

Bay Species

Kathy Hieb, DFG

Annual abundance indices for six representative "bay" species are presented in this article: *Crangon franciscorum*, Dungeness crab, Pacific herring, shiner perch, California halibut, and starry flounder. *Crangon franciscorum* and starry flounder rear in oligohaline and mesohaline salinities (0.5-5.0 and 5-18‰, respectively); the other four species rear in polyhaline salinities (18-30‰). All of these species spawn in the lower estuary or the near-shore ocean area.

The 1996 abundance index of immature *C. franciscorum* was the highest for the study period (Figure 1), with an index similar to other years with high outflow (eg, 1982, 1983). Distribution was centered in San Pablo and Suisun bays in the summer and Suisun Bay in the fall.

In 1996 the abundance of juvenile Dungeness crabs was very low (Figure 2), typical of years with frequent storms. Dungeness crab larvae hatch in the ocean and are pelagic for about 90 days. In years with frequent storms, ocean currents transport the larvae offshore and to the north, far from the near-shore area. Recruitment of Dungeness crab juveniles to the estuary is highly correlated to the number of late-stage larvae in the Gulf of the Farallones (Reilly 1983).

Abundance of young-of-the-year Pacific herring was also relatively low in 1996 (Figure 3). This was somewhat unexpected, as Pacific herring have responded positively to high outflow in the past and broodstock abundance was very high in 1996.

Shiner perch young-of-the-year abundance has been relatively low since 1988, and the low 1996 index continued this trend (Figure 4). Although we do not know what factors control shiner perch abundance in the estuary, there is some evidence that fishing pressure may have contributed to this recent decline.

The abundance of California halibut continued to decline in 1996 from a record high index in 1993 (Figure 5). Our 1996 catch was dominated by 2- or 3-year-old fish (the 1993 or 1994 year class). The 1992 year class, which dominated the 1993-1995 catches, continued to contribute to our 1996 catch.

Although the 1995 and 1996 young-of-the-year starry flounder indices were the highest since 1983 (Figure 6a), there is strong evidence that starry flounder abundance has declined substantially since the 1960s and 1970s. We believe the increased indices in 1995 and 1996 were in part a response to increased outflow. The one-year-old starry flounder index (1995 year class) increased slightly in 1996 (Figure 6b).

