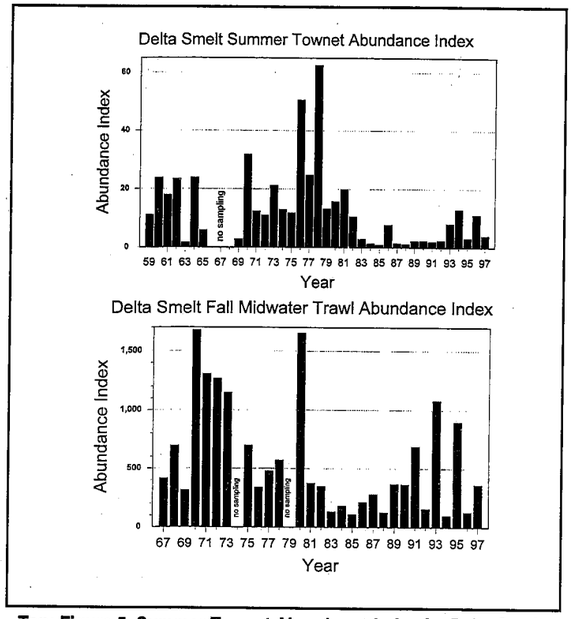
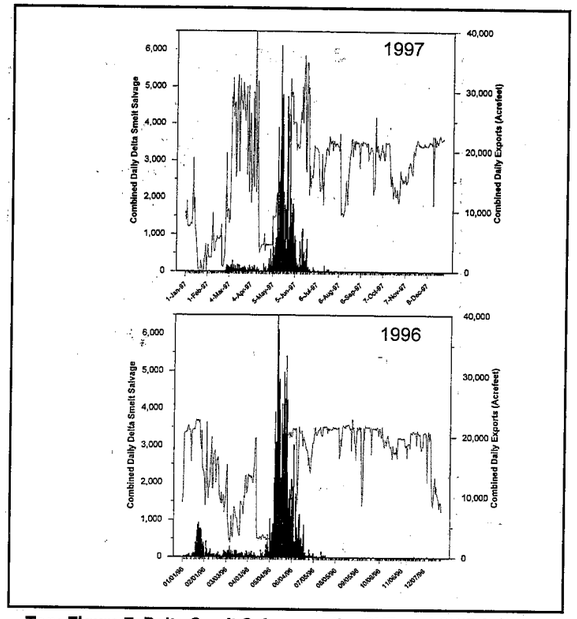


Top: Figure 5. Summer Townet Abundance Index for Delta Smelt. Values represent the sum of volume-weighted means of 8 sampling areas. The average of the first two surveys is used. No sampling in 1969-1996.

Bottom: Figure 6. Fall Midwinter Trawl Abundance Index for Delta Smelt. Values represent the sum of volume-weighted means of 17 sampling areas sampled monthly, September through December. No sampling in 1974 and 1979.



Top: Figure 7. Delta Smelt Salvage at the CVP and SWP in 1997. Bars represent combined daily salvage of delta smelt. Line representss combined daily exports in acre-feet.

Bottom: Figure 8. Delta Smelt Salvage at the CVP and SWP in 1996. Bars represent combined daily salvage of delta smelt. Line represents combined daily exports in acre-feet.

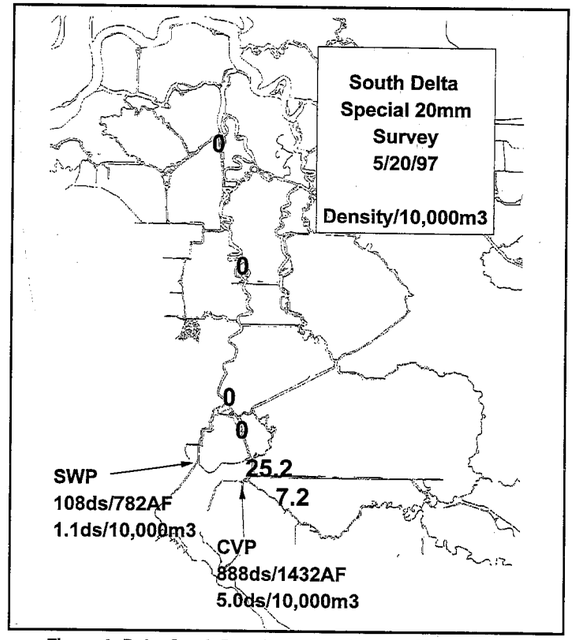


Figure 9. Delta Smelt Density in Old River on May 20, 1997. Numbers represent the average density (delta smelt/10,000 m^3) at each station sampled.

