■ Interagency Ecological Program for the San Francisco Estuary ■

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Warzybok, P.M. and R.W. Bradley. 2007. Population size and reproductive performance of seabirds on southeast Farallon Island, 2007. Prepared for the USFWS, Farallon National Marine Refuge by PRBO Conservation Science, Petaluma, CA. 38 pp.

Notes

K. Newman, USFWS, e-mail to Randy Baxter (California Department of Fish and Game), October 5, 2007.

Fish Salvage for 2007 at the State Water Project and Central Valley Project Fish Facilities.

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Introduction

The Tracy Fish Collection Facility (TFCF) and the Skinner Delta Fish Protective Facility (SDFPF) divert (salvage) fish from water exported from the Sacramento-San Joaquin Delta. The TFCF began operation in 1957 and the SDFPF began operation in 1967 with both facilities using a louver-bypass system to salvage fish from the exported water. The salvaged fish are transported to predetermined release sites after being loaded into tanker trucks and returned to the western Delta. Total fish salvage was estimated by means of several steps. First, bypass flows were sampled once every 2 hours of operation for 10 to 30 minutes. All fish collected in these sampling periods were identified and numerated. These counts were expanded proportionally based on sample time to estimate the total number of fish salvaged in each 2 hour period of operation, then these expanded counts were summed across time to derive monthly and annual totals.

This report summarizes salvage information from the TFCF and the SDFPF in 2007. The following species are given individual consideration: Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss*), striped bass[1] (*Morone saxatilis*), delta smelt[1] (*Hypomesus transpacificus*), longfin smelt (*Spirinchus thaleichthys*), threadfin shad[1] (*Dorosoma petenense*), and splittail (*Pogonichthys macrolepidotus*).

Water Exports

The State Water Project (SWP) exported roughly 3.0 billion m^3 of water in 2007. The 2007 SWP export total was slightly lower compared to recent years (2003 to 2006) that ranged from 4.0 to 5.0 billion m^3 (Figure 1). The Central Valley Project (CVP) exported roughly 3.2 billion m^3 of water in 2007. The annual export in 2007 was comparable to recent exports that ranged from 3.2 to 3.4 billion m^3.

The majority of water exported in 2007 occurred from July through December. SWP monthly exports ranged from 26.8 to 511.0 million m^3 of water (Figure 2). From July through December, 2.1 billion m^3 of water was exported, accounting for 71% of the 2007 annual SWP export. CVP monthly exports ranged from 63.8 to 335.2 million m^3 of water. From July through December, 1.8 billion m^3 of water was exported, accounting for 57% of the 2007 annual CVP export.

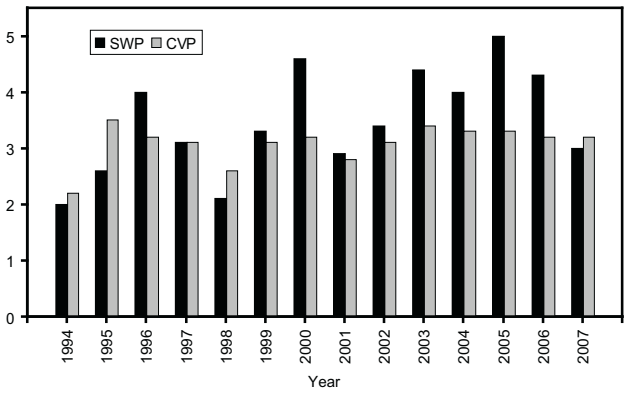

Figure 1 Annual exports in billions of cubic meters for the SWP and the CVP, 1994 to 2007

