

Summary of the 2013-2014 Pacific Herring Spawning Population and Commercial Fisheries in San Francisco Bay



CDFW photo



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SPAWNING POPULATION SUMMARY

Spawning Biomass Estimate

The spawning biomass estimate for the 2013-14 season is 60,600 tons, which exceeds the historical average (1970-80 season to present) of 52,300 tons. This is the fourth consecutive year of above-average spawning biomass since the 2009-10 season, and the fifth consecutive year of improved spawning biomass estimates since the historic low of 4,800 tons calculated for the 2008-09 season (Figure 1).

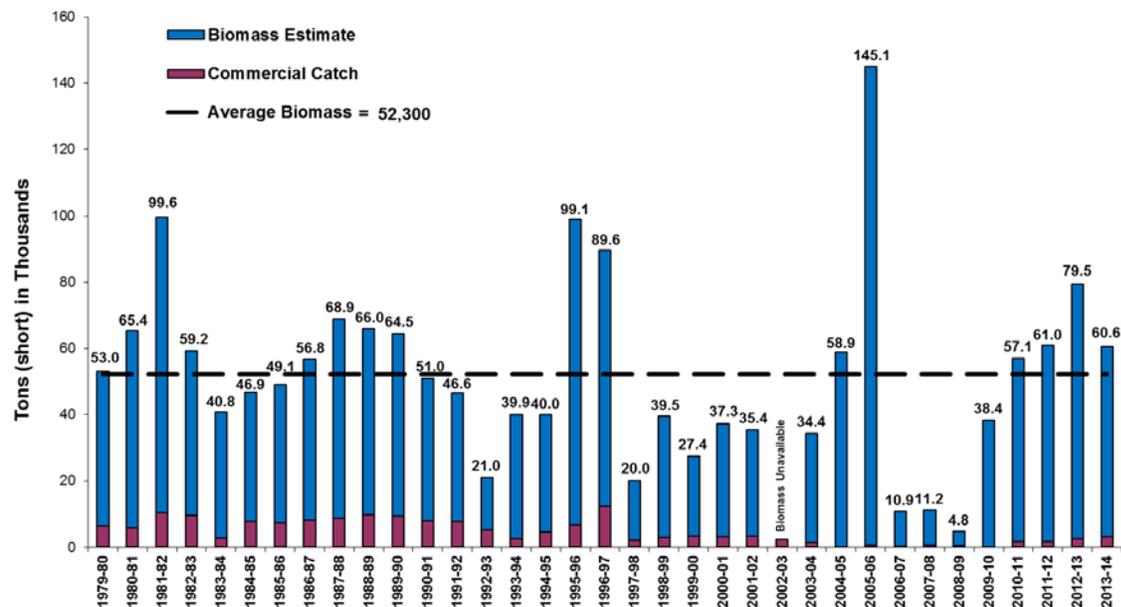


Figure 1. San Francisco Bay Pacific herring biomass estimates and commercial catch.

Thirteen spawning events were recorded during the 2013-14 season, primarily in the northern areas of San Francisco Bay and into San Pablo Bay (Table 1). Spawning events occurred from as far north as Point San Pedro and south to Coyote Point (Figure 2). The first recorded spawn of the season occurred November 22, 2013, and the last recorded spawn occurred on March 4-5, 2014. There were several large spawning events in the Richardson Bay and smaller events to the east along the Marin county shore and at Point Richmond. The spawning biomass for the season was temporally and spatially well distributed. This type of distribution helps prevent over exploitation of a single spawning wave. It should be noted that the spawn at Point San Pedro could be considered outside the normal herring spawning range. Generally, herring do not spawn northeast of the Richmond-San Rafael Bridge. However, given the drought conditions experienced during the winter of 2013-14, herring were likely searching for lowered salinities in other areas of the San Francisco Bay estuary for spawning.

Table 1. San Francisco Bay Pacific herring spawning biomass estimate by event with commercial catch totals, 2013-14.

| # | Approximate Spawn/Catch Date | Location | Submerged Areas | Shore Areas | Spawn Total | Gill-net | HEOK | Biomass Total |
|------------------------------|------------------------------|--------------------------------|-----------------|--------------|---------------|--------------|------|---------------|
| 1 | November 22, 2013 | Richardson Bay | Trace | | Trace | | | Trace |
| 2 | November 29, 2013 | Richardson Bay | 428 | | 428 | | | 428 |
| 3 | December 15-16, 2013 | Richardson Bay | 4,580 | | 4,580 | | | 4,580 |
| 4 | January 2, 2014 | Coyote Point – Burlingame | | 132 | 132 | | | 132 |
| 5 | January 2-7, 2014 | Paradise Cove – Richardson Bay | 5,335 | 1,027 | 6,362 | 847.7 | | 7,209 |
| 6 | January 9-10, 2014 | Point San Quentin | 1,055 | | 1,055 | 540.8 | | 1,596 |
| 7 | January 12-13, 2014 | Bay Farm Island | | Trace | Trace | 0.5 | | 0.5 |
| 8 | January 22-23, 2014 | China Camp – San Pablo Bay | 2,916 | | 2,916 | 57.2 | | 2,973 |
| 9 | January 30-31, 2014 | Paradise Cove | | 15 | 15 | 652.0 | | 667 |
| 10 | January 30-31, 2014 | Richardson Bay | 24,044 | | 24,044 | 191.7 | | 24,236 |
| 11 | February 3-6, 2014 | Point Richmond | 5,153 | 25 | 5,178 | 906.0 | | 6,084 |
| 12 | February 20-23, 2014 | Richardson Bay | 11,443 | | 11,433 | 2.2 | | 11,445 |
| 13 | March 4-5, 2014 | Richardson Bay | 1,276 | | 1,276 | | | 1,276 |
| Spawn Events (n) = 13 | | Totals in short tons | 56,229 | 1,199 | 57,428 | 3,198 | | 60,626 |

