

Summary of the 2005-06 Tomales Bay Herring Fishery Season



Prepared
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In Tomales Bay, the 2005-06 spawning biomass estimate is 2,033 tons, which is a 45 percent decrease from the 2004-05 biomass estimate of 3,686 tons, and 48 percent less than the 14-season average of 3,887 tons (Average is based on seasons since the fishery re-opened in 1992.). The below-average spawning biomass estimate for the 2005-06 season could potentially be an effect of two separate anomalous events that created unfavorable environmental conditions. The first, an unusual warm water event off of Northern California, Oregon, and Washington occurred last spring and summer. This event was not considered an El Nino, but it reduced upwelling in the nearshore environment, which may have created unfavorable oceanic conditions for herring, which, in turn, may have resulted in higher mortality or displacement of herring in the Tomales Bay population. Second, the extraordinary amount of rainfall this season greatly increased the freshwater in-flow to Tomales Bay which reduced salinities in the bay, leading to poor spawning conditions and possible displacement of spawning herring to areas with more favorable conditions.

There were four major spawning events during the 2005-06 season totaling 2,014 tons of spawning escapement. Seven different spawning areas were utilized from November through January. The location of spawning events was similar to previous seasons, as spawning was confined to the southern half of Tomales Bay; however, the timing and magnitude of spawning changed this season. It was the second time since the 1999-2000 season that December spawning escapement did not account for at least 50 percent of the season's spawn escapement, as larger spawn events occurred in January. The spawning escapement total for January was above average for the 14-year period after the Tomales Bay fishery was re-opened for the 1992-93 season. Monthly totals, however, for November, December, February, and March were below average. Eelgrass (*Zostera marina*) and *Gracilaria spp.* resources in Tomales Bay appeared healthy and provided plenty of suitable spawning substrate for herring. Environmental conditions in Tomales Bay (i.e., freshwater inflow and salinity) may be a factor in the decline in spawning biomass this season. The large amount of rainfall, coupled with the duration of the rainfall in Tomales Bay, maintained low salinity levels for prolonged periods that may have created poor spawning conditions and deterred more herring from utilizing Tomales Bay as a spawning area. A similar event occurred in the 1997-98 season, when large amounts of rainfall reduced bay salinities and appeared to deter herring from entering Tomales Bay to spawn.

The first spawn of the season was on November 28, 2005, and was located just south of Marconi Cove near Tomasini Point on the northern end of vegetation bed 28A (Vegetation beds in Tomales Bay have been assigned numbers by the Department). The Department received a report of this spawn on December 2, but was unable to sample the spawn because it was subtidal, and the research vessel (*Ronquil*) was inoperable. Even though an estimate for the spawning escapement for this event could not be calculated, it appeared that the spawn was larger than a trace (less than 1 ton) event. Based upon historical data, timing of the spawn, and the observed area, it is unlikely that the spawn escapement would have exceeded 100 tons. The first time a survey was able to be done in Tomales Bay this season was December 16, 2005. No detectable spawn was located and it appeared that there were few fish in the bay. On December 30, 2005, we recorded a small spawn that resulted in 10 tons of escapement. Roe tests by the herring buyer indicated that the herring were still not ripe enough. On January 4, 2006, the commercial fleet landed 18.5 tons of herring with an average roe percentage of 13.2 percent.

Department staff attempted a spawn survey for the spawning event on January 4, but a damaged steering cable on the Department research vessel, *Ronquil* prevented a survey from being conducted. On January 10, a survey of the January 4 spawn was conducted with a boat borrowed from Department enforcement. The estimated spawning escapement from this event was the largest of the season totaling 1,226 tons. The spawn area was from Indian Beach to Teachers Beach which includes vegetation beds numbered as 1B, 1C, HD, and 1, and also included beds 28 and 28A described above. The final recorded spawn of the season was on January 21, and resulted in 777 tons of estimated spawning escapement. The spawning event was located primarily over vegetation bed 28A, with only a trace at vegetation bed 1. Spawn escapement did not reach 4,000 tons prior to February 15 and consequently, there was no quota increase to the maximum of 500 tons. During the 2005-06 season, the commercial gill net catch for the Tomales Bay herring fishery was below the Department's established initial quota of 400 tons. After January 21, 2006, the remainder of the commercial season was uneventful, despite reports of herring outside of Tomales Bay. Landings made on January 4, were the only commercial landings of the season. In total, nine boats and seventeen permittees made landings for the season.