1. Pelagic Organism Decline (POD) species

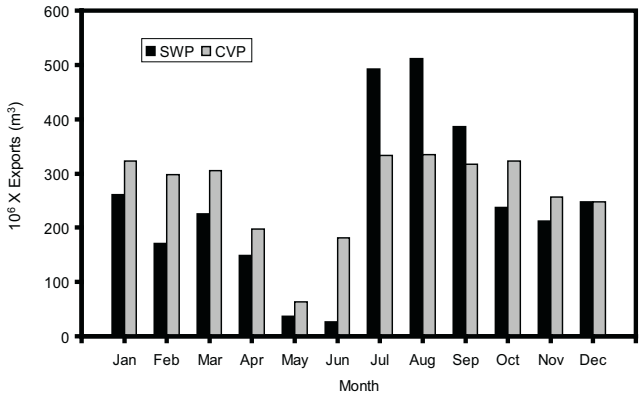

Figure 2 Monthly exports in millions of cubic meters for the SWP and the CVP in 2007

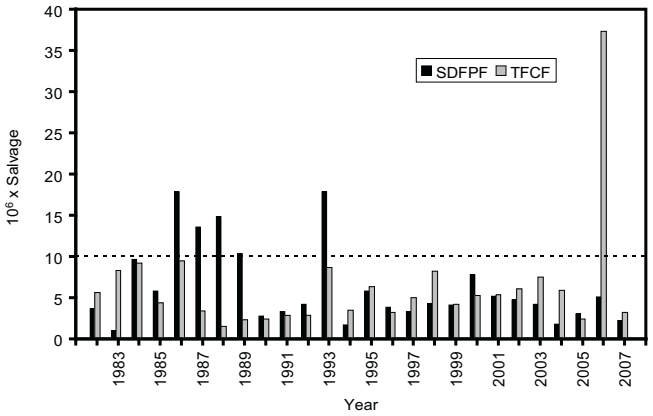

Figure 3 Annual salvage of all taxa combined at the SDFPF and the TFCF, 1982 to 2007

Total Salvage and Prevalent Species

Annual combined salvage (annual salvage) in 2007 at the TFCF (3,164,530) was one of the lowest on record. Generally, annual salvage values were below 10 million/year (Figure 3). In contrast, the 2006 annual salvage at TFCF (37,266,449) dwarfs any previous value and represents an order of magnitude increase from the TFCF annual salvage in 2007 and 2005 (2,430,642). Annual salvage at the SDFPF in 2007 was also one of the lowest on record and decreased substantially in contrast to 2006, from 5,138,457 to 2,239,066.

The annual salvage at both facilities was dominated by threadfin shad. At the TFCF, threadfin shad accounted for 70.9% of the annual salvage (Figure 4). The only other species to be salvaged in substantial numbers at the TFCF was striped bass. The situation was less lopsided at SDFPF where threadfin shad accounted for 56.2% of the annual salvage. The other species that occurred in comparable numbers at SDFPF was striped bass. Generally, threadfin shad has made up the bulk of salvage at both facilities, especially in recent years. Relatively few (< 0.3%) Chinook salmon, steelhead, delta smelt, longfin smelt, and splittail were salvaged at the SDFPF and TFCF.

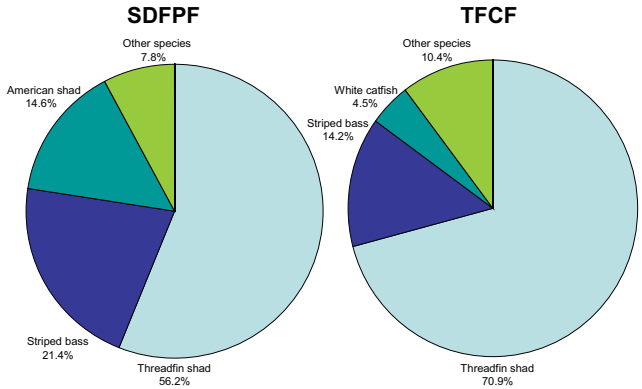

Figure 4 Percentages of annual salvage for the 3 most prevalent species and species of special interest at the SDFPF and TFCF, 2007

Chinook salmon

Annual salvage (all races and origins combined) of Chinook salmon continued to be low at both facilities with salvage at the TFCF higher than at the SDFPF. The annual salvage of 1,941 at the SDFPF in 2007 was a decrease from the annual salvage of 8,629 observed in 2006, continuing the declining trend that started in 2004 (Figure 5). The annual salvage of 7,622 salmon at the TFCF in 2007 was a substantial decrease from the annual salvage of 35,319 observed in 2006 and ended the increasing trend that started in 2002. The annual salvages from 2002 to 2007 are dwarfed by annual salvages observed in the 1980's and the late 1990's.