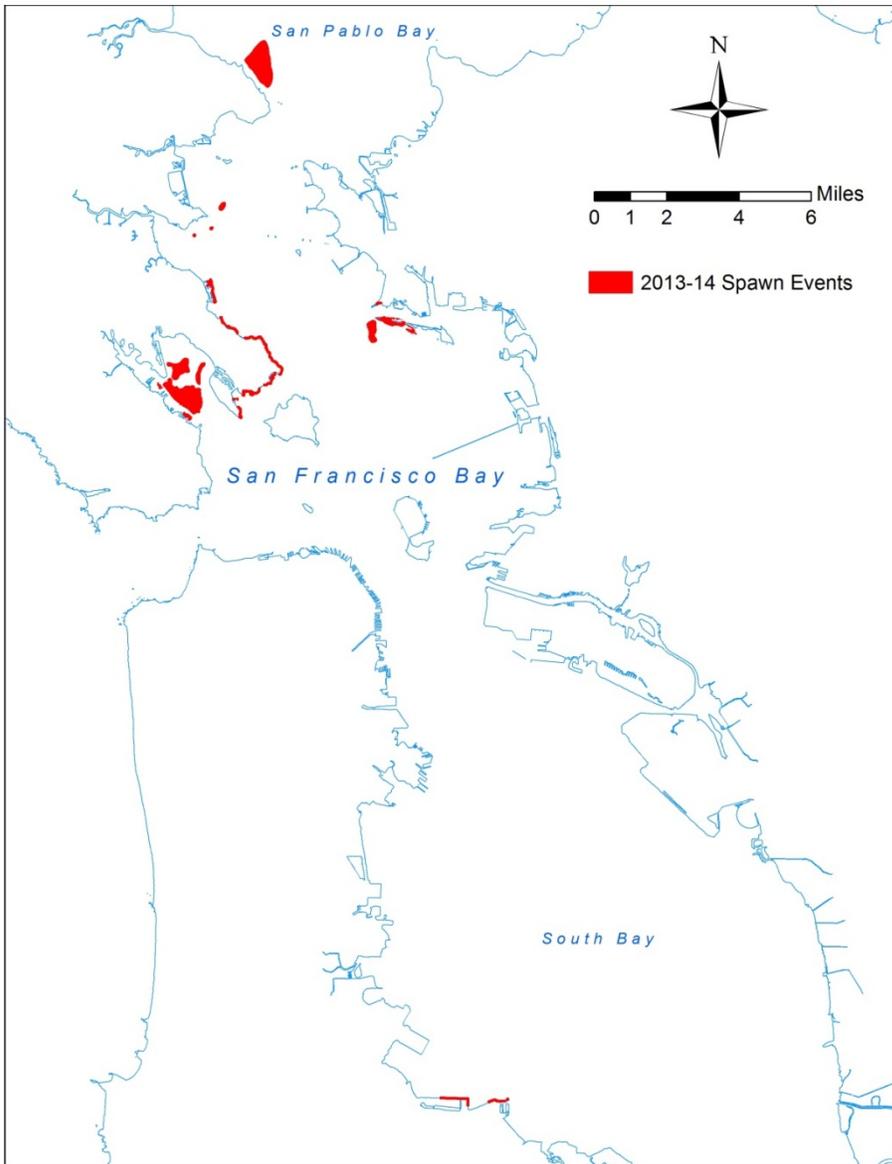


Figure 2. San Francisco Bay herring spawn event map 2013-14 season.

Age composition for the 2013-14 season, based on length frequency age estimates, shows a balanced age class structure with no age cohort dominating the population (Figures 3 and 4). However, the proportion of age six and older herring was below average. This remains a concern for fishery management because these older fish formerly supported the commercial fishery (Figure 5). Reduced numbers of these older age classes places additional burden on younger cohorts to support the San Francisco Bay fishery and to fulfill herring's role as forage. Conversely, the proportion of age one herring in the spawning biomass was above average.

