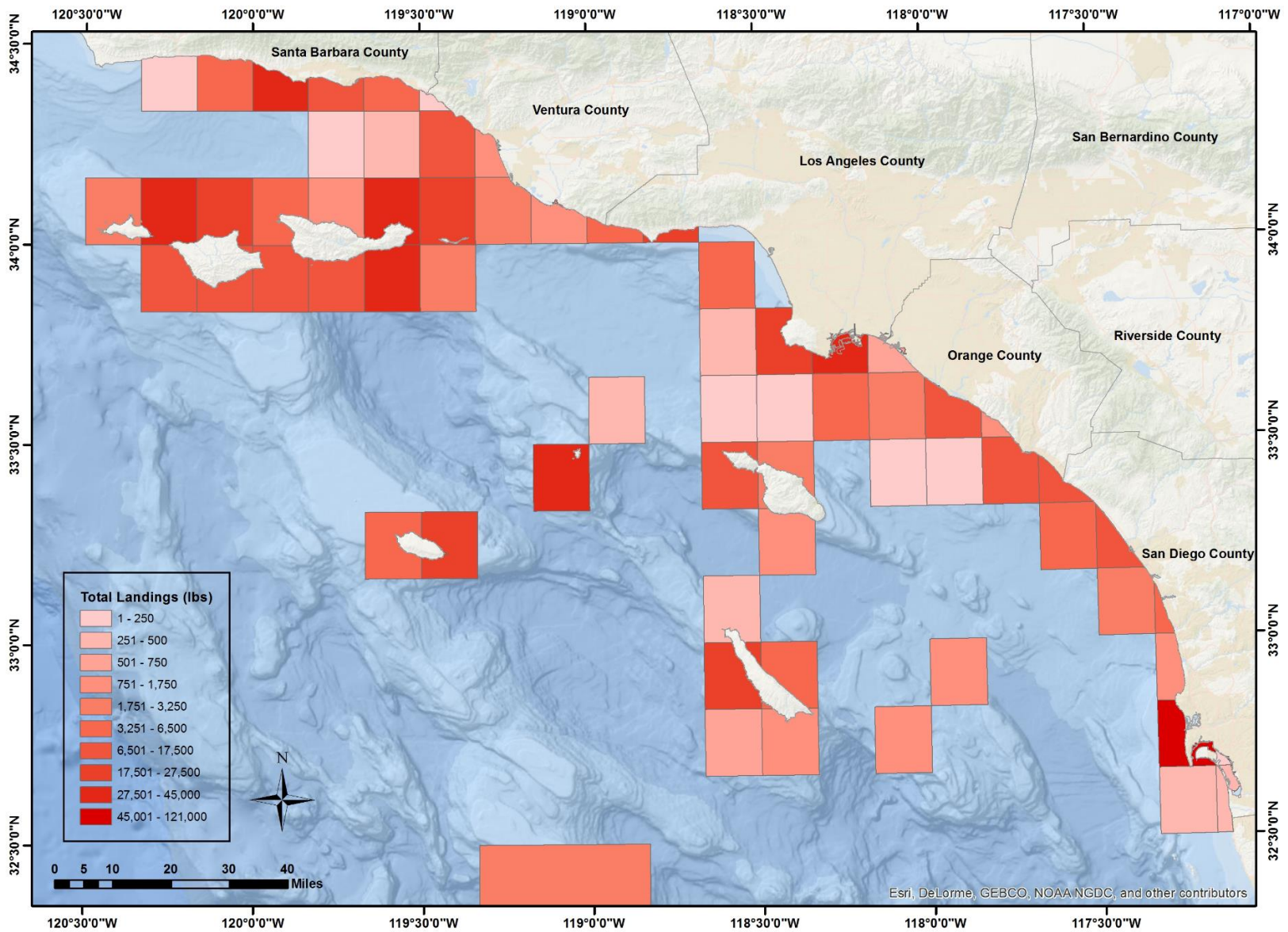


Figure 2: Commercial Lobster Landings (lbs) by CDFW commercial fishing block during 2016-17 Fishing Season (Source: Department Landings Data).