Salvaged Chinook salmon at both facilities were primarily wild, spring-run fish and a lesser number of wild, winter-run fish (Table 1). Wild spring-run fish comprised 52% of the annual salvage at the SDFPF and 39% of the annual salvage at the TFCF. In contrast, wild fall-run fish comprised only 24% of the annual salvage at the SDFPF and 25% of the annual salvage at the TFCF, which was a substantial relative decrease from annual salvage in 2006 when wild fall-run fish comprised 63% at the SDFPF and 82% at the TFCF. The majority of wild fall-run fish at the SDFPF and TFCF were salvaged in April (Figure 6).

Loss of salmon in 2007 was higher at the SDFPF than at the TFCF. At the SDFPF the loss of salmon was estimated at 8,321 while at the TFCF the estimated loss was 5,111.

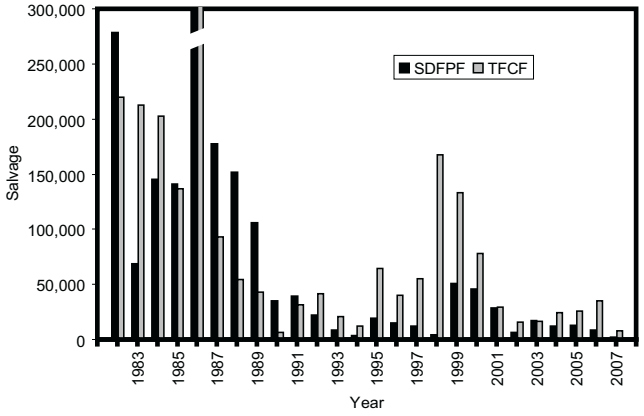

Figure 5 Annual salvage of Chinook salmon (all races and origins combined) at the SDFPF and the TFCF, 1982 to 2007. The SDFPF 1986 salvage of 435,233 and the TFCF 1986 salvage of 752,039 have been truncated for scale considerations.

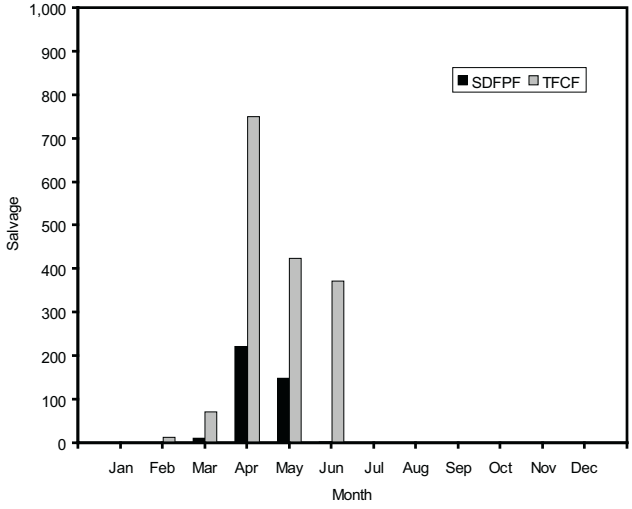

Figure 6 Monthly salvage of wild, fall run Chinook salmon at the SDFPF and the TFCF, 2007

Table 1 Chinook salmon annual salvage, percentage of annual salvage, race and origin (wild or hatchery), and loss at the SDFPF and the TFCF, 2007