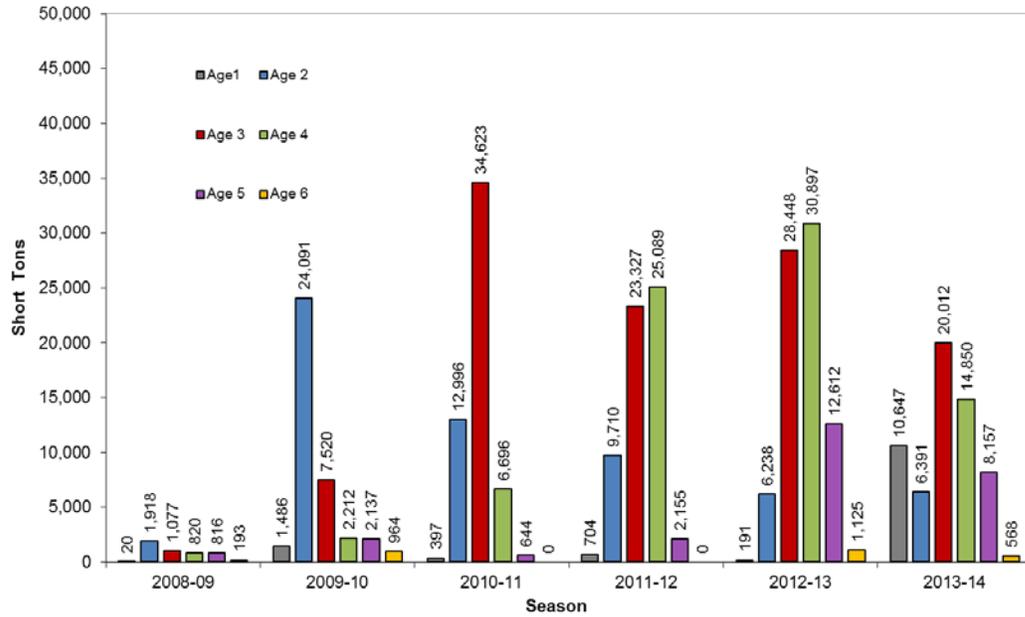


Figure 3. San Francisco Bay spawning biomass by age class for the 2008-09 to 2013-14 seasons.

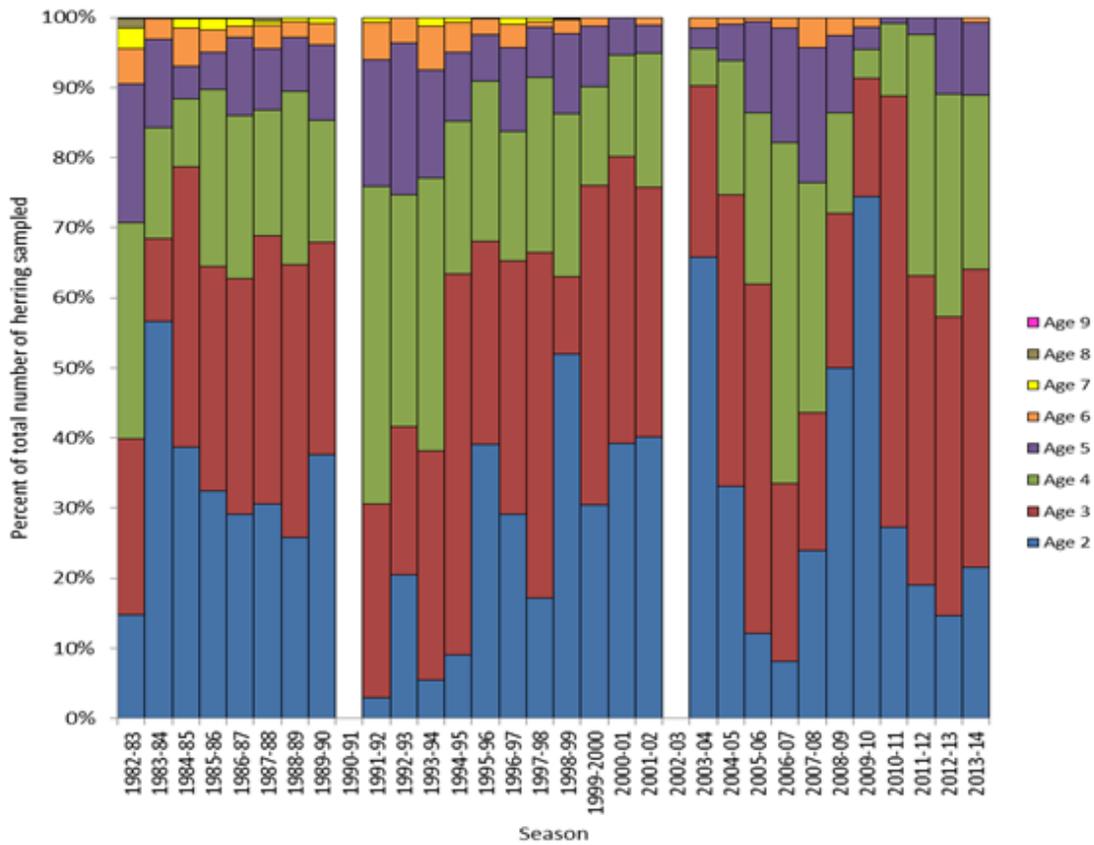


Figure 4. Age composition of the research catch (excluding age-1 fish). Percent by number of ripe fish for the San Francisco Bay herring spawning biomass.