The outlook for the Pacific herring fishery in Tomales Bay for the 2006-07 season is cautiously optimistic. It is possible that the anomalous warm water event that occurred last spring and summer had an adverse effect on the Tomales Bay herring stock. There is relatively weak La Nina predicted to persist for several months and at worst return to a more neutral state. La Nina events are cold water events that are often thought to be beneficial for cold water species like Pacific herring. The Tomales Bay herring fishery may potentially improve next season if beneficial oceanic conditions persist, and if the portion of the Tomales Bay herring stock that may have been displaced returns next season to Tomales Bay.

Table 1 Season Spawning Escapement

Spawning Wave	Spawning Date(s)	Spawning Bed Area(s)	Spawning Escapement (tons)
1	11/28/2005	28A	N/A
2	12/23/2005	28	10
3	1/4/2006	28A, 28, 1B, 1A, 1C, HD, 1	1,227
4	1/21/2006	28A, 1A	777
		Total	2,014

Table 2. Season Landings from Tomales Bay Gill Net Fleet.

Year	Pounds	Tons	Roe Count
<i>Tomales Bay Re-Opened with 2 1/8-inch Mesh and Outer Bodega Bay Closed</i>			
92-93	444,312	222.3	11.0
93-94	437,867	218.9	12.3
94-95	550,262	275.1	12.0
95-96	710,573	355.3	13.8
96-97	443,128	222	11.6
97-98*	0	0	--
98-99	104,722	54	15.0
99-00	83,258	42	15.2
<i>Tomales Bay Gill Net Mesh Study - 2-inch Mesh</i>			
00-01	596,987	298.5	12.4
01-02	708,374	354.2	15.4
02-03	156,351	78	14.0
03-04	559,320	279.7	12.6
04-05	59,523	29.8	13.3
05-06	37,039	18.5	13.2
Average	376,286	188	13.2

* No commercial landings.

Table 3. Tomales Bay Spawning Biomass 1972-73 to 2005-06

Season	Spawn Escapement (tons)	Catch (tons)	Percent Catch (Exploitation Rate)	Spawning Biomass (tons)
1972-73 ^{a, 1}	---	598	---	---
1973-74 ^a	6,041	521	7.9%	6,562
1974-75 ^a	4,210	518	10.9%	4,728
1975-76 ^b	7,769	144	1.8%	7,913
1976-77 ^b	4,739	344	6.7%	5,083
1977-78 ^b	21,513	646	2.9%	22,163
1978-79 ^{c, 1}	---	448	---	---
1979-80 ^c	5,420	603	10.0%	6,023
1980-81 ^c	5,128	448	8.0%	5,576
1981-82 ^c	6,298	851	11.9%	7,149
1982-83 ^c	10,218	822	7.4%	11,040
1983-84 ^c	1,170	110	8.5%	1,280
1984-85 ^d	6,156	430	6.5%	6,586
1985-86 ^{d, 2}	435	771	12.8%	6,000
1986-87 ^d	4,931	867	14.9%	5,798
1987-88 ^d	1,311	750	36.4%	2,061
1988-89 ^d	167	213	56.0%	380
1989-90 ^e	345	0	0.0%	345
1990-91 ^e	779	0	0.0%	779
1991-92 ^e	1,214	0	0.0%	1,214
1992-93 ^f	3,857	222	5.4%	4,079
1993-94 ^f	2,244	219	8.9%	2,463
1994-95 ^f	3,704	275	6.9%	3,979
1995-96 ^f	1,704	355	17.2%	2,059
1996-97 ^f	1,288	222	14.7%	1,510
1997-98 ^f	586	0	0.0%	586
1998-99 ^f	4,015	54	1.3%	4,069
1999-00 ^f	1,969	42	2.1%	2,010
2000-01 ^g	3,898	298	7.1%	4,196
2001-02 ^g	6,889	354	4.9%	7,243
2002-03 ^g	4,304	78	1.8%	4,382
2003-04 ^g	11,844	280	2.3%	12,124
2004-05 ^g	3,656	30	0.8%	3,686
2005-06 ^g	2,014	19	0.9%	2,033
AVERAGE	4,496	339	8.7%	4,847
92-93 to 05-06 AVG	3,712	175	5.3%	3,887
Mesh Study Average	5,434	177	3.0%	5,611