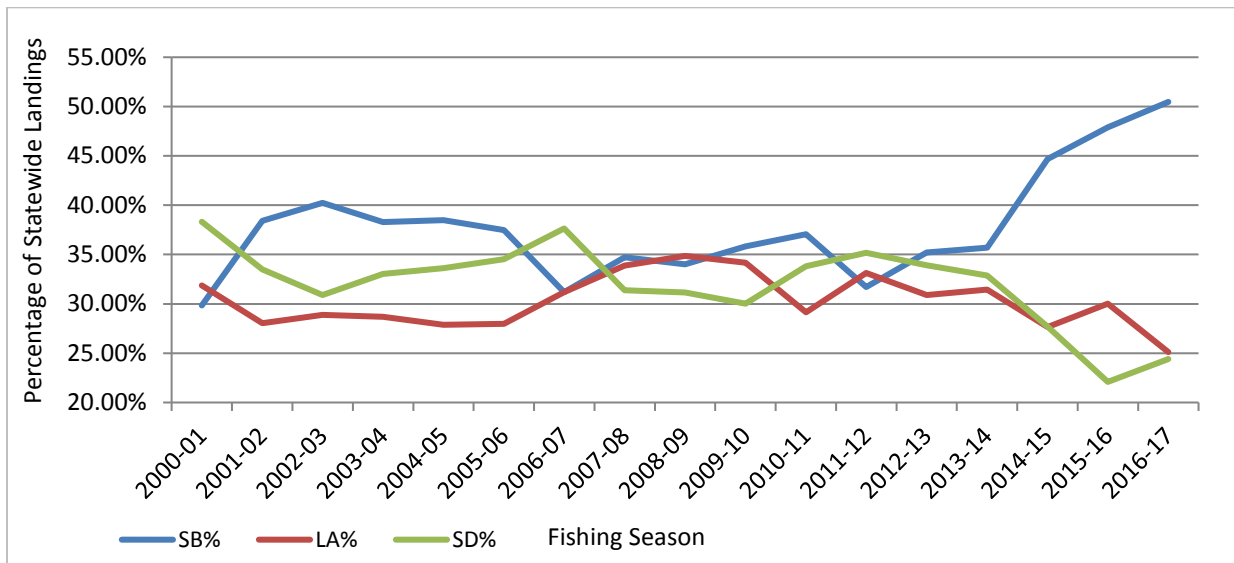


Figure 3: Percent of Total Commercial Landings by Port Region for Santa Barbara and Ventura County Ports (SB), Los Angeles and Orange County Ports (LA), and San Diego County Ports (SD) for each Fishing Season from 2000-2017 (Source: Department CFIS database).

### 2016-17 Commercial Fishing Effort and Catch-Per-Unit-Effort

In the 2016-17 permit year (from April 1 of one year to March 31 of next year), 139 transferable and 45 non-transferable lobster operator permits were issued, with 139 permit holders making landings during the 2016-17 fishing season. During the same permit year, 229 lobster crewmember permits were issued. The efficiency (CPUE) of the fleet has been more volatile than its catch for the last ten seasons, and retroactive calculations of the CPUE reference point for the past ten seasons show that the threshold was crossed four times (Figure 4). CPUE for the 2016-17 season was 0.41 legal size lobsters per trap pull, bringing the three year average to 0.46 and the ten year average to 0.49 (Figure 4). The CPUE reference point value (CPUE index) is thus currently at 0.95 (Figure 4). The 2016-17 CPUE is the lowest within the ten season period, but the implementation of a trap limit for the 2017-18 fishing season is expected to reduce effort in the fishery, which may raise the fleet’s CPUE. However; if next season’s CPUE remains at the same level, the CPUE threshold of 0.9 will be reached.