Splittail and Longfin Smelt, Winter 1998

Randall Baxter

Splittail

Splittail abundance (all ages combined) declined for the second year in a row in the 1997 Fall Midwater Trawl Survey — only a single young-of-the-year (YOY) splittail was collected (Figure 1). This was the third lowest index since 1967, only 1976 and 1977 were lower. Similar declines in YOY splittail abundance were detected by the Bay Study after record indices in 1995 (Figures 1 and 2). During the 1997 index period, the Bay Study midwater trawl collected only one YOY and the otter trawl collected none. These indices were comparable to or lower than many dry-year indices. The Suisun Marsh YOY index peaked at 1.18 fish per trawl in 1996, slightly above 1995, then declined in 1997 (Figure 2). Age groups were not separated for reporting in 1997, but the combined YOY- adult index was 0.99 fish per trawl. Considering there were good YOY indices in 1995 and 1996, the 1997 index was probably composed mostly of age-1 and adult fish. The 1995 and 1996 YOY indices were still below those of the early 1980s.

Most evidence of YOY splittail recruitment in 1997 came from non-index stations and post-index period sampling. The Bay Study otter trawl collected four YOY from new (since 1991) non-index stations in the Delta and another three were collected after October, the last month of the index period. A few additional YOY splittail were captured in both Bay Study Midwater Trawl and Fall Midwater Trawl surveys after their index periods.

Bay Study indices indicated good recruitment of the 1995 year-class to age-1 and adult in 1996 and 1997, respectively (Figures 1 and 2). Both indices of age-1 abundance reached record high levels in 1996. Adult indices in 1997 were not similarly high. The Bay Study Midwater Trawl index was higher than drought and post-drought indices except 1993, whereas the Otter Trawl index was lower than 1988, 1989 and 1993 indices, but higher than other indices since 1987. Similar to YOY, additional adults were collected by the Bay Study from non-index stations in the delta. Nine adults were collected at MWT index stations and an additional four at non-index stations; three adults were collected at OT index stations and an additional six at non-index stations.

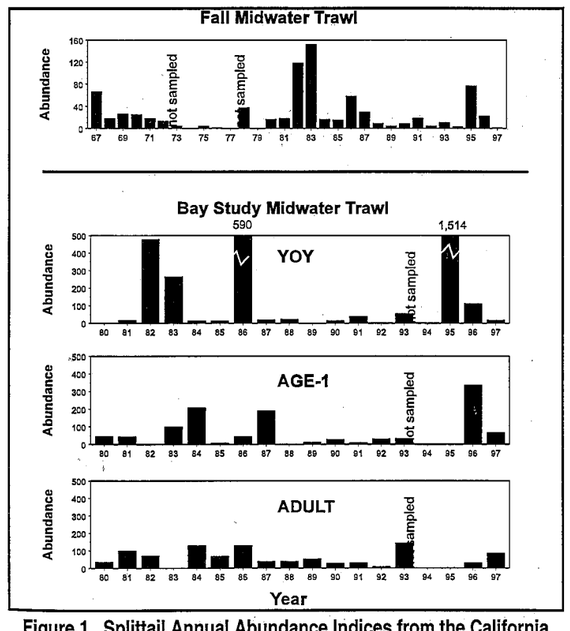


Figure 1. Splittail Annual Abundance Indices from the California Department of Fish and Game Fall Midwater Trawl Survey (all ages combined) and Delta Outflow-San Francisco Bay Survey Midwater Trawl (age groups separated)

