

2018-19 Summary of the Pacific Herring Spawning Population and Commercial Fisheries in San Francisco Bay



2019 Report



California Department of Fish and Wildlife

Aquaculture and Bay Management Project

Pacific Herring Management and Research

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INTRODUCTION

The California Department of Fish and Wildlife (Department) has conducted Pacific Herring (*Clupea pallasii*) research in San Francisco Bay as part of its ongoing monitoring and management of the commercial fishery since 1972. The Department uses annual dive surveys and individual spawn deposition surveys to calculate a spawning stock biomass (SSB) estimate each year. It also uses mid-water trawl survey data each season to estimate the age class structure, sex composition, and general condition of the San Francisco Bay spawning population. The Department collaborates with the industry to collect commercial fishery data to determine age class structure of the population. The SSB estimate, age class structure, condition indices, and commercial catch analysis all serve as the basis for establishing fishing quotas for the next season. Specific information on commercial Pacific Herring fishing regulations are contained in Title 14, California Code of Regulations, Sections 163 and 164.

POPULATION SUMMARY

Spawning Stock Biomass Estimate

The 2018-19 Pacific Herring season in San Francisco Bay ended with the second lowest SSB estimate on record of 8,030 tons, and this was the fifth year in a row of below average Pacific Herring returns (Figure 1). The historical average equals 47,491 tons (1979-present).

There were 13 recorded spawn events through the season starting in early-December and ending in early-March (Table 1). The first recorded spawn of the season occurred on December 3, 2018, and the last recorded spawn occurred on March 2, 2019. Two large spawns at Point Richmond accounted for over half of the season's estimate. Several spawning events occurred in Richardson Bay (see Figure 2 for the spatial distribution of all spawn events). A single spawning event occurred at Candlestick Point, but no other spawns were detected on the San Francisco waterfront. There were two small spawning events at Coyote Point in the South Bay and one trace spawn in Ballena Bay off Alameda Island.

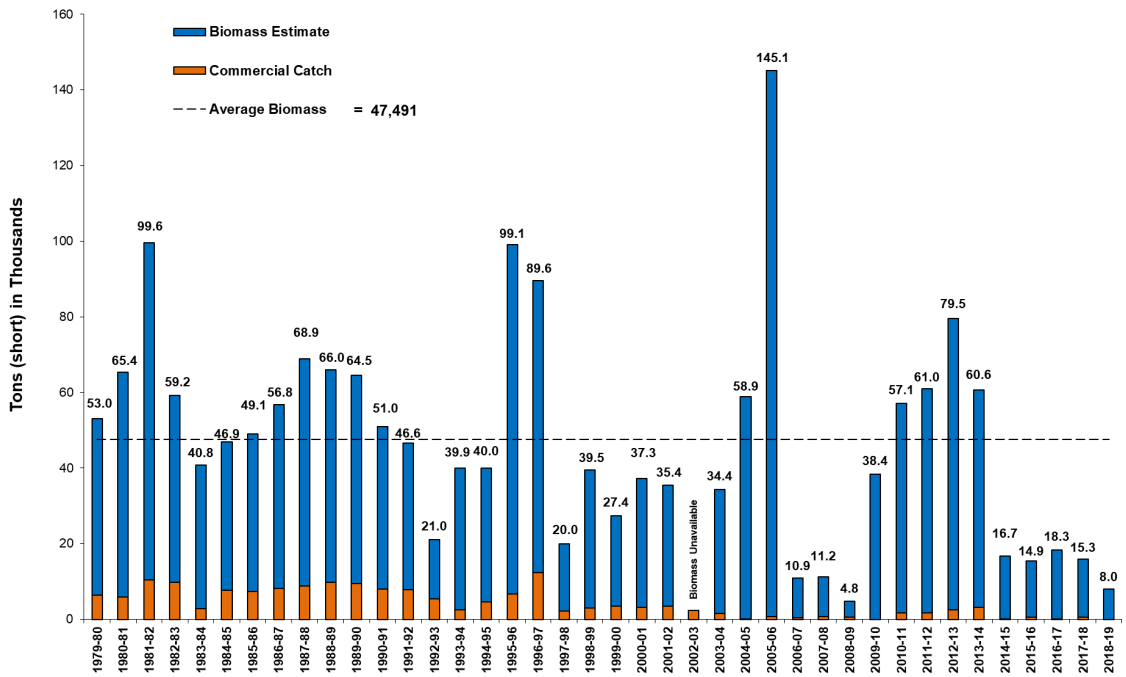


Figure 1. San Francisco Bay Pacific Herring spawning stock biomass estimates and commercial catch, 1979-2019.