Facility	Origin	Race	Salvage	Percentage	Loss
SDFPF					
	Wild				
		Fall	383	24	1,645
		Late-fall	0	0	0
		Spring	846	52	3,563
		Winter	396	24	1,729
	Total Wild		**1,625**		**6,937**
	Hatchery				
		Fall	4	1	19
		Late-fall	0	0	0
		Spring	7	2	30
		Winter	303	97	1326
	Total Hatchery		**314**		**1,375**
	Total Adult		**2**	<1	**9**
	Grand Total		**1,941**		**8,321**
TFCF					
	Wild	Fall	1,629	25	1,187
		Late-fall	12	<1	9
		Spring	2,532	39	1,649
		Winter	2,305	35	1,516
	Total Wild		**6,478**		**4,361**
	Hatchery				
		Fall	24	2	17
		Late-fall	36	3	25
		Spring	24	2	15
		Winter	1060	93	693
	Total Hatchery		**1,144**		**750**
	Grand Total		**7,622**		**5,111**

Steelhead

The annual salvage of steelhead (all origins combined) at both facilities continued to be low in 2007 (Figure 7). Annual salvage at the SDFPF in 2007 was slightly higher than in 2006; 1,561 as opposed to 1,287. This trend was also observed at the TFCF as the annual salvage in 2007 was greater than in 2006; 4,068 as opposed to 2,516.

The majority of steelhead salvaged at the SDFPF were considered wild fish while at the TFCF the majority of steelhead salvaged were of hatchery origin. At the SDFPF the salvage composition was 941 wild, 612 hatchery fish, and 8 of unknown origin. At the TFCF the salvage composition was 1,827 wild and 2,241 hatchery fish.

The salvage of wild steelhead occurred in the first half of the year for both facilities. Wild steelhead were salvaged from January through May at the SDFPF and from January through June at the TFCFF (Figure 8). At the SDFPF steelhead were salvaged most frequently in: February (144), March (450), and April (315). For the TFCF, steelhead was salvaged most frequently in: February (276), March (792), and April (720).

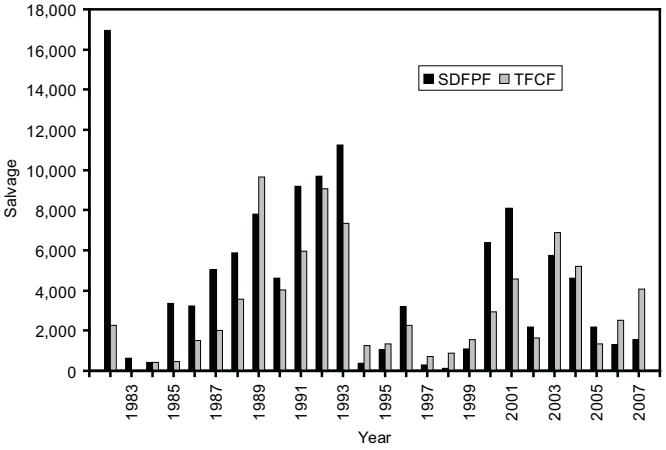

Figure 7 Annual salvage of steelhead (all origins combined) at the SDFPF and the TFCF, 1982 to 2007

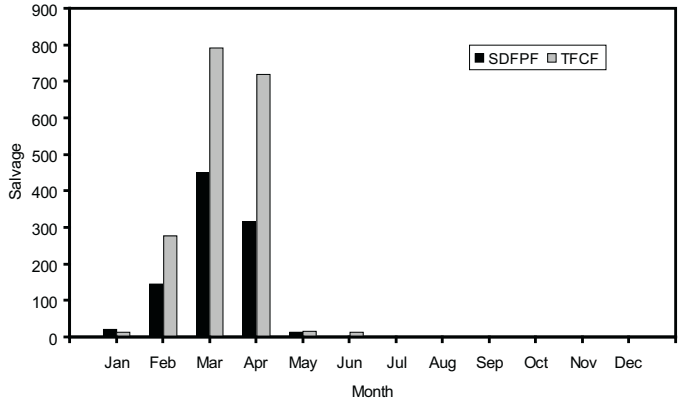

Figure 8 Monthly salvage of wild steelhead at the SDFPF and the TFCF, 2007

Striped bass

In 2007, the facilities reported low annual striped bass salvages continuing the trend in low annual salvage numbers observed since 2001 (Figure 9). At the SDFPF, the 2007 annual salvage was 479,561, an increase from the 2006 annual salvage of 140,795. The 2006 annual salvage was just slightly more than the minimum for the period of record, 131,039 in 1983. At the TFCF, the 2007 annual salvage of 447,971 was also an increase from the record low annual salvage of 37,359 in 2006. The next lowest TFCF annual salvage of 124,645 was observed in 2005.