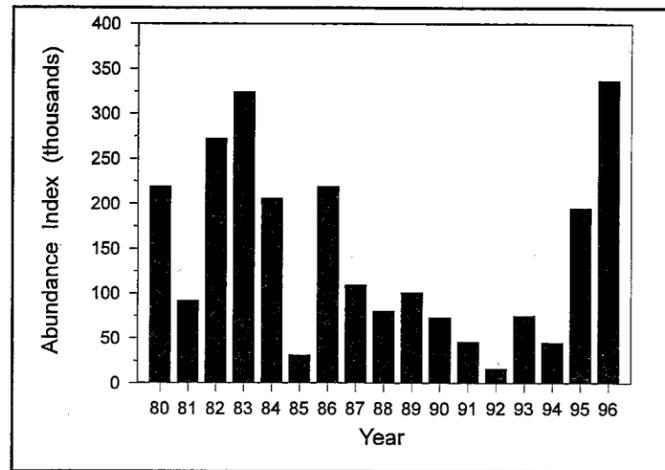


Figure 1
ANNUAL ABUNDANCE OF IMMATURE *C. FRANCISCORUM*,
MAY-OCTOBER, OTTER TRAWL

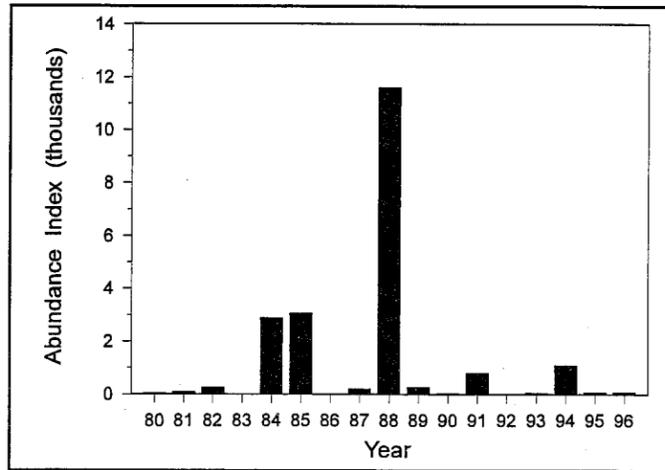


Figure 2
ANNUAL ABUNDANCE OF 0+ DUNGENESS CRAB,
MAY-JULY, OTTER TRAWL

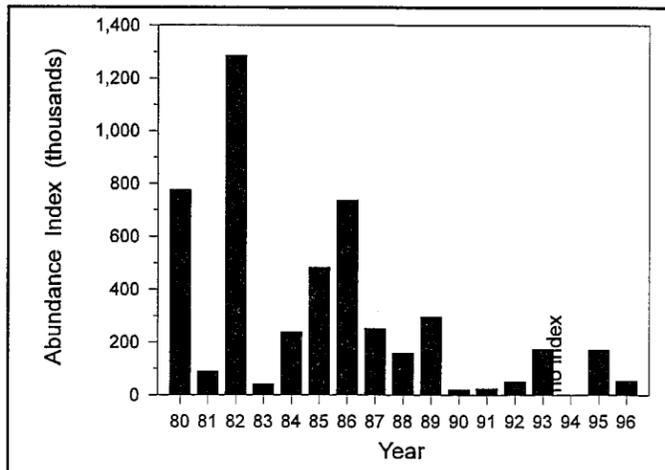


Figure 3
ANNUAL ABUNDANCE OF YOUNG-OF-THE-YEAR PACIFIC HERRING,
APRIL-SEPTEMBER, MIDWATER TRAWL
No index in 1994.

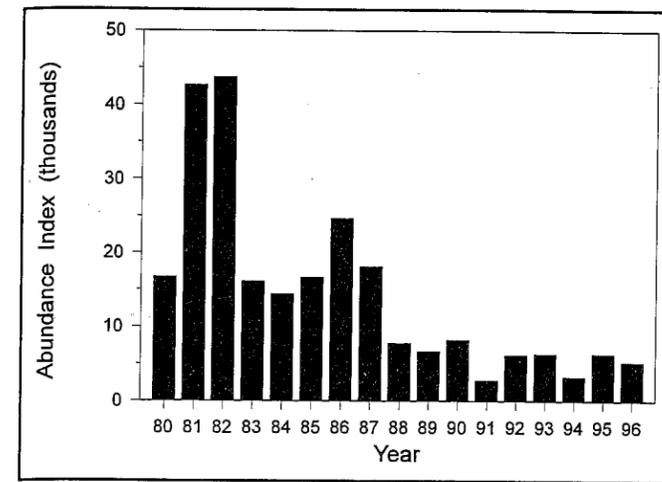


Figure 4
ANNUAL ABUNDANCE OF YOUNG-OF-YEAR SHINER PERCH
MAY-OCTOBER, OTTER TRAWL

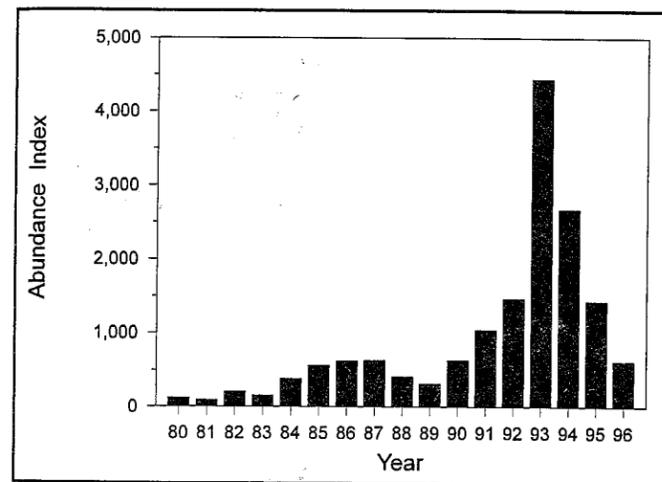


Figure 5
ANNUAL ABUNDANCE OF CALIFORNIA HALIBUT (ALL SIZES),
FEBRUARY-OCTOBER, OTTER TRAWL

Juvenile Salmon Abundance and Survival

Jeff McLain and Mark Pierce, USFWS

Midwater trawling has been done at Sacramento since 1988 to estimate the abundance and timing of juvenile chinook salmon entering the delta.