Table 1. San Francisco Bay Pacific Herring spawning stock biomass estimate by event, 2018-19. There was no commercial fishing effort during the 2018-19 fishing season.

#	Approximate Spawn Dates	Location	Submerged	Shore	Biomass Total (Short Tons)
1	December 3, 2018	Alameda - Ballena Bay	trace	trace	trace
2	December 20-23, 2018	Richardson Bay	16	0	16
3	December 20-23, 2018	Point Richmond	2,712	0	2,712
4	December 31, 2018	Keil Cove	46	0	46
5	January 2, 2019	Coyote Point	0	1	1
6	January 4-8, 2019	Candlestick Point	0	53	53
7	January 9-12, 2019	Richardson Bay	2,844	0	2,844
8	January 9-12, 2019	Paradise Cove	183	0	183
9	January 24-27, 2019	Richardson Bay	480	36	516
10	January 24-27, 2019	Point Richmond	1,348	198	1,546
11	February 11, 2019	Richardson Bay	48	0	48
12	February 28, 2019	Richardson Bay	27	0	27
13	March 2, 2019	Coyote Point	0	40	40
-	Spawn Events (n) = 13	Totals in Short Tons	7,703	327	8,030

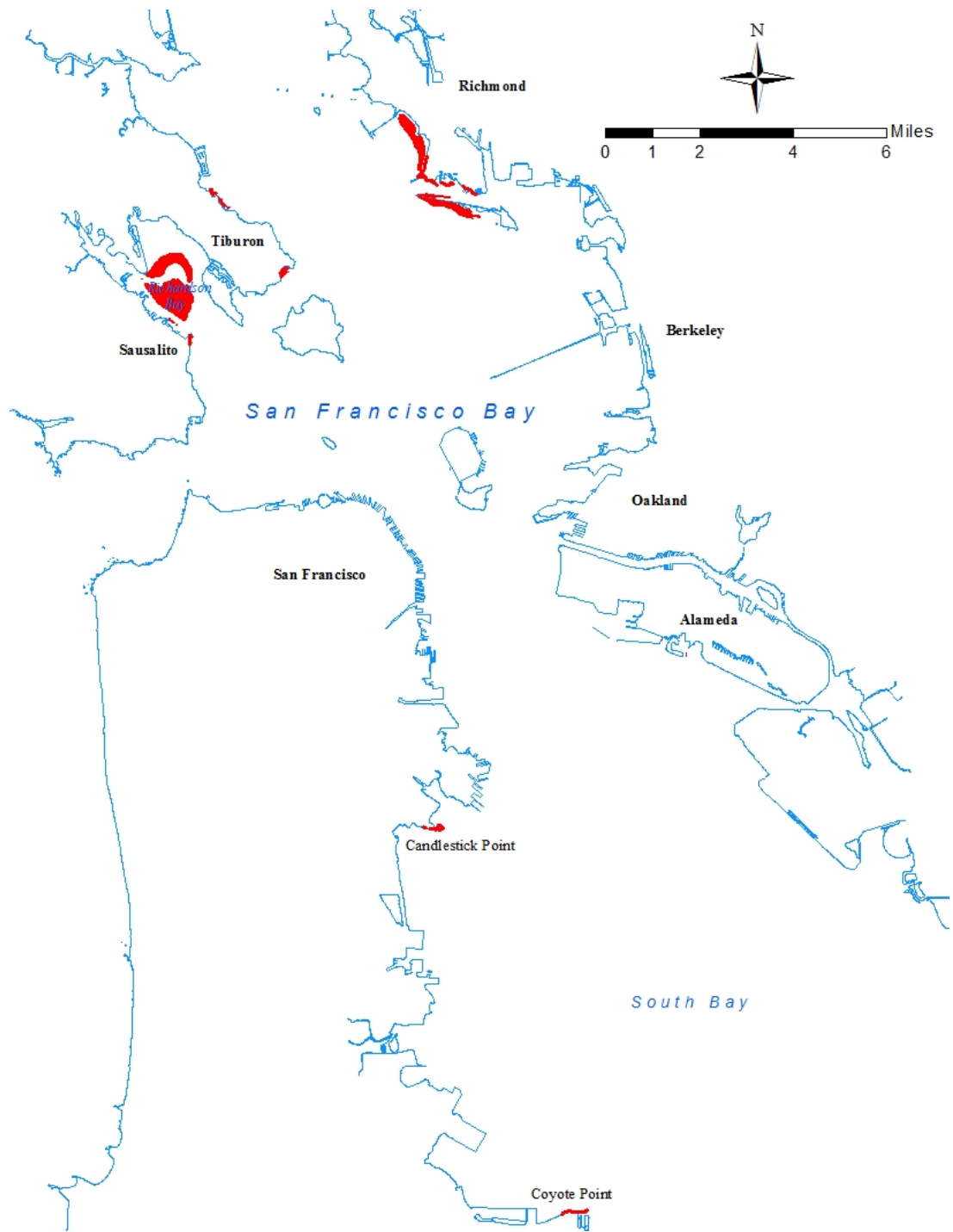


Figure 2. San Francisco Bay Pacific Herring spawn event map for the 2018-19 season.

Age Structure and Biological Characteristics

Pacific Herring are aged each season using otolith surface readings. The proportion and tonnage in the spawning biomass (Figures 3 and 4) of age 4 and 5 Pacific Herring were well below average for the 2018-19 season. However, the proportion and tonnage in age 2 and 3 fish increased markedly from the prior season, which suggests improved survival of young fish from the 2016-17 and 2015-16 cohorts.