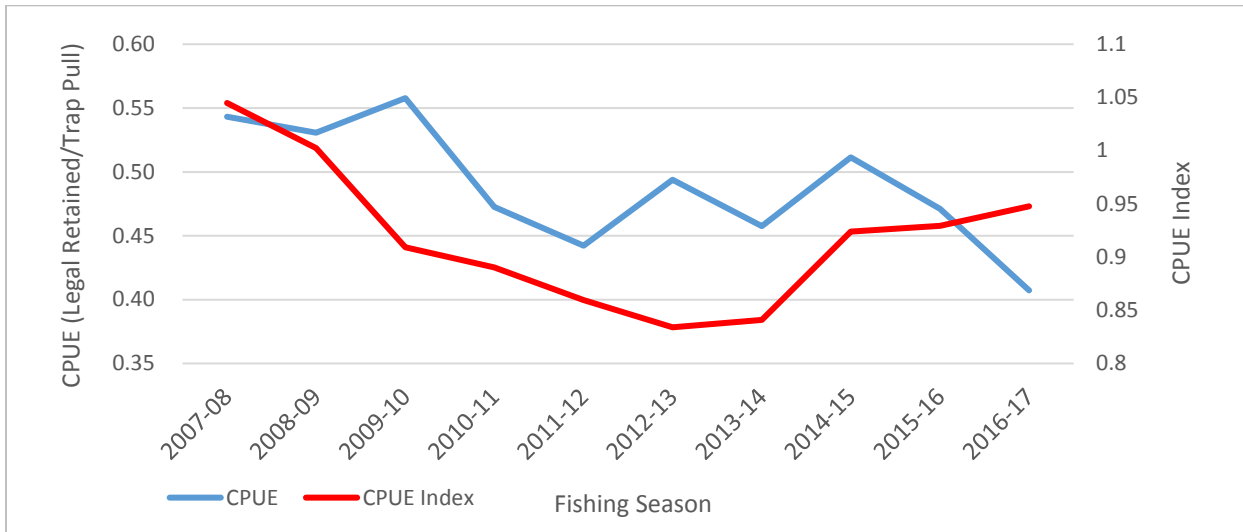


Figure 4. Average CPUE and CPUE Index (3 year average/10 year average) for each Fishing Season from 2007–2017 (Source: Department Lobster Logbook Data); CPUE Index Threshold Is 0.9.

CPUE generally exhibited a downward trend as the 2016-17 fishing season progressed (Figure 5). The slight uptick in CPUE at the end of a fishing season observed in most fishing seasons did not occur for the 2016-17 fishing season. A closer look at different regions of Southern California over the past ten fishing seasons also reveals important details about the fishery (Figure 6). CPUE in every region along the coast has declined in the past 3 fishing seasons, and while vessels from the Los Angeles & Orange County ports have always exhibited the lowest CPUE, vessels from the Santa Barbara & Ventura County ports experienced the sharpest drop during the 2016-17 fishing season (Figure 6). This drop in CPUE could be explained by a measurable effort shift towards the region, as more of the fleet’s fishing effort measured in trap pulls has shifted to the Santa Barbara & Ventura region (Figure 7).

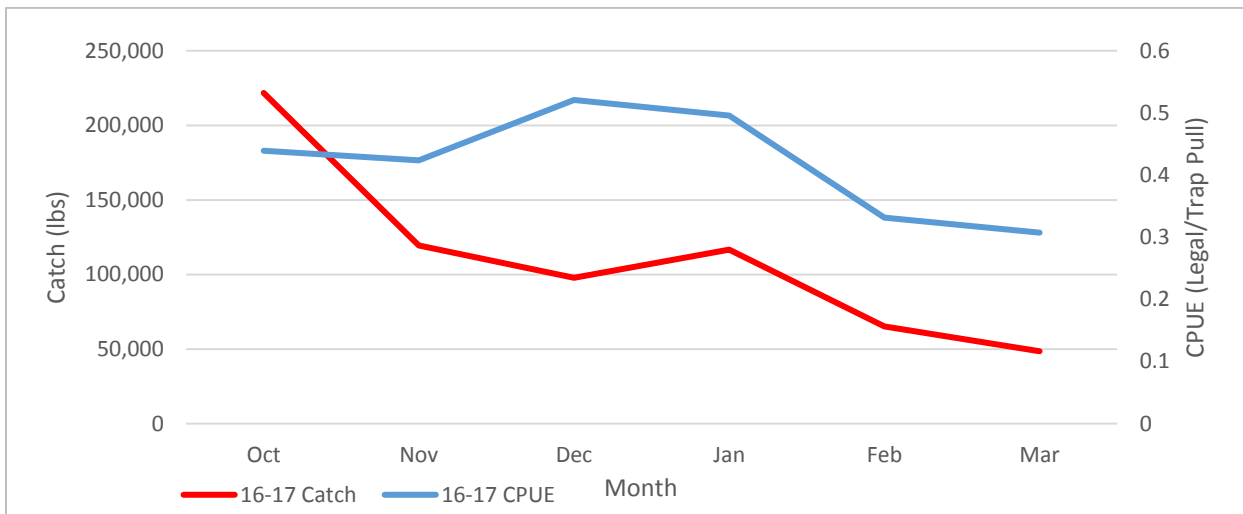


Figure 5. 2016-17 Fishing Season Catch and Average CPUE by Month (Sources: Department Lobster Logbook Data & Department Landings Data).