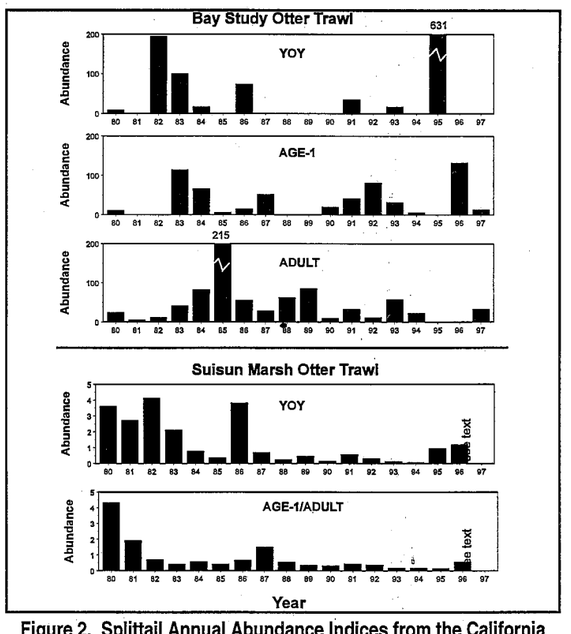


Figure 2. Splittail Annual Abundance Indices from the California Department of Fish and Game Delta Outflow-San Francisco Bay Survey Otter Trawl (age groups separated) and the U.C. Davis Suisun Marsh Otter Trawl Survey (YOY separated from age-1 and adults except in 1997)

Longfin Smelt

Longfin smelt abundance was low in 1997 (Figure 3), especially considering the potentially large number of spawners from the 1995 year-class and relatively good outflow conditions during the peak spawning and larval-rearing months of January and February. Such conditions should have produced an index as large or larger than 1995. It remains to be determined whether the low 1997 indices resulted from a large portion of the population rearing in the Gulf of the Farallones or poor recruitment.

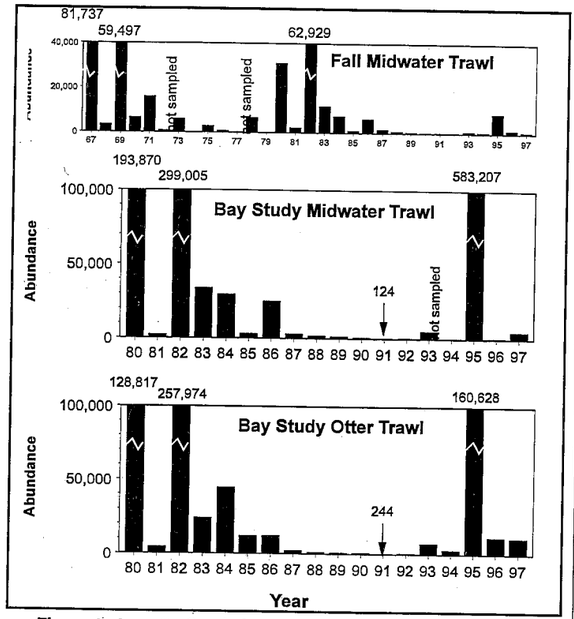


Figure 3. Longfin Smelt Annual Abundance Indices from the California Department of Fish and Game Fall Midwater Trawl Survey (all ages combined) and Delta Outflow-San Francisco Bay Survey Midwater and Otter Trawl Sampling

Surfperch Abundance Trends in San Francisco Bay

Suzanne DeLeón, DFG

The surfperch family, *Embiotocidae*, ranges along the Pacific Coast from southern Alaska to central Baja California, and two species are found in the Sea of Japan. Of the 19 species found in California, all are marine except the tule perch, which is found in freshwater (Tarp 1952, Miller and Lea 1972). Surfperches use a variety of nearshore coastal and estuarine habitats- rocky or sandy surf, kelp forests, ocean reefs, and areas around structures such as pilings and piers (Karpov *et al.* 1995).