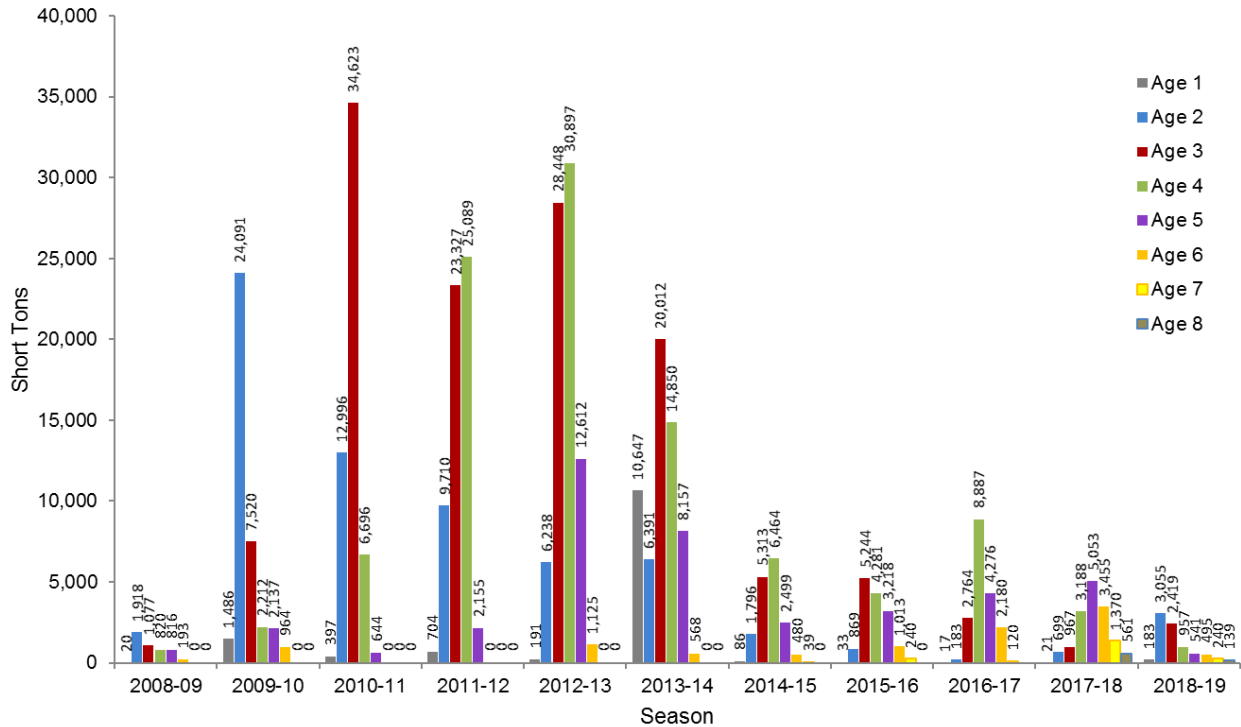


Figure 3. Estimated short tons of San Francisco Bay spawning Pacific Herring biomass by age class for the 2008-09 to 2018-19 seasons based on research catch.