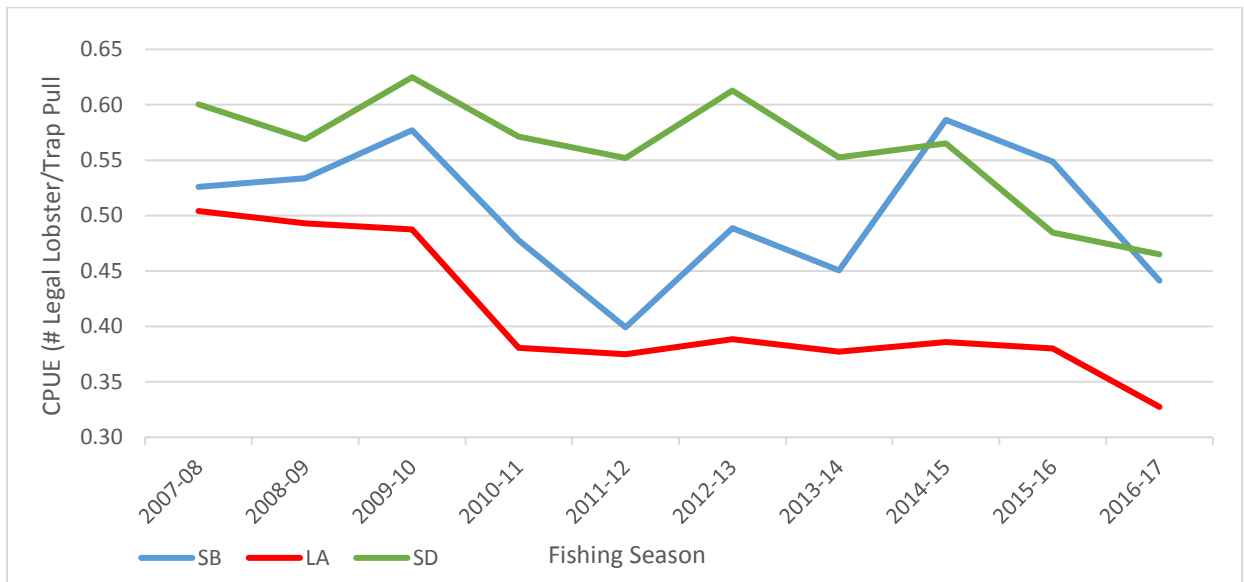


Figure 6. Commercial CPUE by Region 2007–2017 for Santa Barbara and Ventura County Ports (SB), Los Angeles and Orange County Ports (LA), and San Diego County Ports (SD) for each Fishing Season from 2007-2017 (Sources: Department Lobster Logbook Data).

