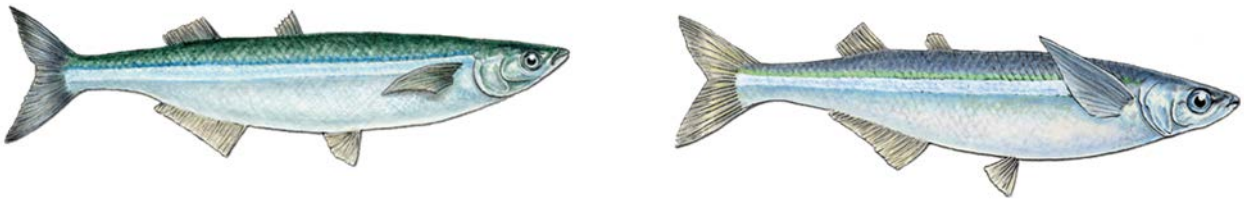
8 Silversides, Atherinopsidae



Left: Jacksmelt, *Atherinopsis californiensis*. Right: Topsmelt, *Atherinops affinis.* Photo credit: NOAA Fisheries Service (both).

There are three species of silversides (family Atherinopsidae) in California ocean waters, jacksmelt, *Atherinopsis californiensis*, topsmelt, *Atherinops affinis,* and California grunion which is presented in a separate section of this report. Although jacksmelt and topsmelt have the name "smelt" incorporated into their common names, they are not true smelt. True smelt (family Osmeridae) are more closely related to trout and differ from silversides in that they have an adipose fin, one dorsal fin, and their pectoral fins are placed low on the bodies. Silversides, which are more closely related to mullet and barracuda, lack an adipose fin, have two dorsal fins, and their pectoral fins are placed high on their bodies. Silversides have a brilliant silver stripe running the length of their bodies which gives them their name.

History of the Fishery

The commercial fishery for silversides is not considered an important fishery and is of minor economic importance in California. The commercial fishery is primarily incidental to other fisheries. Historically silversides have been reported in California's commercial landings as "smelt" and combined with the landings for true smelt species. Jacksmelt made up a majority of the historical landings for "smelt" and topsmelt contributed up to 25 percent. Since 1976, topsmelt and jacksmelt have been reported separately from true smelt species in annual landings published in California Department of Fish and Wildlife (Department) catch bulletins. According to landing receipt data from the Department's Commercial Fisheries Information System (CFIS), the commercial landings for grunion and topsmelt have been sporadic and very low compared to those for jacksmelt and the generic landing category "silversides". The commercial landings and ex-vessel values for the silversides (jacksmelt, topsmelt, grunion, and unspecified silversides) have varied sharply over time (Figure 8-1).

In 1994, the Department revamped the landing receipts, dropping "silversides" from the list of preprinted species. At present, jacksmelt is the only silverside species listed on Department landing receipts, the rest of the silversides (topsmelt, grunion, "silversides") have to be written in by the fish buyer. Prior to the change in landing receipts, landings of jacksmelt and "silversides" accounted for most of the landings (43 and 57 percent, respectively). Since 1994, "silversides" show up occasionally in the landings and

jacksmelt make up 98 percent of all silverside landings. This is likely due to the presence of jacksmelt on the landing receipt and not a change in the commercial catch.