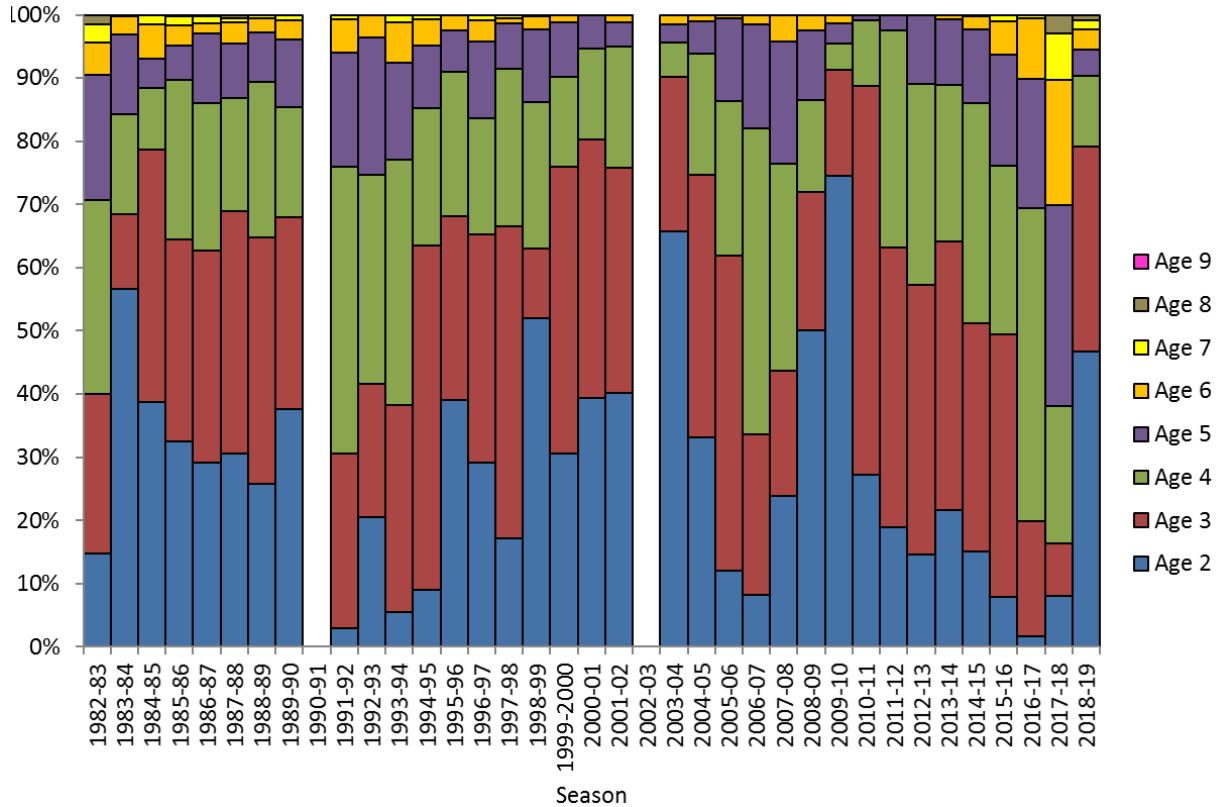


Figure 4. Percent at age, by number, of ripe fish for the San Francisco Bay Pacific Herring spawning biomass. Based on age composition of the research catch (excluding age-1 fish).