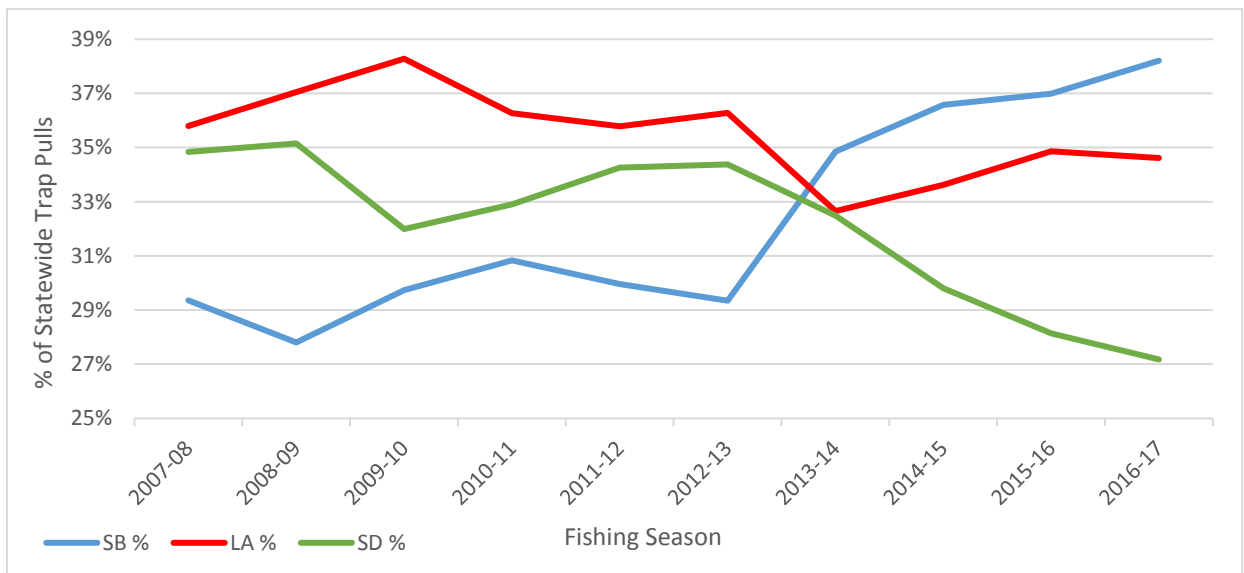


Figure 7. Percentage of Total Commercial Effort by Region 2007–2017 for Santa Barbara and Ventura County Ports (SB), Los Angeles and Orange County Ports (LA), and San Diego County Ports (SD) for each Fishing Season from 2007-2017 (Sources: Department Lobster Logbook Data).

### 2016-17 Stock Health

The SPR reference point serves to gauge the reproductive potential of the lobster stock with average weight being the only variable model input from year to year. The average weight of an individual lobster landed during the 2016-17 season was 1.71 lbs, which corresponds to an SPR value of 35 according to the [Cable-CDFW SPR model](#). Because the current SPR value is higher than that of the stable

reference seasons from 2008-2012, which is 25, no management response is necessary at this time. Retrospective analyses of SPR using data from the past 17 seasons shows that SPR threshold has only been crossed one time (2005-06 season) (Figure 8).

However, there is evidence that regional differences in the average individual weight landed could influence SPR. The overall increase in the average weight over the last four seasons (Figure 8) is likely driven by a higher portion of the catch (Figure 3) coming from the Santa Barbara/Ventura area. This area traditionally has had a higher average weight compared to the southern part of the fishery (1.78 lbs for the 2016-17 fishing season compared to 1.61 lbs in the south). This is in line with the recent rise in effort experienced in that region (Figure 6), suggesting that the increasing average weight and SPR reflects a shift in catch and effort to the northern region. The Department will continue to monitor and evaluate regional differences in landings and average weight and their influence on SPR.

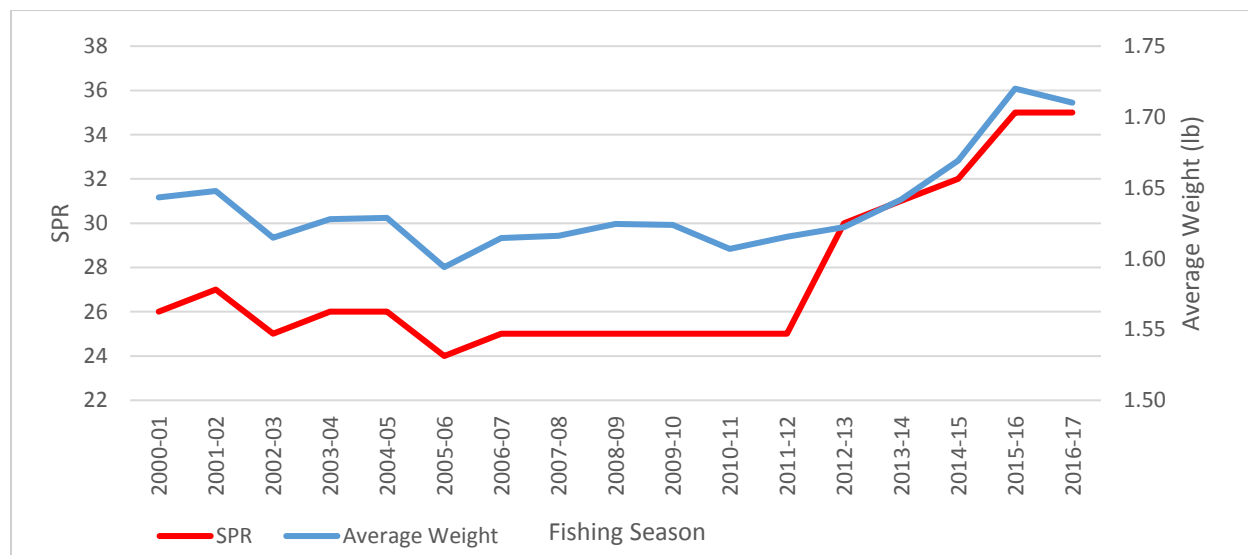


Figure 8. Average Weight and SPR Values 2000-2017 (Source: Department Lobster Logbook Data); SPR Index Threshold Is 25.