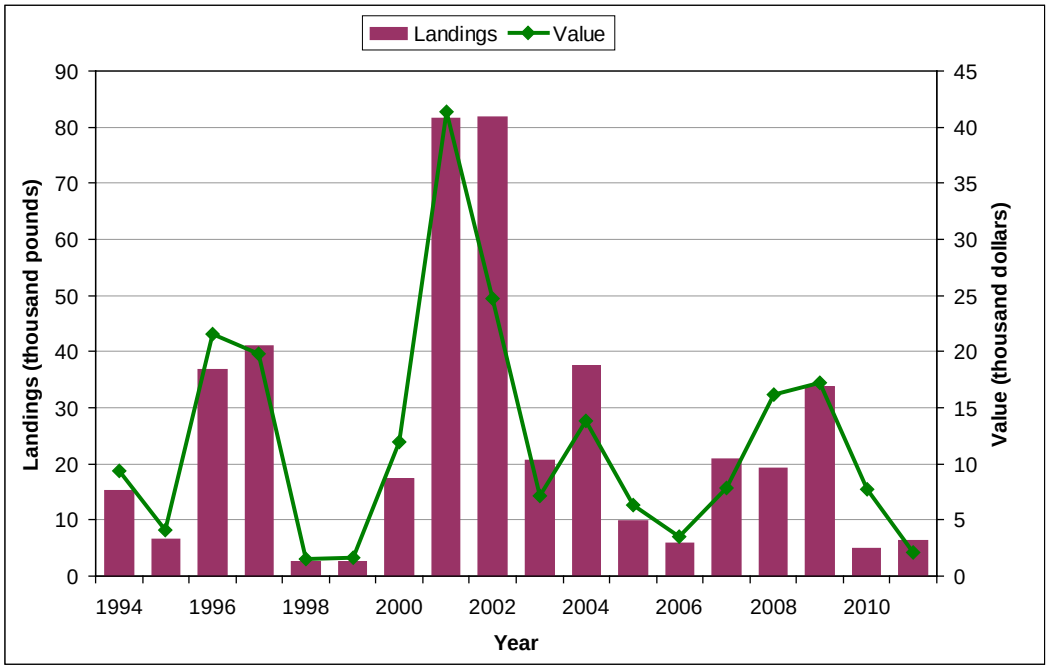


Figure 8-1. Silversides commercial landings and value, 1994-2011. Data source: CFIS data, all species combined including grunion.

Silversides have been caught using a variety of gear types such as encircling nets, hook-and-line, gill nets and beach seines. According to CFIS data, encircling nets such as purse seines, drum seines, and lampara nets have accounted for the majority of the landings. Starting in 1991, the use of hook-and-line gears increased. In 2010, hook-and-line gears contributed 95 percent of the total catch.

There is no commercial fishing season for silversides and they are landed throughout the year. There is no commercial take limit. The landings are largely made in San Francisco and ports to the south. According to CFIS data, the ports in Los Angeles County dominated commercial landings for jacksmelt from 1976 until 1999. However from 2000 on, a majority of the landings have been made in Monterey.

Recreational anglers catch silversides using hook-and-line gear from piers, beaches, and private and rental boats. A few silversides are taken by anglers on commercial passenger fishing vessels (CPFV). Anglers on piers catch silversides using fishing line with several small, shiny, bare hooks sometimes with colored yarn attached (typically yellow and red). Single baited hooks are also used from boats and piers. Juveniles of both jacksmelt and topsmelt can easily be taken by anglers chumming with bread crumbs and using nets to scoop up the feeding masses.

In California there are no seasons, size or bag limits for jacksmelt or topsmelt taken recreationally. The recreational catch of silversides has been highly variable ranging from a low of 315,000 fish caught in 1999 to a high of 1.08 million fish in 1993 according to data from the Marine Recreational Fisheries Statistics Survey (MRFSS) (Figure 8-2). During that period (1980-2003), jacksmelt accounted for 85 percent of the recreational catch, with topsmelt accounting for 15 percent. The catch of jacksmelt in southern California (Point Conception to the U.S./Mexico border) decreased from 53 percent to 33 percent, averaging 43 percent from 1980-2003 according to MRFSS data. Topsmelt were caught primarily in southern California and showed an increasing trend between 1980 and 2003, going from 90 percent (1980-1989) to 97 percent (1993-2003). Grunion were not sampled by MRFSS samplers because catch only occurs at night and samplers only sample during daylight hours.

In 2004, the California Recreational Fisheries Survey (CRFS) replaced MRFSS and while direct comparisons are not possible due to changes in sampling methodology, similar trends are seen in the silversides catch. CRFS samplers do not sample grunion catch. The recreational catch of silversides remained highly variable ranging from 350,000 fish in 2009 to 744,000 fish in 2006 (Figure 8-3). Jacksmelt continue to make up most of the silversides catch, averaging 82 percent between 2004 and 2011. More jacksmelt were caught in northern California than southern California (57 and 43 percent, respectively). Topsmelt were caught primarily in southern California, averaging 84 percent between 2004 and 2011 according to CRFS data.