The length-weight relationships for Pacific Herring in spawning condition are used to develop a condition factor index (CI), which is derived from a fish's weight divided by the cube of its length and is used to describe the health of a population. Condition indices may be affected by sampling method such as research gill nets which may bias samples towards deeper bodied, higher condition fish. High condition indices have been associated with increased reproductive capacity and fish survival (Schloesser and Fabrizio 2017). The average San Francisco Bay Pacific Herring CI for mature 2018-19 fish was 1.49, down from the record high in 2017-18 (Figure 5), but equal to the long-term average (1.49).

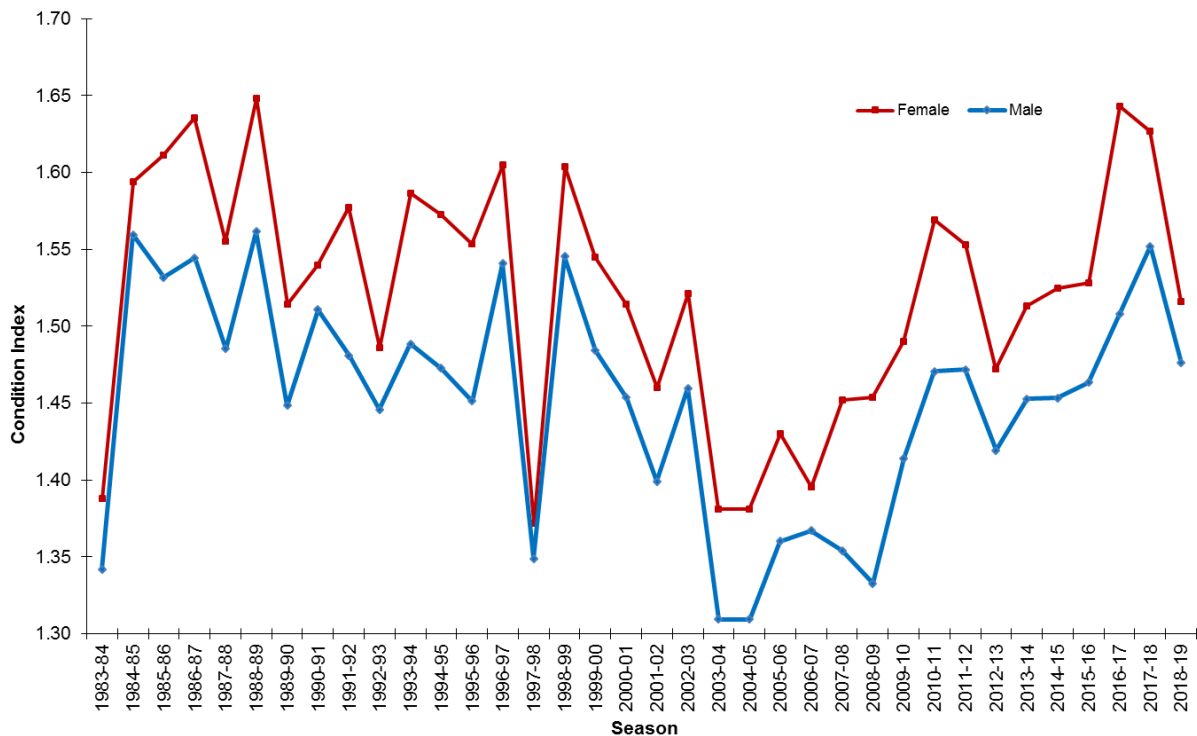


Figure 5. Average Condition Index (CI) and CI for ripe male and female fish based on research catch from the San Francisco Bay Pacific Herring spawning population.