The months of July and August accounted for the majority of striped bass salvage at SDFPF and June and July at the TFCF (Figure 10). At the SDFPF the July salvage of 362,104 and the August salvage of 89,747 accounted for 94% of the 2007 annual salvage. At the TFCF the June salvage of 231,912 and the July salvage of 180,183 accounted for 92% of the annual salvage. Striped bass were salvaged every month at both facilities with the lowest monthly salvage in November (367) for SDFPF and in October (428) at the TFCF.

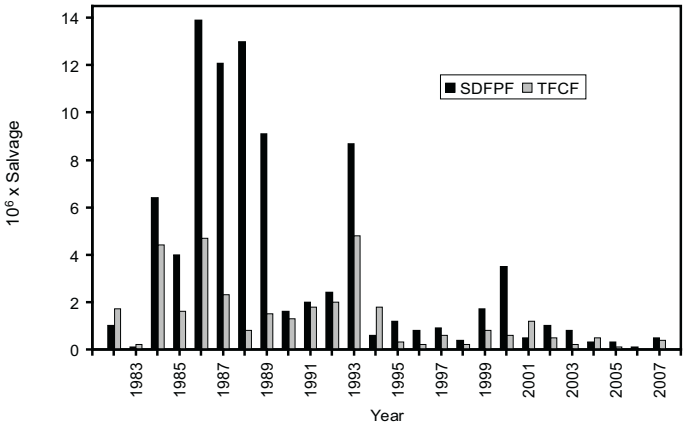

Figure 9 Annual salvage of striped bass at the SDFPF and the TFCF, 1982 to 2007

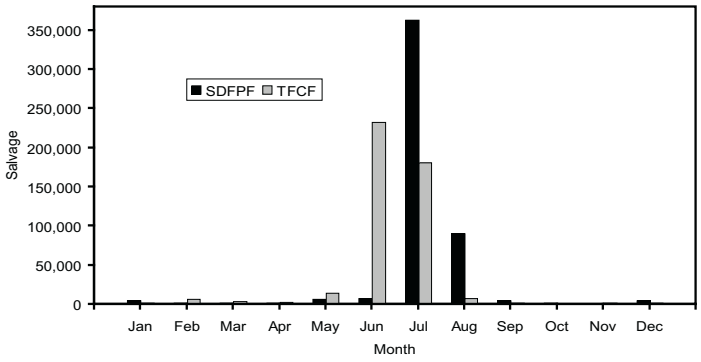

Figure 10 Monthly salvage of striped bass at the SDFPF and the TFCF, 2007

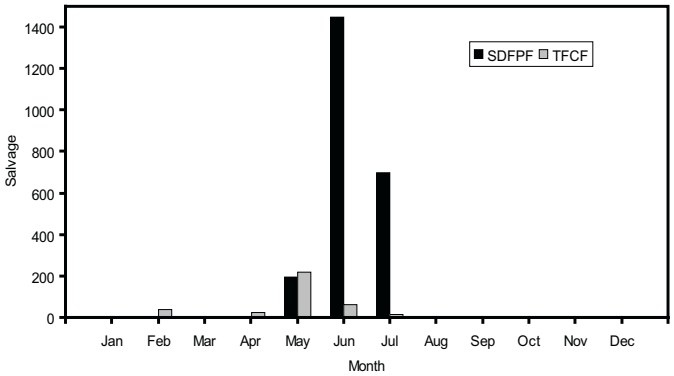

Figure 12 Monthly salvage of delta smelt at the SDFPF and the TFCF, 2007

Delta smelt

Compared to the historical levels, low numbers of delta smelt were salvaged by either facility in 2007, continuing the decline in salvage that started in 2002 (Figure 11). At the SDFPF the annual salvage in 2007 was 2,343 which was markedly higher than the 2006 annual salvage of 24. At the TFCF the annual salvage in 2007 was 348, approximately equal to the near record low annual salvage in 2006 of 312.