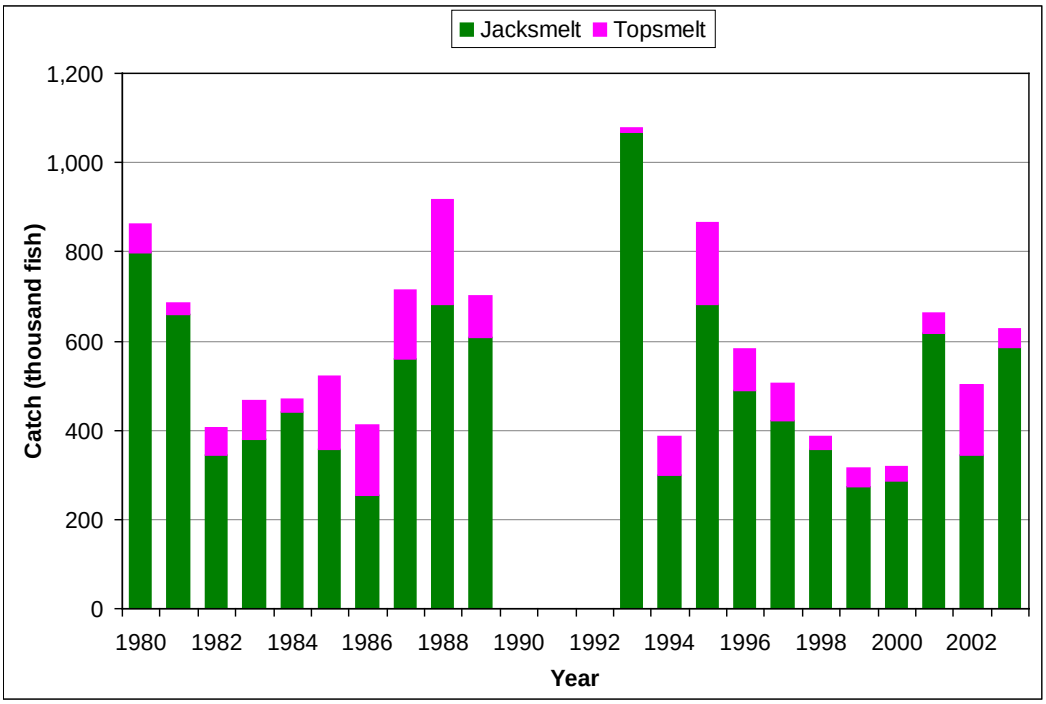


Figure 8-2. Silversides recreational catch, 1980-2003. Data source: MRFSS data, all fishing modes and gear types combined, except grunion. Data for 1990-1992 are not available.