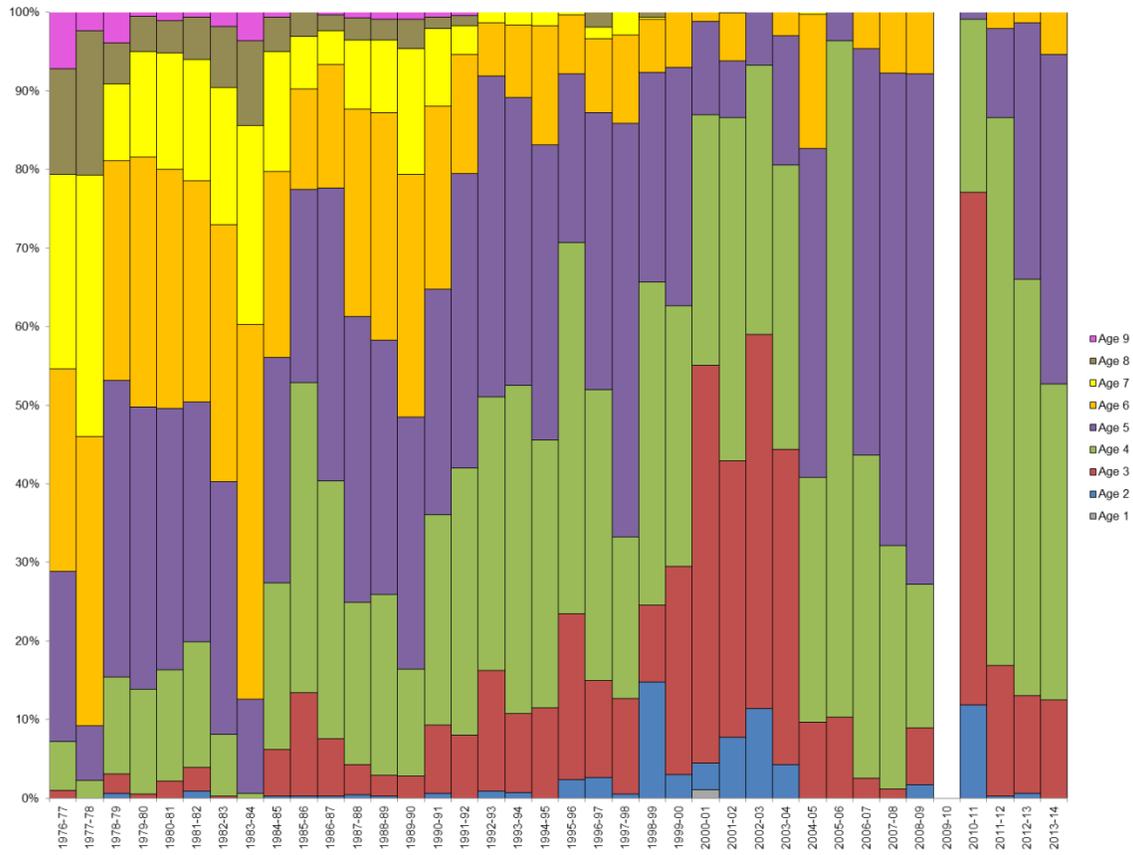


Figure 5. Age composition of the commercial gill net catch. Percent by number of fish for the San Francisco Bay herring fishery. The fishery was closed during the 2009-10 season.

Age 1 fish made up a substantial portion of the spawning biomass (Figure 3). Age 4- and 5-year old herring also continued to persist in the population. The high numbers of returning 4- and 5-year old herring, as well as improved physical condition, is likely due to more favorable biological and environmental conditions in oceanic ecosystems.

The length-weight relationships for 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 used to describe the health of a population. The San Francisco Bay herring CI for mature 2013-14 fish was near average and showed an increase relative to the 2012-13 season (Figure 6).