Delta smelt were salvaged in only a few months during the spring and summer of 2007 (Figure 12). At the SDFPF delta smelt were most frequently salvaged in June (1,449) and July (699). At the TFCF delta smelt were most frequently salvaged in May (216).

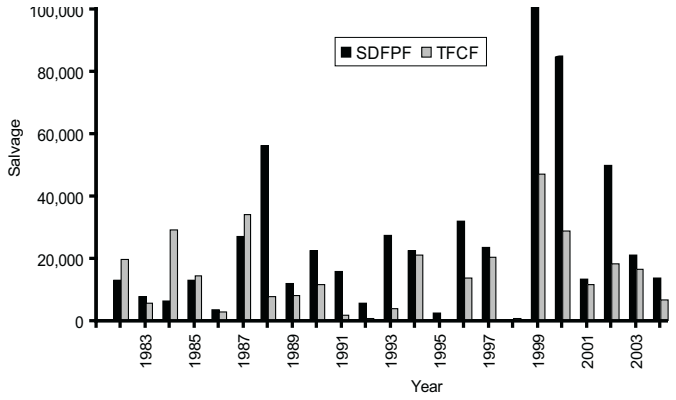

Figure 11 Annual salvage of delta smelt at the SDFPF and the TFCF, 1982 to 2007

Longfin smelt

Longfin smelt continued the decline in salvage that started in 2003 (Figure 13). The annual salvage in 2007 was 59 at the SDFPF and 48 at the TFCF. Low or zero annual salvages of longfin smelt were not uncommon. The annual salvage of 0 in 2006 at the SDFPF was a new record low for recent years (the previous low was 52 in 1982). No longfin smelt were salvaged in 1982 and 1995 at the TFCF. Large (greater than 10,000) annual salvages of longfin smelt have also been observed in: 1984, 1985, 1987-1990, and 2002.

Longfin smelt were salvaged in spring and summer at the SDFPF and in the winter and spring at the TFCF (Figure 14). At the SDFPF longfin smelt were most frequently salvaged in May (47). Twelve longfin smelt were salvaged at the TFCF in January, February, May, and December.

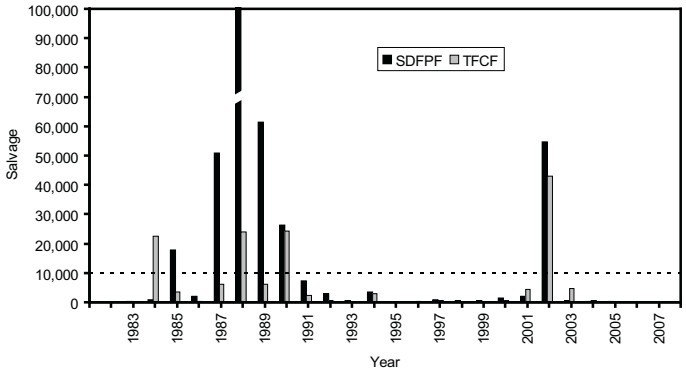

Figure 13 Annual salvage of longfin smelt at the SDFPF and the TFCF, 1982 to 2007. The annual salvage at the SDFPF for 1988 has been truncated for scale considerations (140,040).