COMMERCIAL GILL NET FISHERY SUMMARY

The Pacific Herring gill net fisheries catch Pacific Herring as they move into shallow areas to spawn. The traditional product from this fishery, *kazunoko*, is the sac roe (eggs) removed from the females, which is processed and exported for sale in Japan. California’s roe fishery began in 1973 and a formal limited-entry permit system was implemented in 1977.

In San Francisco Bay, the fishery is currently separated into Even and Odd fishing groups (platoons) based on permit numbers. Platoons rotate fishing weeks throughout the season and the calendar year in January determines which platoon begins fishing first. However, the upcoming 2019-20 season will mark the final season during which the San Francisco fishery will operate using the platoon system and beginning with the 2020-21 season, and the regulations implementing the California Pacific Herring Fishery Management Plan will be in effect. There were no

landings during the 2018-19 season in San Francisco Bay (Figure 6) or any of the state’s other commercial Pacific Herring fisheries.

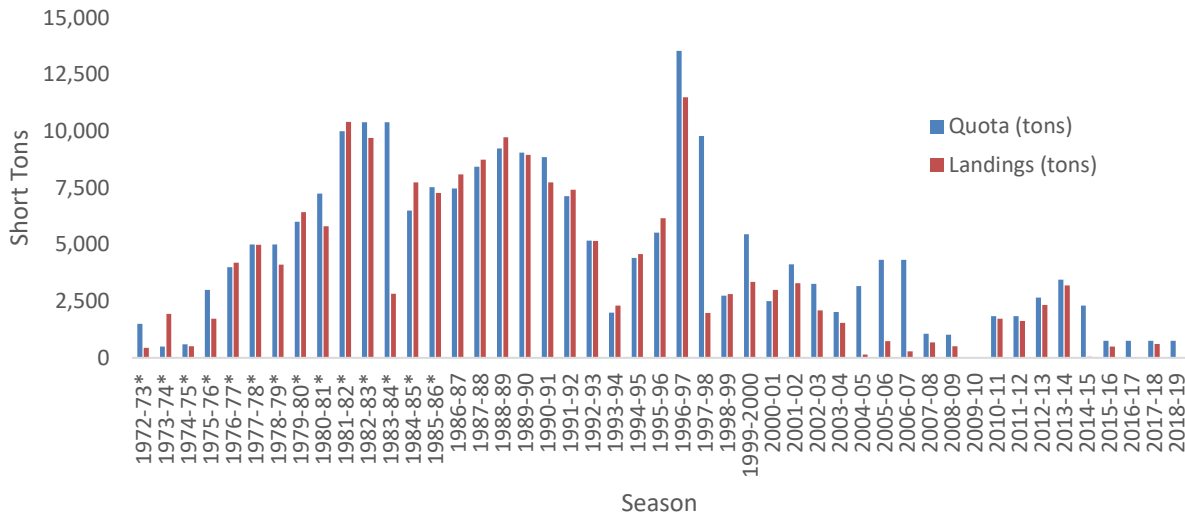


Figure 6. Quotas and landings for the Pacific Herring sac roe fisheries in San Francisco Bay, 1972-73 season through 2018-19 season. * Quotas and landings prior to the 1986-87 season include HEOK and fresh fish allocation and landings.

HERRING EGGS ON KELP (HEOK) FISHERY SUMMARY

The HEOK fishery occurs only in San Francisco Bay. The fishery suspends Giant Kelp, *Macrocystis pyrifera*, from lines on which Pacific Herring spawn. The product of this fishery, *komochi* or *kazunoko kombu*, is the egg-coated kelp blades that are processed and exported to Japan where it is consumed as a delicacy.