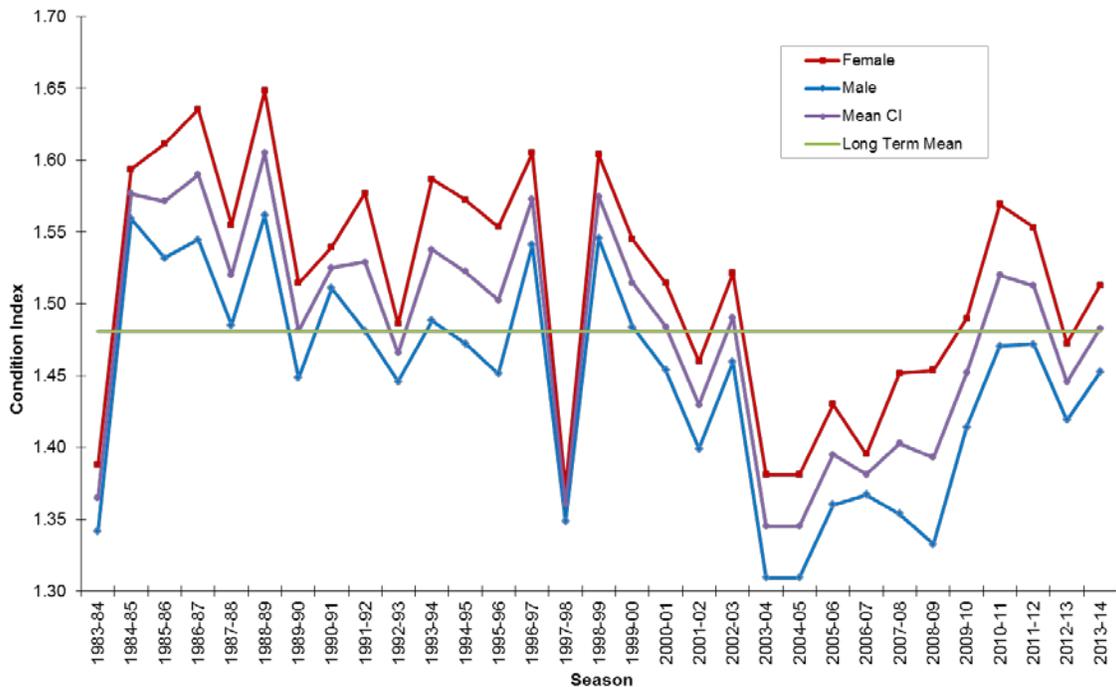


Figure 6. Average Condition Index (CI) and CI for ripe male and female fish in the research catch from the San Francisco Bay herring spawning population.

In summary, the spawning biomass estimate for the 2013-14 season was 60,600 tons, 8,300 tons above the historical average (1979-80 season to present) of 52,300 tons. Following the record low spawning estimate of the 2008-09 season, the San Francisco Bay spawning population has shown strong signs of recovery over the last five years. The recovery began during the 2009-10 season with an estimate of 38,400 tons, followed by increases to 57,000 tons, 61,000 tons, and 79,500 tons. Age composition analysis indicated the continued above average spawning biomass was due to unusually high recruitment of 1-year old herring to the spawning population and the continued presence of high numbers of 4- and 5-years olds. Continued monitoring of both the herring population and commercial catch will ensure that the Department’s management goals are achieved and younger fish are not harvested at unsustainable levels. It is the Department’s longstanding management objective to reduce the harvest of 2- and 3-year old herring, many of which are first-time spawners. Based on age composition analysis, this objective was achieved during the 2013-14 commercial season (Figure 5). The population is safeguarded by the low exploitation rates that have resulted from the Department’s recommended harvest percentages of less than 5 percent. These low harvest levels allow the herring population to continue to recover and help safeguard herring’s importance as a forage species.

See Appendix for additional historical roe counts and body lengths.

COMMERICAL FISHERY SUMMARY

Quotas

The total fishery quota for San Francisco Bay was set at 3,737 short tons (tons) for the 2013-14 season. This was an 883 ton increase from the 2012-13 season quota of 2,854 tons and equaled 4.7 percent of the 2011-12 season spawning biomass estimate of 79,500 tons.

Gill Net Fishery

The quota for the gill net fishery was 3,442 tons (Tables 2 and 3) and was divided between the Odd and Even platoons based on the number of permits in each platoon, with the Odd receiving 1,703 tons and the Even receiving 1,739 tons. The DH fishery continued to be integrated into the Odd and Even platoons this season.

Fresh Fish Market Fishery

The fresh fish market fishery for San Francisco Bay was folded into the gill net fishery. Fish landed could be sold as either roe herring or fresh fish. No fresh fish permits were required.

Herring Eggs on Kelp Fishery

The total quota for the herring eggs on kelp fishery (HEOK) was 66 tons of product, which was converted from 295 tons of whole fish based on the total San Francisco Bay quota. All HEOK permittees must hold a herring permit (i.e. a regular gill net or a CH gill net). Each permittee's share of the herring quota (from the sac roe fishery) is then transferred to the HEOK fishery.

SEASON DATES

Gill Net Fishery

The gill net fishery opened at 5:00 p.m. on Wednesday, January 1, 2014, and closed at noon on Friday, March 14, 2014. Since 1974, the gill net fisheries have been closed each week from noon on Friday until 5:00 p.m. on Sunday. The weekend closures reduce conflict with recreational use of the bay and provide additional conservation safeguards, allowing herring to spawn without pressure from the commercial fleet. Both platoons ceased fishing prior to their scheduled closing dates. The Odd reached its quota on Thursday, February 6, 2014. The Even platoon was closed on Thursday, January 30, but had 240 tons remaining in its quota so it was reopened on February 6, after the Odd platoon was closed for the season. The Even platoon ceased fishing prior to reaching its quota when the last herring buyer shut down operations for the season on February 26, 2014.