**2016-17 Value**

The total commercial ex-vessel value of California spiny lobster was \$13,691,364 for the 2016 calendar year. This makes the lobster fishery the third-most valuable fishery by ex-vessel value, behind only the market squid fishery and the Dungeness crab fishery. The ex-vessel price of the species started at approximately \$19.00/lb during the beginning of the 2016-17 season and increased to approximately \$21.50/lb before ending the season at just under \$18.00/lb (Figure 9). This is the first time in the past five fishing seasons that the per-pound ex-vessel price at the beginning of the fishing season was higher than the price at the end of the fishing season.

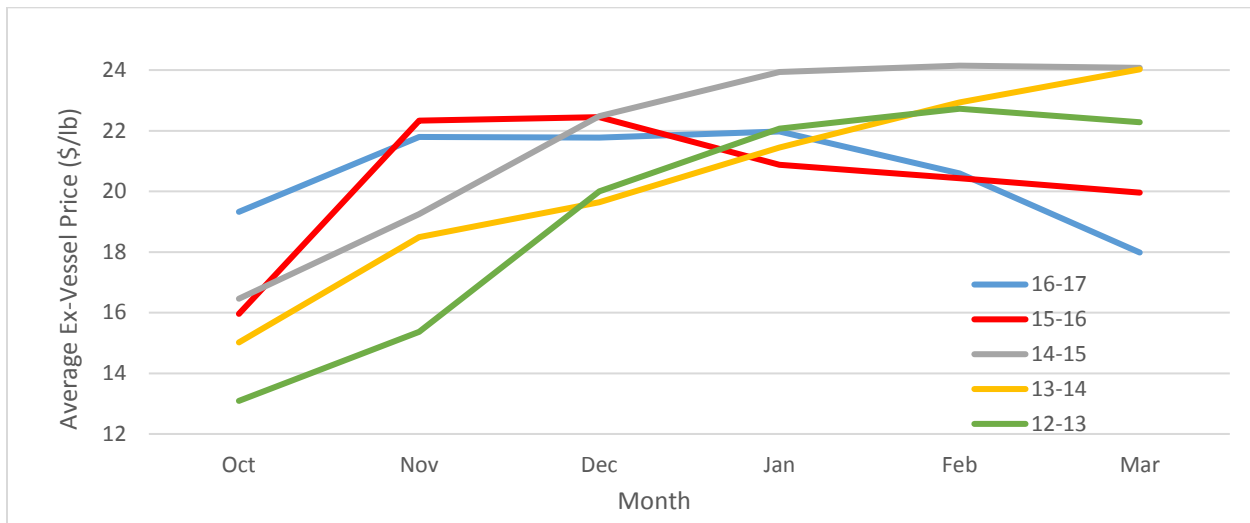


Figure 9. Average Per-Pound Ex-Vessel Value of California Spiny Lobster by Month and Season from the 2012-13 Fishing Season to the 2016-17 Fishing Season (Source: Department Landings Data).

### Ongoing Department Research- Early Stage Lobster Larvae (Phyllosoma)

The Department has initiated a study examining the abundance and distribution of California spiny lobster larvae to provide indicators for fishery management. Recruitment is likely the most important driver of stock size and structure as well as catch for the species but little is understood about larval and early-post larval (newly settled) life because of the long pelagic larval phase and the long dispersal distance of this species. However, recruitment monitoring has been successful in some areas and plays an important role in ongoing stock assessments for Western Australian rock lobster (*Panulirus cygnus*), which has a similarly long pelagic larval phase.<sup>iii</sup> Moreover, Department researchers have previously identified important relationships between lobster larval abundance and environmental factors using samples collected by the California Cooperative Oceanic and Fisheries Investigations (CalCOFI) long-term monitoring program.<sup>iv</sup>

The Department is one of three partnering institutions in the CalCOFI program, along with the Scripps Institution of Oceanography and NOAA Fisheries Service. The program’s long history allows for detection of long-term patterns in larval abundance as they relate to environmental conditions and fishery catch history. The broad geographic scope of sampling extending across the California spiny lobster stock and up to 220 nm from shore encompasses the area where the wide-ranging larvae are likely to be found. Additionally, CalCOFI staff already routinely separate phyllosoma from other larvae in the samples. Finally, the harvest control rule used by the Department to manage the stock relies exclusively on fishery -dependent data. The recently approved lobster FMP identifies both the strengthening of our understanding of the species’ larval dynamics as well as the development of fishery -independent data streams as important management needs.