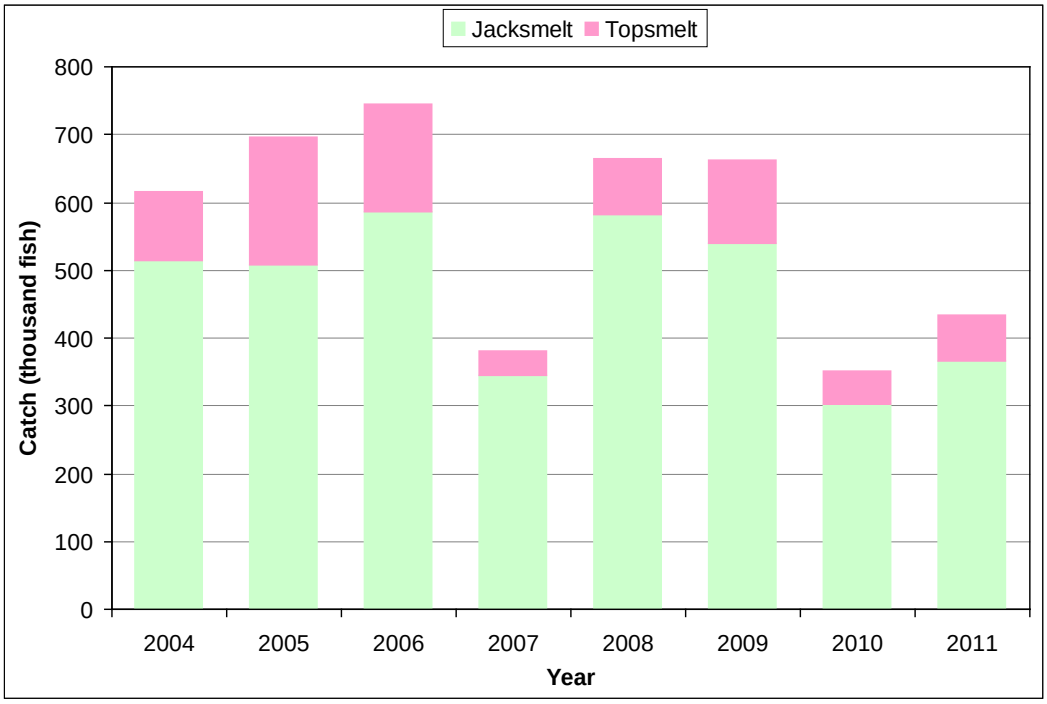


Figure 8-3. Silversides recreational catch, 2004-2011. Data source: CRFS data, all fishing modes and gear types combined, except grunion.

Status of Biological Knowledge

Jacksmelt

Jacksmelt range from Santa Maria Bay, Baja California, Mexico, to Yaquina, Oregon. Jacksmelt and topsmelt look similar to each other in that they are green to greenish-blue above, slivery on the sides with a blue midline stripe. Jacksmelt differ from topsmelt in that the anal fin originates between the two dorsal fins. The jacksmelt's teeth are not forked and are arranged in several bands on each jaw. Jacksmelt are reported to grow larger than topsmelt. The largest jacksmelt ever measured was 17.5 inches (44.5 centimeters) total length. Jacksmelt are schooling fish commonly found inshore and in bays near the surface.

Aging studies for jacksmelt were based primarily on length frequencies although annual growth rings on scales were used to ascertain maximum ages. Jacksmelt grow to an average length of 4.5 inches (11.4 centimeters) in their first year of life and 7.3 inches (18.5 centimeters) by the end of their second year, when most are sexually mature. Early research showed jacksmelt obtained a maximum age of nine or ten years, but in 1958, a 16 inch (40.6 centimeters) male taken off of Balboa pier was 11 years old.

Jacksmelt spawn in shallow waters between October and early April. Eggs range in size from 0.08-0.1 inches (2-2.5 millimeters) and are attached in masses by long filaments to submerged objects, usually kelp. Females can spawn several times during

the breeding season. Jacksmelt larvae and juveniles are found in abundance in the surface canopy of kelp.

Studies of the digestive system of silversides show that jacksmelt are omnivores feeding on detritus and algal material, but mainly feeding on a variety of zooplankton. Jacksmelt are important forage species for many marine birds, fish, and mammals.

Topsmelt

Topsmelt range from the Gulf of California to four miles (6.4 kilometers) west of Sooke Harbour, Vancouver Island, British Columbia, including Guadalupe Island, Baja California, Mexico. As with the jacksmelt, topsmelt are green to greenish-blue above, silvery on the sides, and have a blue midline stripe. The topsmelt's anal fin originates directly below the posterior end of the first dorsal fin. Topsmelt have forked teeth arranged in one row on the jaw, unlike the jacksmelt which has multiple rows of teeth. The largest recorded topsmelt was 14.5 inches (36.8 centimeters). Although topsmelt from different locations and habitats were once thought to be different subspecies due to the variation in external characteristics, topsmelt has been recognized for more than a quarter of a century as a single species. Topsmelt are also schooling fish that are common in the surface waters of bays, sloughs, and kelp beds.