Herring Eggs on Kelp Fishery

The HEOK season began December 1, 2013, and ended March 31, 2014. The opening and closing dates for the HEOK fishery are not adjusted for holidays or weekends. Herring eggs on kelp may be harvested on Saturdays and Sundays at any time if the permittee reimburses the Department for the cost of operations.

LANDINGS

Approximately 93 percent (3,198 tons) of the San Francisco Bay gill net quota was landed by the combined platoons during the 2013-14 commercial herring season (Tables 2 and 3). The Odd platoon landed 1,694 tons, which was 99% of their allocation (1,703 tons) and the Even platoon landed 1,504 tons, equal to 86% of their allocation. The HEOK fishery made no landings during the season.

Table 2. Herring quotas, landings, roe and fish counts for San Francisco Bay, 2013-2014 season.

| FISHERY | QUOTA (tons) | LANDINGS (tons) | OVER QUOTA (+) UNDER QUOTA (-) | ROE COUNT |
|--------------------------|----------------------------------|------------------------------------|-----------------------------------|--------------|
| Odd gill net | 1,703 | 1,694 | - 9 tons | 13.4 |
| Even gill net | 1,739 | 1,504 | - 235 tons | 13.3 |
| TOTAL GILL NET | 3,442 | 3,198 | - 244 tons | 13.4* |
| HEOK (2 of 10 active) | 295 whole fish = 66 tons product | 0 tons whole fish = 0 tons product | - 295 ton | |
| SF BAY TOTAL | 3,737 | 3,198 | - 543 tons | |

* Roe counts are averages of information provided on receipts; therefore they may not equal the sum of platoon averages.

Table 3. Quotas and landings for the herring gill net fisheries* in San Francisco Bay, 1972-73 season through 2013-14 season.

| Season | Quota (tons) | Landings (tons) | Season | Quota (tons) | Landings (tons) |
|----------|--------------|-----------------|-----------|--------------|-----------------|
| 1972-73* | 1,500 | 436 | 1994-95 | 4,408 | 4,574 |
| 1973-74* | 500 | 1,938 | 1995-96 | 5,524 | 6,165 |
| 1974-75* | 600 | 514 | 1996-97 | 13,543 | 11,496 |
| 1975-76* | 3,000 | 1,719 | 1997-98 | 9,793 | 1,981 |
| 1976-77* | 4,000 | 4,201 | 1998-99 | 2,739 | 2,817 |
| 1977-78* | 5,000 | 4,987 | 1999-2000 | 5,460 | 3,356 |
| 1978-79* | 5,000 | 4,115 | 2000-01 | 2,499 | 2,991 |
| 1979-80* | 6,000 | 6,430 | 2001-02 | 4,128 | 3,287 |
| 1980-81* | 7,250 | 5,811 | 2002-03 | 3,262 | 2,097 |
| 1981-82* | 10,000 | 10,415 | 2003-04 | 2,020 | 1,540 |
| 1982-83* | 10,399 | 9,699 | 2004-05 | 3,169 | 145 |
| 1983-84* | 10,399 | 2,828 | 2005-06 | 4,328 | 744 |
| 1984-85* | 6,500 | 7,740 | 2006-07 | 4,328 | 292 |
| 1985-86* | 7,530 | 7,278 | 2007-08 | 1,057 | 687 |
| 1986-87 | 7,470 | 8,098 | 2008-09 | 1,019 | 507 |
| 1987-88 | 8,432 | 8,741 | 2009-10 | 0 | 0 |
| 1988-89 | 9,238 | 9,736 | 2010-11 | 1,845 | 1,727 |
| 1989-90 | 9,057 | 8,962 | 2011-12 | 1,845 | 1,634 |
| 1990-91 | 8,858 | 7,741 | 2012-13 | 2,655 | 2,332 |
| 1991-92 | 7,134 | 7,417 | 2013-14 | 3,442 | 3,198 |
| 1992-93 | 5,175 | 5,151 | Average : | 5,050 | 4,234 |
| 1993-94 | 1,996 | 2,302 | | | |

* Quotas and landings prior to the 1985-86 season include HEOK and fresh fish allocation and landings.

REVIEW OF EACH FISHERY

Even and Odd Gill Net Platoons

The gill net fishery is divided into two separate platoons grouped by permit numbers that are either even or odd. Platoons alternate fishing weeks with the first platoon to fish being determined by whether January falls on an odd or even year; thus the Even platoon was designated to fish first for the 2013-14 season.

Even Platoon Summary

The Even platoon consisted of 35 boats during the 2013-14 season. The Even platoon fishery opened on Wednesday, January 1, 2014, at 5:00 p.m. and made landings every other week from the second through sixth weeks of the season (Table 4). This platoon opened again at 4:00 p.m., Thursday, February 7, after the Odd platoon quota was reached. Although the Even quota was not reached, the fleet ceased fishing on Wednesday, February 26. The average roe count for all Even platoon landings equaled 13.3 percent.