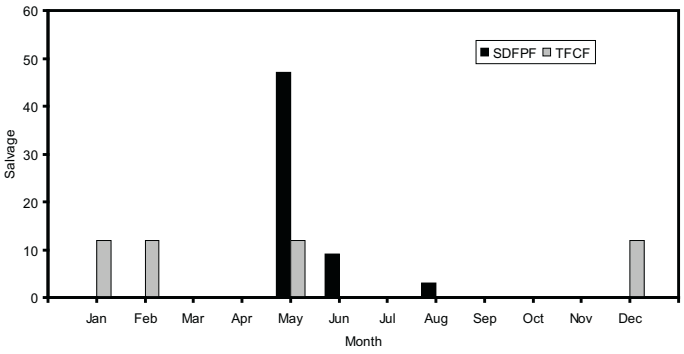

Figure 14 Monthly salvage of longfin smelt at the SDFPF and the TFCF, 2007

Splittail

The annual salvage of splittail was substantially lower for both facilities in 2007 than in 2006. The 2007 annual salvage was 538 at the SDFPF as opposed to 417,859 in 2006 (Figure 15). The 2007 annual salvage was 780 at the TFCF; a dramatic decrease from the record high value of 5,002,611 in 2006. However, large salvages (greater than 150,000) were not uncommon and have been seen in 1982, 1983, 1986, 1995, 1998, and 2005.

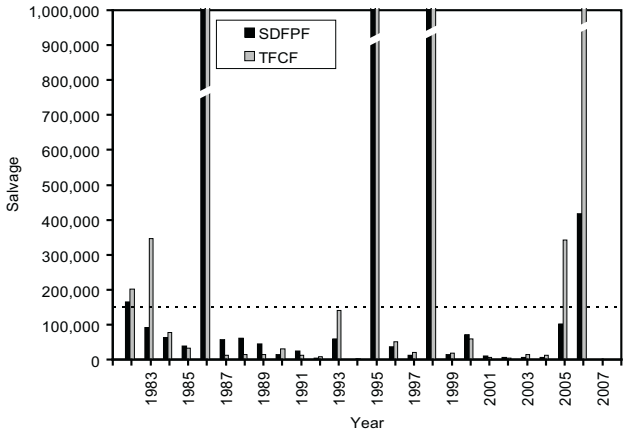

Figure 15 Annual salvage of Splittail at the SDFPF and the TFCF, 1982 to 2007. The annual salvages at the SDFPF for the following years have been truncated for scale considerations: 1986 (1,160,305), 1995 (2,190,517), and 1998 (1,042,239) . The annual salvages at the TFCF for the following years have been truncated for scale considerations: 1986 (1,231,283), 1995 (3,143,156), 1998 (2,051,660), and 2006 (5,002,611).

Threadfin shad

Annual salvage of threadfin shad at both facilities was higher in 2007 than in 2005 and 2006. At the SDFPF the 2007 annual salvage was 1,258,807 whereas the 2006 annual salvage was 857,140 and preceded by 1,183,267 in 2005 (Figure 16). At the TFCF, the 2007 annual salvage was 2,242,577, whereas the 2006 annual salvage was 717,112 and preceded by 1,111,569 in 2005.

Annual threadfin shad salvage values over 2 million were historically the exception and not the rule. At the TFCF, 8 years out of 26 had annual salvages over 2 million. At the SDFPF only 3 years out of 26 had annual salvages over 2 million. The majority of annual salvages over 2 million occurred in years since 2000 and at the TFCF.

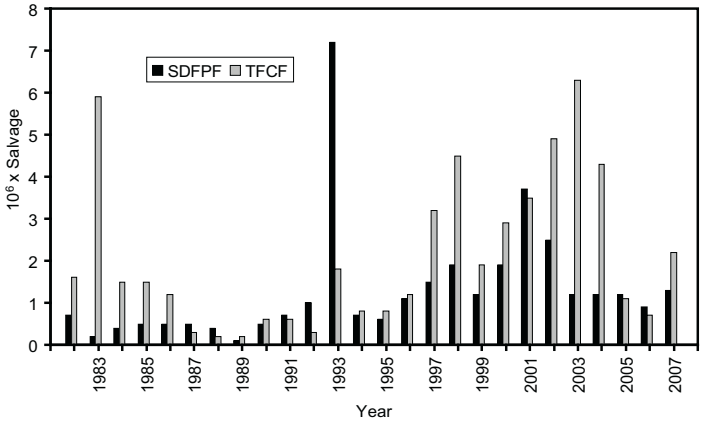

Figure 16 Annual salvage of threadfin shad at the SDFPF and the TFCF, 1982 to 2007