■ Interagency Ecological Program for the San Francisco Estuary ■

IEP NEWSLETTER

VOLUME 17, NUMBER 2, SPRING 2004

■

Other Activities

In addition to our IEP sampling obligations, a number of other projects were conducted during the sampling period. In December, we released approximately 218,000 late-fall Chinook salmon (obtained from Coleman National Fish Hatchery) as part of the Delta Action 8 experiments. Also in December, we assisted the US Geological Survey with acoustic monitoring near Georgiana Slough. Throughout the sampling period, we continued to assess fish distribution and abundance at Liberty Island as part of an ongoing California Bay-Delta Authority project.

Summer Townet Survey and Fall Midwater Trawl Survey Status and Trends

Marade Bryant and Kelly Souza (DFG), mbryant@delta.dfg.ca.gov

Young striped bass (*Morone saxatilis*) are indexed twice in their first year of life, first by the Summer Townet Survey (TNS) and later by the Fall Midwater Trawl Survey (FMWT). The 2 indices can be compared to each other and are used to evaluate age-0 population trends. The TNS is conducted annually to obtain an index of abundance for age-0 striped bass (the 38.1-mm Index) soon after their larval stage and to determine their distribution within the upper estuary. The FMWT, also conducted annually, evaluates abundance and distribution of age-0 striped bass several months after the 38.1-mm Index is determined. Each survey calculates an abundance index for delta smelt (*Hypomesus transpacificus*). The FMWT also calculates indices for longfin smelt (*Spirinchus thaleichthys*), American shad (*Alosa sapidissima*), and splittail (*Pogonichthys macrolepidotus*).

The TNS has been conducted since 1959, with the exception of 1966 when no boat was available for sampling. Exceptionally wet weather and a protracted spawning period resulted in no index for 1983 and an approximated index for 1995. An index was not set in 2002 due to record low catches, consistently small fish throughout the season, and boat breakdowns which left the survey incomplete. The FMWT survey has been running since 1967, with no sampling occurring in 1974 and 1979. The abundance indices have been used to follow age-0 striped bass population trends and to assess the effects of water management on striped bass recruitment.

The TNS begins in June and samples 32 sites from eastern San Pablo Bay to Rio Vista on the Sacramento River and to Stockton on the San Joaquin River. All sites are sampled during a five-day period. The survey is repeated at two-week intervals until the mean length of striped bass caught exceeds 38.1-mm. Sampling at each site consists of up to three 10-minute, stepped, oblique tows with a ski-mounted net. Each survey index is calculated by summing the catch at each station and multiplying by a weighting factor representing the amount of water (in acre-feet) at that station. The weighted catches are then summed and divided by 1,000, resulting in the survey index (Chadwick 1964). For the annual striped bass TNS index, the two surveys that bracket the period of time when striped bass reach a mean size of 38.1-mm fork length are log-transformed and the index is interpolated between the two surveys (Chadwick 1964; Turner and Chadwick 1972). The TNS delta smelt index is calculated by averaging the first two survey indices.

The FMWT survey samples 116 stations from San Pablo Bay east to Stockton on the San Joaquin River and to Hood on the Sacramento River. The index calculation (the same for all species) uses catch data from 100 of the 116 stations sampled monthly from September to December. The remaining 16 stations are used to increase the spatial coverage to track distribution of delta smelt. These stations are grouped into 14 areas. The mean monthly catch for each area is multiplied by a weighting factor representing the volume of water in that area. This value is summed for all areas to obtain a monthly index. The sum of the four monthly indices constitutes the annual FMWT abundance index.

The 2003 TNS completed six surveys from June 9 to August 22, 2003. The striped bass 38.1-mm Index was set on July 28, 2003, at 1.5 based on results from surveys 4 and 5 (Table 1). This is the second lowest index in the 45-year history of the survey (Figure 1). The lowest index was set in 1998 at 1.4 and the index has not been above 10 since 1994. These low indices show a severe decline from the historical indices, which peaked at 117 in 1965 (Figure 1). The FMWT striped bass index was 108, a slight increase (34%) from last year's index of 71; however, these indices were still the two lowest on record.

Table 1 Mean length, sample size, and survey indices for striped bass and delta smelt from townet surveys 1-6, 2003.