All surfperches are viviparous; small species reproduce at age 1 and larger species after age 1 (Baltz 1984). Most species mate in winter and store sperm for 3 to 9 months before fertilization (Carlisle *et al.* 1960, Anderson and Bryan 1970). Gestation lasts 3 to 6 months and the females of many species migrate into bays to give birth. Fecundity is low, averaging 3 to 40 young. The young are born fully developed and the males of many estuarine species mature soon after birth.

Many of the larger species of embiotocids are commercially important, although some may no longer be targeted due to declines in abundance. All species are important in the sport fishery except dwarf perch, which is too small.

Fourteen species of surfperches were collected in San Francisco Bay from 1980 to 1997 (Tables 1, 2, and 3). Our abundance analyses are focused on the commonly collected species which include shiner perch, pile perch, dwarf perch, barred surfperch, walleye surfperch, and white seaperch. All of these species, except the barred surfperch and walleye surfperch, are estuarine species and use estuaries and bays for part or most of their life cycle. Although the barred and walleye surfperches are considered coastal species, they were once common in San Francisco Bay.

Surfperches primarily use San Francisco Bay as a birthing and nursery area. The adults migrate into the estuary and remain in the deeper areas of the South and Central Bay and San Pablo Bay. Just before parturition, the females move into shallow areas. After parturition, the males of most estuarine species migrate to the shallows and mate with the females. Age-0 fish rear in the shallows while the adults move to deeper areas of the bay. Most adults emigrate from the bay and the age-0 fish migrate to deeper areas in fall. Age-0 shiner perch and dwarf perch remain in the bay through their first winter while the age-0 fish of the other common species migrate out of the bay in winter.

Abundance of all the commonly collected species of surfperches has declined since the mid-1980s and has remained relatively low through 1997 (Figures 1-6). The age-0 walleye surfperch abundance index has been low since 1984 and the 1997 index of 95 follows this trend (Figure 1). In 1995, no age-0 walleye surfperch were collected.

Pile perch were once relatively common in San Francisco Bay, but abundance declined in 1986 (Figure 2). We have not collected any age-0 pile perch since 1989.

White seaperch abundance has declined since 1984. We have not collected any age-0 or older age classes since 1990 (Figure 3).

Barred surfperch abundance has been low since 1983 (Figure 4). The abundance index of all age classes has been < 100 since 1987 and remained low in 1997, with an index of 104.

Table 1. Total Catch of Surfperches in the Midwater Trawl from 1980 to 1997

Species	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	Total
Barred surfperch	1	1										1	1						4
Calico surfperch														1					1
Redtail surfperch																1			1
Shiner perch	406	1148	790	302	320	826	731	635	665	333	262	211	142	357	29	31	233	520	7421
Black perch						1													1
Walleye surfperch	41	207	72	22	78	40	29	67	35	36	26	15	15	21		11	28	11	743
Silver surfperch	1				1														2
Dwarf perch			1																1
White seaperch	11	23	3	3	1	1	1	13	5	5	1		1				1		69
Rubberlip seaperch								4											4
Pile perch	3	6	5	2	1	4	4	1	1			1							28
All	463	1385	871	329	401	872	765	720	706	374	289	228	159	379	29	43	262	531	8275

Table 2. Total Catch of Surperches in the Otter Trawl from 1980 to 1987

Species	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	Total
Barred surfperch	19	29	16	48	19	6		7	3	4	4	3	1	1	2	4	1	3	170
Shiner perch	1654	1929	3167	1667	1015	1803	2730	1375	1402	433	649	412	283	259	204	413	271	575	20241
Black perch		13	3	4	12	4	1	1	3	3	2		4	4	3	2	9	12	80
Spotfin perch					1														1
Walleye surfperch	28	184	91	37	22	16	39	26	24	5	7	7	5	3	2		3	5	504
Silver surfperch	2							2											4
Rainbow seapearch				1															1
Dwarf perch	14	31	50	5			3	1	8	5	1	1							167
White seapearch	17	35	12	10	25	5	9	7	4	1	4								128
Rubberlip seaperch	2	3	2		2				1	1						1	1	1	14
Pile perch	36	34	38	35	9	19	19	1	16	3	1								211