*Table 4. Daily landings for the **Even** gill net platoon.*

| Date | Pounds | Tons | # Receipts | Tons/Receipt | Roe Count |
|---------------------|-------------|----------|------------|--------------|-----------|
| 1/02/2014 | 622,286 | 311.14 | 34 | 9.15 | 11.8 |
| 1/03/2014 | 1,073,053.5 | 536.53 | 58 | 9.25 | 11.3 |
| 1/14/2014 | 1,062 | 0.53 | 2 | 0.27 | 12.5 |
| 1/27/2014 | 680 | 0.34 | 2 | 0.17 | 11.5 |
| 1/28/2014 | 11,941 | 5.97 | 4 | 1.49 | 13.4 |
| 1/29/2014 | 10,717 | 5.36 | 11 | 0.49 | 15.0 |
| 1/30/2014 | 1,280,534 | 640.27 | 99 | 6.47 | 14.6 |
| 2/07/2014 | 2,684 | 1.34 | 2 | 0.67 | 15.0 |
| 2/18/2014 | 4,288 | 2.14 | 6 | 0.36 | 16.9 |
| 2/19/2014 | 200 | 0.10 | 2 | 0.05 | 10.0 |
| Totals and averages | 3,007,446 | 1,503.72 | 220 | 6.84* | 13.3* |

* Tons per receipt and roe count are averages of all receipts; therefore they may not equal the sum of daily averages.

Odd Platoon Summary

The Odd platoon consisted of 35 boats during the 2013-14 season. The Odd platoon fishery opened on Sunday, January 6, 2014, at 5:00 p.m. and made landings during the second, fourth and fifth fishing weeks of January and the first week of February (Table 5). This platoon was closed Thursday, February 6, at noon. Average roe percentage for Odd platoon landings equaled 13.4 percent.

Table 5. Daily landings for the **Odd** gill net platoon.

| Date | Pounds | Tons | # Receipts | Tons/Receipt | Roe Count |
|---------------------|-----------|----------|------------|--------------|-----------|
| 1/06/2014 | 241,108 | 120.55 | 52 | 2.32 | 11.4 |
| 1/07/2014 | 88,273 | 44.14 | 21 | 2.10 | 12.8 |
| 1/08/2014 | 76,118 | 38.06 | 16 | 2.38 | 14.3 |
| 1/09/2014 | 253,514 | 126.77 | 41 | 3.09 | 14.0 |
| 1/10/2014 | 422,483 | 211.24 | 49 | 4.31 | 10.8 |
| 1/20/2014 | 9,405 | 4.70 | 8 | 0.59 | 12.6 |
| 1/21/2014 | 48,657 | 24.33 | 20 | 1.22 | 12.3 |
| 1/22/2014 | 56,284 | 28.14 | 30 | 0.94 | 12.6 |
| 1/31/2014 | 383,438 | 191.72 | 49 | 3.91 | 14.5 |
| 2/03/2014 | 622,991 | 311.50 | 51 | 6.11 | 13.7 |
| 2/04/2014 | 547,964 | 273.98 | 67 | 4.09 | 14.4 |
| 2/05/2014 | 260,411 | 130.21 | 33 | 3.95 | 15.0 |
| 2/06/2014 | 378,033 | 189.02 | 53 | 3.57 | 15.0 |
| Totals and averages | 3,388,679 | 1,694.36 | 490 | 3.46* | 13.4* |

* Tons per receipt and roe count are averages of all receipts; therefore they may not equal the sum of daily averages.

Herring Eggs on Kelp Fishery

The HEOK fishery consisted of 10 permits during the 2013-14 season. Each season, the fishery opens on December 1, and closes on March 31, the following year. The HEOK fishery did not land any product during the 2013-14 season (Table 6).

Table 6. Quotas and landings of product for the **HEOK** fishery in San Francisco Bay, 1989-90 season through 2013-14 season.

| Season | Quota (tons) | Landings (tons) |
|-----------|--------------|-----------------|
| 1989-90 | 110.0 | 107.1 |
| 1990-91 | 144.0 | 47.0 |
| 1991-92 | 114.0 | 84.2 |
| 1992-93 | 84.5 | 47.4 |
| 1993-94 | 35.1 | 35.0 |
| 1994-95 | 85.0 | 13.1 |
| 1995-96 | 106.5 | 106.8 |
| 1996-97 | 286.0 | 185.7 |
| 1997-98 | 209.0 | 36.4 |
| 1998-99 | 54.4 | 31.7 |
| 1999-2000 | 99.2 | 30.5 |
| 2000-01 | 49.3 | 27.2 |
| 2001-02 | 73.2 | 45.3 |
| 2002-03 | 57.6 | 53.3 |
| 2003-04 | 38.9 | 6.3 |
| 2004-05 | 55.7 | 0 |
| 2005-06 | 34.0 | 0 |
| 2006-07 | 34.0 | 3.9 |
| 2007-08 | 17.0 | 15.1 |
| 2008-09 | 17.6 | 3.3 |
| 2009-10 | 0 | Fishery closed |
| 2010-11 | 14.3 | 0 |
| 2011-12 | 12.3 | 0 |
| 2012-13 | 40.5 | 39.3 |
| 2013-14 | 66 | 0 |
| Average | 73.5 | 38.3 |

Special Education Permits

No Special Education Permits were issued for the 2013-14 season.