	Survey 1	*Survey 2*	*Survey 3*	*Survey 4*	*Survey 5*	*Survey 6*
Striped Bass						
Mean length (mm FL)	14.8	16.8	25.9	34.7	44.8	58.3
N	919	542	150	77	67	15
Survey index	16.3	14.3	3.4	1.5	1.5	0.3
Delta Smelt						
Mean length (mm FL)	29	33	41	40	47	47
N	40	47	91	53	55	52
Survey index	1.5	1.6	3.9	2.1	1.9	2.1

Few to no young striped bass were caught in the southern or eastern Delta during the TNS in 2003. The percentage of striped bass caught in Suisun Bay increased as the summer went on, while the percentages caught in Montezuma Slough and the San Joaquin River fluctuated throughout the summer (Table 2). This pattern was mimicked in the FMWT survey. Age-0 striped bass were detected in the eastern and southern Delta only in September. Suisun Bay and the Carquinez Strait area accounted for the largest percentage of the index in every month of the 2003 survey.

The 2003 delta smelt index was 1.6, the lowest since 1988 (Figure 2). This index is nearly a three-fold decrease from last year's index of 4.7. The total catch of delta smelt by survey increased after the index was set (Table 1). The overall trend in delta smelt indices from the TNS has been down over the last four years. The 2003 FMWT delta smelt index was 210, which is an increase from 2002 (139); however, the overall trend has been downward since 1999 and there are only 7 other years in which the delta smelt index was lower than 2003.

No delta smelt were caught in the southern or eastern Delta during the TNS. The majority of delta smelt were caught in Suisun Bay and the Sacramento River (Table 2). Few were caught in Montezuma Slough. The proportion of delta smelt caught in the Sacramento River decreased with each survey until survey six, when it jumped to 50%. These smelt likely shifted their distribution from Suisun Bay (Table 1). This shift in distribution of delta smelt continued after the TNS period, as evidenced by most delta smelt caught in the September FMWT survey coming from the Sacramento River; this distribution was maintained throughout the duration of the FMWT survey. The percentage of the FMWT delta smelt index from the lower Sacramento River never fell below 81% and very few smelt were collected within the southern or eastern Delta.

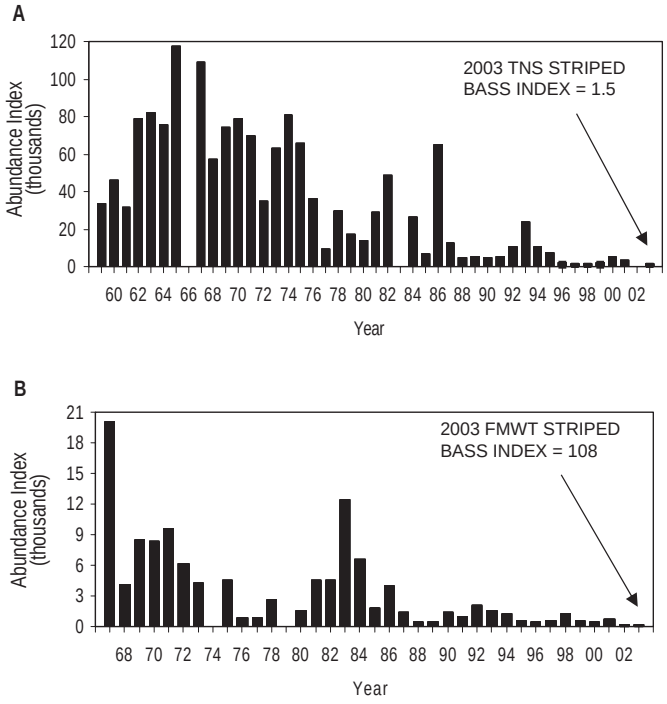

Figure 1 Age-0 striped bass abundance indices for (A) Summer Townet Survey, 1959-2003 (no sampling occurred in 1966, the index was invalid in 1983 due to high flows, and no index was calculated in 2002); and (B) Fall Midwater Trawl Survey, 1967-2003 (no sampling occurred in 1974 and 1979).