Figure 1 shows mean catch per 20-minute tow of all salmon at Sacramento in April-June of 1988 to 1996 (comprised mostly of juvenile fall-run chinook). The last two sampling years (1995 and 1996) both wet, show relatively low mean monthly catch per tow. A large portion of the fall-run outmigrant population during these seasons may have entered the delta as fry due to the higher spring flows. This hypothesis is supported by the positive relationship between mean number of fry captured in January-March at historical northern delta seine sites and mean February flow

Literature

Reilly, P.N. 1983. Dynamics of Dungeness crab, *Cancer magister*, larvae off the central and northern California coast. Pages 57-84. in P. W. Wild and R. N. Tasto, editors. Life history, environment, and mariculture studies of the Dungeness crab, *Cancer magister*, with emphasis on the central California fishery resource. California Department of Fish and Game Fish Bulletin 172.

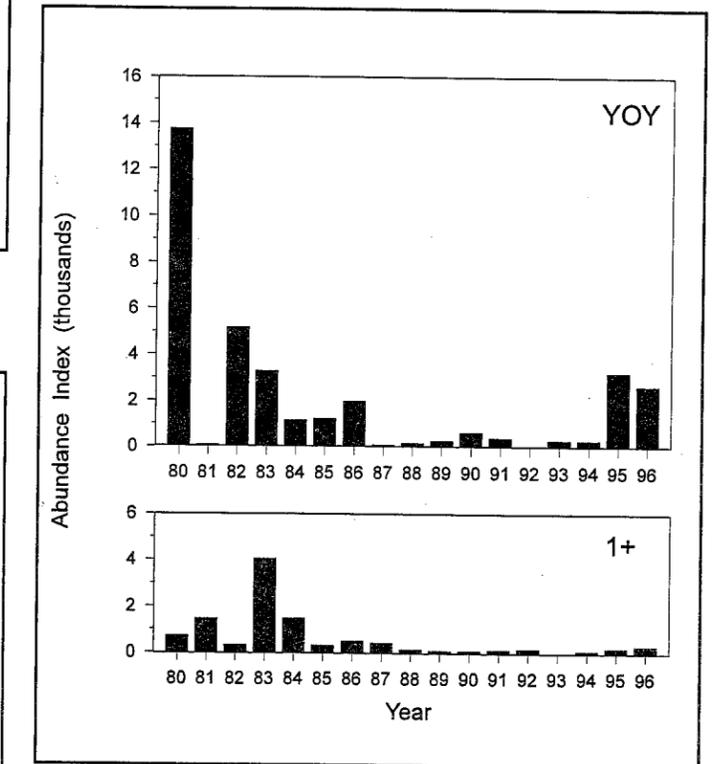


Figure 6
ANNUAL ABUNDANCE OF STARRY FLOUNDER, OTTER TRAWL:
a. Young-of-Year, May-October
b. One-Year-Old, February-October

at Freeport (Figure 2). The 1995 and 1996 seasons fit the historical regression well, showing high catch per cubic meter in years of high February flow at Freeport. The high catches appear to indicate a greater use of the delta in wetter years for rearing of fry.

Annual April-June smolt abundance at Chipps Island (Figure 3) is graphed for 1978-1996. Catches at Chipps Island in 1995 and 1996 were slightly above average for the 3-month period and much higher than in 1994, the lowest catch on record. The wetter hydrology in 1995 and 1996 likely increased juvenile survival upstream and through the delta and contributed to the increased catches.