^a Catch with round haul from Tomales Bay.

^b Catch includes the use of round haul and gill net gear types, and herring caught from both Tomales Bay.

^c Catch is by gill net only, includes catch from Tomales and Bodega Bay. Use of round haul gear prohibited since 1978-79 season, in Tomales Bay and Bodega Bay.

^d Catch is by gill net only with minimum mesh size of 2-inches, includes catch from Bodega Bay.

^e Tomales Bay fishery is closed. Bodega Bay fishery remains open with gill nets, minimum mesh size of 2-inches.

^f Bodega Bay fishery is closed and Tomales Bay fishery is re-opened with gill nets with a minimum mesh size of 2 1/8 – inches.

^g Bodega Bay fishery remains closed. Gill nets with a minimum mesh size of 2-inches are allowed during the gill net mesh study, in progress. The mesh study is being conducted to evaluate the use of a minimum mesh size of 2-inch gill nets on the Tomales Bay Population

¹ Spawning ground escapement survey not conducted to generate the spawning biomass.

² Spawning biomass estimated by cohort analysis for this season.

Table 4. Estimated Numbers (x 1,000) of Herring-at-Age in the Tomales Bay Spawning Population, 1993 to present

Age and Percent Composition																			
Season	1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%	9	%	Total
93-94	0	0	567	2.8	3,329	16.7	6,021	30.1	3,329	16.7	5,171	25.9	1,062	5.3	425	2.1	71	0.4	19,974
94-95	0	0	4,446	13.9	10,209	32.0	4,281	13.4	3,293	10.3	5,846	18.3	2,717	8.5	988	3.1	165	0.5	31,945
95-96	0	0	1,000	5.6	1,643	9.2	7,287	40.6	5,930	33.1	1,072	6.0	214	1.2	786	4.4	0	0	17,932
96-97	0	0	117	1.0	2,225	18.4	4,625	38.2	4,098	33.8	820	6.8	234	1.9	0	0	0	0	12,118
97-98																			
98-99	0	0	11,655	25.1	14,127	30.5	14,598	31.5	4,827	10.4	1,177	2.5	0	0	0	0	0	0	46,383
99-00	0	0	487	2.2	5,606	25.4	10,603	48.1	4,753	21.5	244	1.1	366	1.7	0	0	0	0	22,059
00-01	0	0	6,983	16.7	17,642	42.1	15,437	36.8	1,838	4.4	0	0	0	0	0	0	0	0	41,900
01-02	0	0	19,379	25.3	35,776	46.8	17,060	22.3	4,306	5.6	0	0	0	0	0	0	0	0	76,521
02-03	0	0	15,113	29.3	22,589	43.8	11,613	22.5	2,148	4.2	80	0.2	0	0	0	0	0	0	51,542
03-04	0	0	45,193	31.7	55,565	39.0	26,548	18.6	11,483	8.1	2,593	1.8	1,235	0.9	0	0	0	0	142,616
04-05	0	0	10,560	25.0	18,170	43.1	9,498	22.5	3,481	8.3	472	0	0	0	0	0	0	0	42,181
05-06																			
Mean	0	0	10,500	16.2	16,989	31.5	11,597	29.5	4,499	14.2	1,588	5.7	530	1.8	200	0.9	21	0.1	45,925

Note: 1997-98 and 2005-06 seasons not included due insufficient data set for expansion