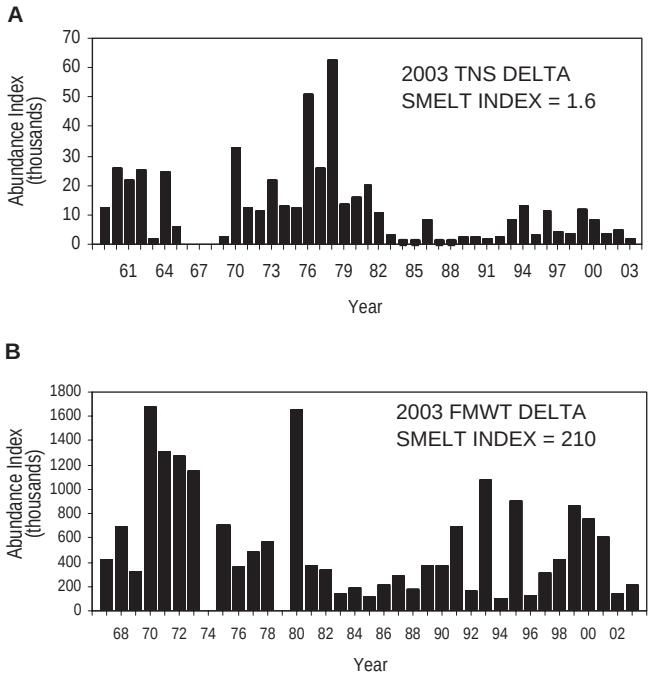

Figure 2 Delta smelt abundance indices for (A) Summer Townet Survey, 1959-2003 (no sampling occurred in 1966, and delta smelt were not enumerated in 1967-68); and (B) Fall Midwater Trawl Survey, 1967-2002 (no sampling occurred in 1974 and 1979).

The 2003 FMWT longfin smelt index was 191, a significant decrease from last year's index of 707 (Figure 3). There were only two other years in which the index was lower (1991 and 1992) and these coincided with the end of a protracted drought period. Longfin smelt distribution was centered within Suisun Bay in every month except December, when distribution shifted into the lower Sacramento River.

After a steady increase in annual abundance from the mid-1990s through 2001, threadfin shad abundance in 2003 was low for the second year in a row (Figure 4). Threadfin shad were captured entirely within the Delta.

The 2003 FMWT splittail indices were 6 (age-0), 3 (age 2+), and 9 (all ages combined.) No age-1 splittail were collected this year. Of the 12 fish that comprise the indices, 7 were collected in Montezuma Slough and the remainder in Grizzly Bay.

The majority of the annual indices of relative abundance calculated from these two long-term monitoring projects are decreasing, and many are at all-time lows (for example, TNS delta smelt, FMWT longfin smelt, and age-0 striped bass). With the exception of American shad abundance (Figure 5), which has been steadily increasing beyond historic levels, it is difficult to find any upward shift in fish abundance. The TNS and FMWT programs will continue to monitor whether or not these trends persist.

Table 2 Percentages of survey index by area for striped bass and delta smelt for townet surveys 1-6, 2003.

Species and Area	*Survey 1*	*Survey 2*	*Survey 3*	*Survey 4*	*Survey 5*	*Survey 6*
Striped Bass						
Montezuma Slough	62.0	12.0	30.0	46.0	27.0	23.0
Suisun Bay	14.9	21.0	32.0	33.0	45.0	52.0
Sacramento River	20.1	49.0	11.0	19.0	7.0	25.0
San Joaquin River	2.2	17.0	24.0	0.0	21.0	0.0
East Delta	0.5	1.0	3.0	1.0	0.0	0.0
South Delta	0.3	0.0	0.0	1.0	0.0	0.0
Delta Smelt						
Montezuma Slough	1.8	6.7	0.1	0.0	0.4	0.2
Suisun Bay	28.0	38.7	58.2	62.4	85.9	49.3
Sacramento River	58.3	44.7	38.3	37.6	13.7	50.5
San Joaquin River	11.9	9.9	3.4	0.0	0.0	0.0
East Delta	0.0	0.0	0.0	0.0	0.0	0.0
South Delta	0.0	0.0	0.0	0.0	0.0	0.0

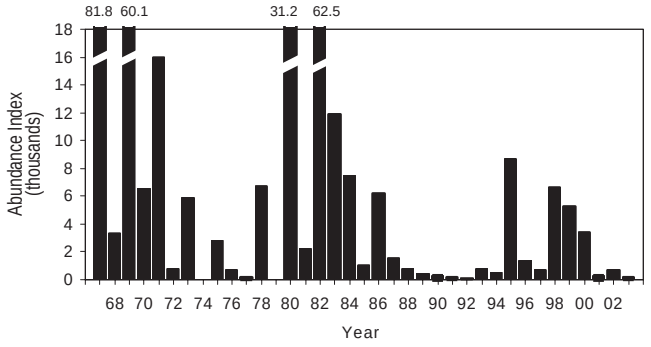

Figure 3 Longfin smelt abundance indices for Fall Midwater Trawl Survey, 1967-2003 (no sampling occurred in 1974 and 1979).