The total amount of HEOK that may be harvested is based on the previous season’s SSB estimate in San Francisco Bay and the HEOK fishery is currently allocated a quota equal to approximately one percent of the overall San Francisco Bay quota. In 2018-19, the total quota for the HEOK fishery was 18.7 tons of product (Figure 7), which was converted from 83.4 tons of whole fish from the total San Francisco Bay quota. The HEOK season began December 1, 2018 and ended March 31, 2019. Seven HEOK permits were renewed this season but there was no fishing effort and for the sixth consecutive season no HEOK product was landed.

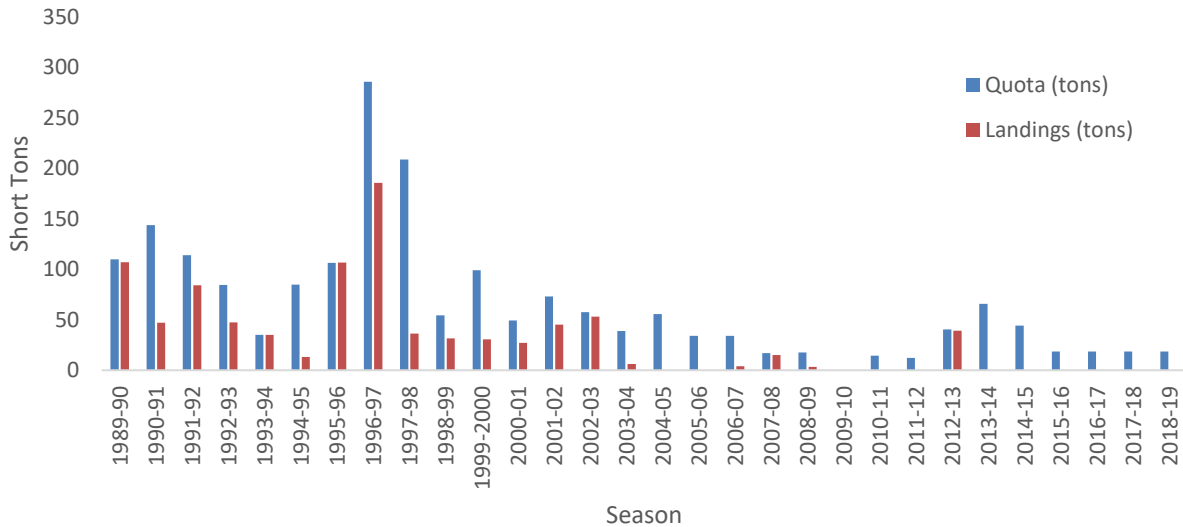


Figure 7. 1989-90 season through 2018-19 season.

CONCLUSION

The San Francisco Bay commercial Pacific Herring fishery saw no commercial fishing effort during the 2018-19 season. This is the first season in the modern fishery with no participation, other than the closed season in 2009-10. This coincided with an SSB estimate well below the long-term average and the fifth year of low overall returns for this fishery. The low SSB estimate recorded during the 2018-19 season likely reflects continued population-level impacts sustained during multiple consecutive years of anomalously high sea-surface temperatures and depressed productivity in the central California Current Ecosystem as well as low freshwater outflow in the San Francisco Estuary between 2011 and 2016. Despite the relatively low spawning biomass observed, the Department considers precautionary target harvest rates as the primary means of assuring a sustainable fishery even in years of unfavorable ecological conditions.

More information on the life history of Pacific Herring, the Department’s management objectives and cohesive strategy to guide the sustainable management of California’s commercial and recreational Pacific Herring fisheries, as required by the Marine Life Management Act, can be found in the California Pacific Herring Fishery Management Plan:

<https://www.wildlife.ca.gov/Fishing/Commercial/Herring/FMP>. The Department is also developing a Pacific Herring Enhanced Status Report to present future data and information collected.

REFERENCES

Schloesser, R. W. and M. C. Fabrizio (2017). Condition Indices as Surrogates of Energy Density and Lipid Content in Juveniles of Three Fish Species. Transactions of the American Fisheries Society.

Sydeman, W. J., M. Garcia-Reyes, A. I. Szoboszlai, S. A. Thompson, and J. A. Thayer (2018). Forecasting herring biomass using environmental and population parameters. Fisheries Research 205: 141-148.