### Ongoing Department Research-Individual Lobster Size Monitoring

Beginning with the 2016-17 lobster season, the Department began a monitoring program to collect data on individual lobster sizes in the commercial landings. This effort serves two primary purposes: 1) to



provide an additional method to calculate the average size of commercially retained California spiny lobster for the HCR and 2) to develop a time series of the population's size structure that will allow the use of additional stock assessment methods.

The age and/or size structure of the catch is a commonly collected data time series, even in data poor fisheries, and is required by many modern fisheries models. Average weight of commercially landed lobsters is the key empirical data input to the [Cable-CDFW model](#) for calculating SPR, which is used in the HCR. The currently available method for calculating average weight relies on matching commercial lobster logbook data (number caught) to the associated landing receipt (pounds landed) data. This process requires a variety of assumptions and discards a significant portion of the available data from the logbooks and receipts that can't be matched. Therefore, improvement of this data stream is a high priority. A revised landing receipt developed for use in 2018 will require reporting the number of lobster landed in addition to pounds. This should improve the Department's future ability to calculate average weight as both the number and pounds landed are available from one source.

Benefits of the Cable-CDFW model include its suitability for the readily available data, ability to incorporate MPAs in population dynamics, and ability to investigate relative impacts of alternative management strategies. However, equilibrium assumptions and the relative lack of resolution provided by average weight rather than size structure present drawbacks. The Cable-CDFW model cannot estimate the biomass of the California spiny lobster stock, forecast future catches, or incorporate variability in biomass resulting from recruitment variability or shifting spatial dynamics within the fishery, among others. The FMP's scientific peer review panel recommended that the Department work towards the implementation of a fisheries model utilizing annual estimates of the size structure of the catch, which allows tracking of individual cohorts through time. A dockside or market sampling program conducted by Department staff could ensure that a well-structured sample of lobsters are accurately measured. This type of sampling program would also initiate a time series of size frequency of catch that could build towards more sophisticated assessments.

Department staff are working with fishermen and buyers to sample lobster sizes both at the dock and at buyer facilities. The Department greatly appreciates the cooperation of those who have assisted. While cooperation has been voluntary to date, the Department does have the authority to require staff entry to any vessel or place of business to collect information pertaining to commercial fishing (Fish & Game Code § 7702). We strive to make our sampling efforts as quick and convenient for fishermen and buyers as possible and stress that this effort is restricted to sampling for the purposes of biological monitoring and is entirely separate from any enforcement effort.

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<sup>i</sup> Miller, E. 2014a. Status and Trends in the Southern California Spiny Lobster Fishery and Population: 1980-2011. Bulletin of the Southern California Academy of Sciences. 113(1): 14-33; Koslow, J.A., L. Rogers-Bennett, and D.J. Neilson. 2012. A time series of California spiny lobster (*Panulirus interruptus*) phyllosoma from 1951-2008 links abundance to warm water oceanographic conditions in southern California. California Cooperative Oceanic Fisheries Investigations Report 53: 132-139.

<sup>ii</sup> Neilson, D.J. 2011. Assessment of the California Spiny Lobster (*Panulirus interruptus*). Final, post technical review, report submitted to and approved by the California Fish and Game Commission. 138p.

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<sup>iii</sup> Caputi, N., Feng, M., Pearce, A., Benthuysen, J., Denham, A., Hetzel, Y., ... & Chandrapavan, A. (2014). *Management implications of climate change effect on fisheries in Western Australia Part 1: Environmental change and risk assessment*. Tech. Rep. 2010/535, FRDC.

<sup>iv</sup> Koslow, J. A., Rogers-Bennett, L., & Neilson, D. J. (2012). A time series of California spiny lobster (*Panulirus interruptus*) phyllosoma from 1951 to 2008 links abundance to warm oceanographic conditions in southern California. *Calif. Coop. Ocean. Fish. Invest. Rep*, 53, 132-139.