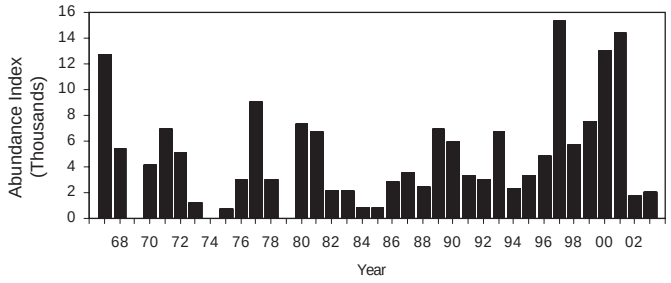

Figure 4 Threadfin shad abundance indices for Fall Midwater Trawl Survey, 1967-2003 (no sampling occurred in 1974 and 1979).

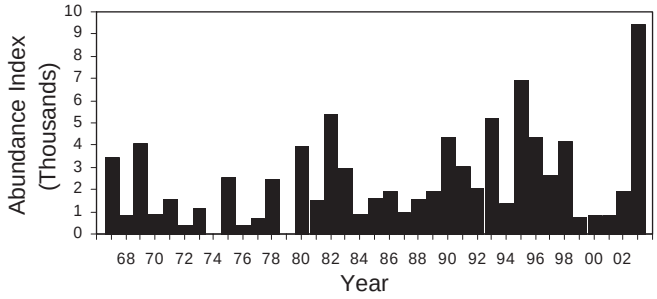

Figure 5 American shad abundance indices for Fall Midwater Trawl Survey, 1967-2003 (no sampling occurred in 1974 and 1979).

References

Calhoun, AJ. 1953. Distribution of striped bass fry in relation to major water diversions. California Fish and Game 39(3): 279-299.

Chadwick HK. 1964. Annual abundance of young striped bass, *Roccus saxatilis*, in the Sacramento-San Joaquin Delta, California. California Fish and Game 50(2): 69-99.

Turner JL, Chadwick HK. 1972. Distribution and abundance of young-of-the-year striped bass, *Morone saxatilis*, in relation to river flow in the Sacramento-San Joaquin Estuary. Trans Am Fish Soc 101(3):442-52.

San Francisco Bay Species: 2003 Status and Trends Report

Kathryn Hieb, Thomas Greiner, and Steven Slater (DFG), khieb@delta.dfg.ca.gov

Annual abundance trends from 1980-2003 and distributional patterns for 2003 are summarized in this article for the most commonly collected crabs and fishes from San Francisco Estuary. Shrimp abundance trends are summarized from 1980-2002 for 6 species, as the 2003 shrimp samples were not processed by March 2004. Summary life history information for most of these species was presented in the 1997 Status and Trends reports (DeLeón 1998 and Hieb 1998); additional life history information and methods of abundance index calculation can be found in IEP Technical Report 63 (Orsi 1999).

Freshwater outflow and ocean conditions, including temperature, nearshore surface currents, and upwelling, are four of the most important physical factors controlling abundance and distribution of species in the estuary, especially downstream of the Delta. Water year 2003 was classified as "Above Normal", after two consecutive "Dry" water years. The January-May average daily outflow was 32,146 cfs, compared to 16,024 cfs in 2001 and 18,643 cfs in 2002. However, March 2003 outflow was lower than either March 2001 or 2002, with an average daily outflow of only 15,761 cfs. In 2003, there were 2 outflow peaks, one in February and another in April.

Sea surface temperatures (SSTs) in the Gulf of the Farallones have generally been below average since 1999, when the ocean climate regime shifted from warm to cool along the west coast (Peterson and Schwing 2003). However, winter 2002-2003 SSTs were approximately 0.5 °C warmer than the long-term (1925-2002) monthly means.

Southerly winds from winter storms drive the winter nearshore surface currents, and in winters with frequent storms, such as 2002-2003, the nearshore surface flow is northward (Davidson Current) and onshore (Coriolis