APPENDIX

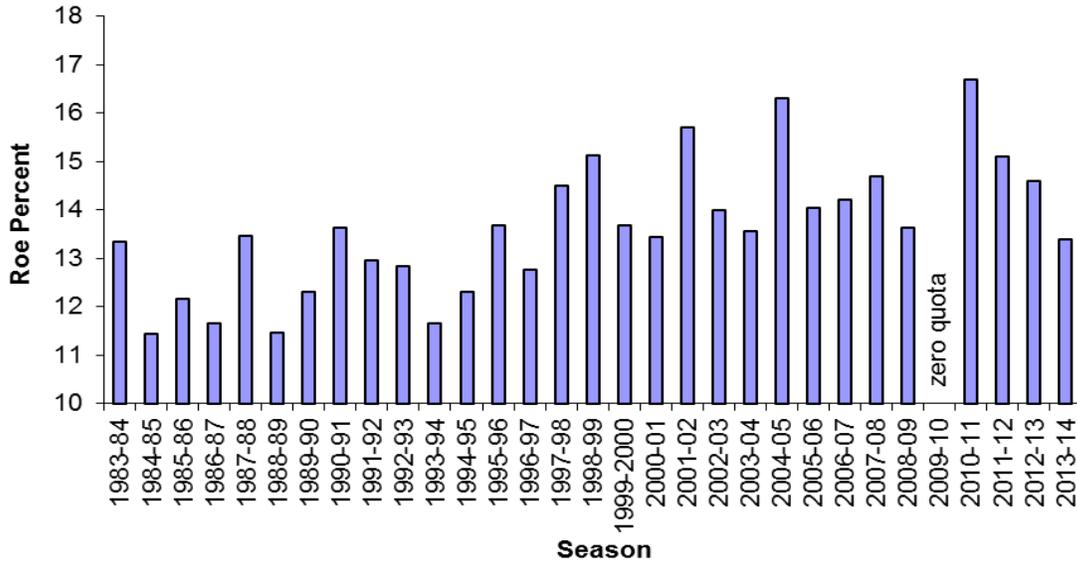


Figure A1. Average roe count in the San Francisco Bay gill net fisheries from 1983-84 through 2013-14 seasons.

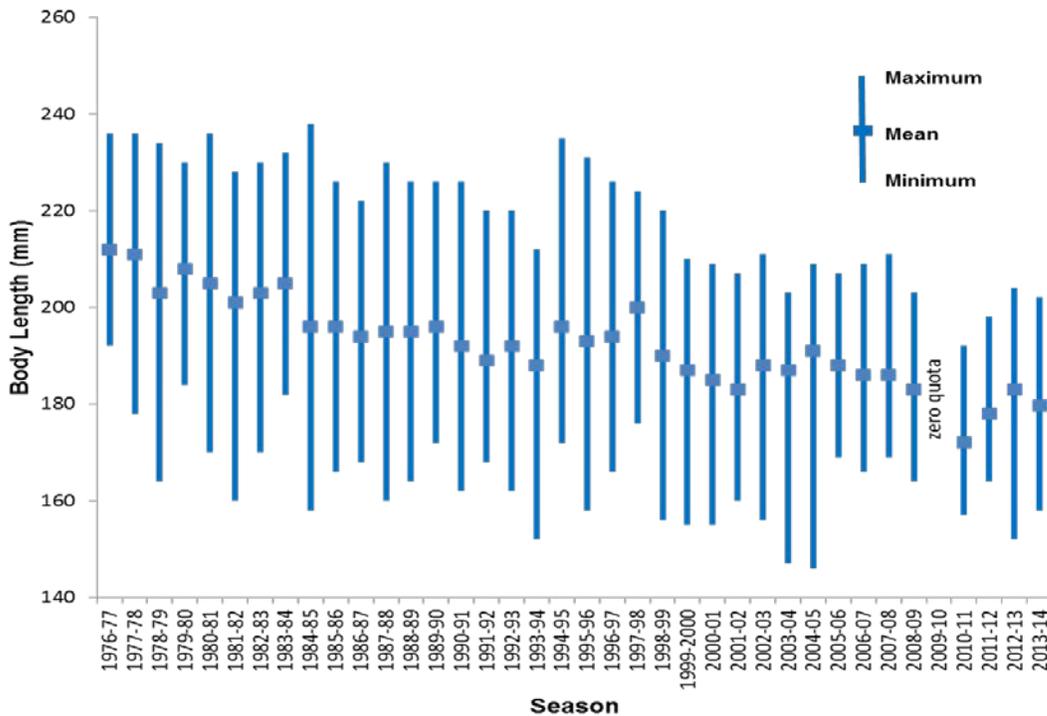


Figure A2. San Francisco Bay herring commercial gill net fishery minimum, mean and maximum body length from 1976-77 through 2013-14 seasons