Topsmelt grow from 2.5 to 4 inches (6.4 to 10.2 centimeters) during their first year with another 2 inches (5.1 centimeters) added during their second year, in which most are sexually mature. Ageing studies on topsmelt were conducted using length frequencies and by counting annual growth rings on scales to determine age and growth rates. The longest fish are 7 to 8 years old. Larger fish usually occur in the northern extremities of their range.

Topsmelt spawning season runs from mid-May to early July, when females, accompanied by several males, enter shallow water to spawn. The eggs are attached to eel grass or low growing algae. Topsmelt larvae and juveniles are found in abundance in the surface canopy of kelp.

Topsmelt feeding habits reflect the different habitats they can occupy. Those found in estuaries are primarily herbivorous whereas those found in kelp forests are carnivorous. Topsmelt are important forage species for many marine birds, fish, and mammals.

Status of the Population

Stock sizes for jacksmelt and topsmelt have not been determined. At present, there are no indications that either species is being over harvested.

Management Considerations

The commercial and recreational fisheries for both species have no season, size or harvest limits. At present the silverside commercial fishery is incidental and of low

economic importance, and therefore not foreseen to be over-exploited in the near future.

Because both species use bays and estuaries for spawning, they can be susceptible to adverse effects from pollution and habitat modification, especially the disturbance of eelgrass beds.

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Further Reading

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Silversides commercial landings (pounds) and value, 1994-2011.						
Year	Jacksmelt	Topsmelt	Grunion	Unspecified silversides	Total	Value
1994	15,084	69		35	15,188	$9,403
1995	5,391			1,200	6,591	$4,100
1996	36,662			162	36,824	$21,612
1997	40,766	133		130	41,029	$19,773
1998	2,537			34	2,571	$1,466
1999	2,538			24	2,562	$1,687
2000	16,003	981	73	237	17,294	$11,969
2001	74,971	406		6,334	81,710	$41,458
2002	81,449			432	81,881	$25,424
2003	20,919	20			20,939	$8,516
2004	38,322			205	38,527	$18,432
2005	9,747				9,747	$6,382
2006	5,785	12		5	5,802	$3,671
2007	20,661			84	20,745	$7,837
2008	19,116			4	19,120	$16,160
2009	33,664			118	33,782	$17,269
2010	4,999				4,999	$7,708
2011	6,321	19			6,340	$2,125

Data source: CFIS data, all gear types combined.

Silversides recreational catch (number of fish), 1980-2003.							
Year	Jacksmelt	Topsmelt	Total	Year	Jacksmelt	Topsmelt	Total
1980	796,323	66,096	862,419	**1994**	297,852	87,263	385,115
1981	657,910	28,444	686,354	**1995**	683,621	181,722	865,343
1982	343,591	61,474	405,065	**1996**	489,128	92,023	581,151
1983	379,888	86,476	466,364	**1997**	422,594	81,650	504,244
1984	441,024	28,423	469,447	**1998**	357,115	29,116	386,231
1985	356,449	163,516	519,965	**1999**	272,223	42,876	315,099
1986	255,676	156,159	411,835	**2000**	287,792	30,926	318,717
1987	559,038	154,528	713,566	**2001**	616,173	48,100	664,272

Silversides recreational catch (number of fish), 1980-2003.							
Year	**Jacksmelt**	**Topsmelt**	**Total**	**Year**	**Jacksmelt**	**Topsmelt**	**Total**
1988	683,089	233,911	917,000	**2002**	343,084	160,256	503,340
1989	606,798	95,087	701,885	**2003**	585,303	42,222	627,525
1993	1,066,864	10,197	1,077,060				

Data source: MRFSS data, all fishing modes and gear types combined, except grunion. Data for 1990-1992 are not available.

Silversides recreational catch (number of fish), 2004-2011.			
Year	**Jacksmelt**	**Topsmelt**	**Total**
2004	513,679	101,682	615,361
2005	508,604	188,580	697,185
2006	586,557	157,460	744,017
2007	345,602	34,371	379,973
2008	582,153	82,907	665,060
2009	539,271	123,983	663,253
2010	303,125	47,514	350,639
2011	365,768	67,215	432,983

Data source: CFRS data, all fishing modes and gear types combined, except grunion.