

Summary of the 2003-2004 Pacific Herring Spawning Season and Commercial Herring Fishery for Tomales Bay



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Review of the 2003-04 Tomales Bay Pacific Herring Fishery Season by Month

November

We had received reports at the beginning of the month from local fishermen that a school of herring was in the bay. Our field season didn't start until November 11, due to problems associated with hiring a scientific aide. On the bay, we were able to find several scattered groups of herring that were catchable. Typically, we are rarely able to catch November fish because they don't hold in the bay very long before spawning, and most of our effort is concentrated on mapping eelgrass beds instead of catching herring. This season we put forth a greater effort to capture these November herring because of the early success we had this season. On November 18, 2003 we had to pull our 19 ft. research vessel, *Ronquil*, to get the steering cable and rotary helm replaced. Despite our boat troubles, we continued our surveys from a 13 ft research vessel, *Macoma*. Prior to Thanksgiving the smaller groups of herring coalesced into two larger groups, one working above Laird's Landing and the other below. The marks we saw on the fathometer were the best we had seen so far. It appeared that a Thanksgiving weekend spawning event could occur as it did last season. However, after returning to the field after Thanksgiving we did not find any signs of spawning. At the end of November, herring were still present in the bay, yet no spawning had occurred.

Gracilaria density seemed to greatly reduced in some areas (MC, 28A), but more evenly distributed across beds (28A, 1B, 1A). This season there was an abundance of juvenile brown smoothhounds and sardines as incidental catch in our herring research gill nets. Another interesting note was the increased abundance of sea lions in the bay. The past few seasons we have had one or two come in the bay during herring season. This year there were rafts of sea lions working fish mid-bay south of Pelican Point. These changes in the species composition and abundance within the bay may indicate changes in oceanic conditions that may also influence herring population changes this season.

December

On December 1, 2003, there were still herring present in Tomales Bay despite the lack of spawning in November. We set our net on what appeared to be good marks of herring in the hole south of Pelican Point. Instead of herring, our net was plugged with sardines, with a couple of herring mixed in the catch. We concluded that the rafts of sea lions in the area were most likely working on the sardines, so we stopped fishing in the area. On the following day, December 2, 2003, we had difficulty finding good marks in the southern part of the bay. On December 3, 2003, we were able to catch herring during a spawning event at bed 28. This spawning event lasted from December 3-5, and involved beds 28,

28A, 1B, 1C, and 1A. The herring from this school were noticeably larger in size than what we have seen in recent seasons because of a higher percentage of 200+ mm fish.

After spending time in the lab working up spawn samples, we returned to the bay on December 8, 2003, and found a new herring school in the bay with a mix of sardines. This school continued to build throughout the month. On December 19, 2003, there was a large percentage of unripe females in the school that had been building; however it appeared that the ripened fish might not hold until the opening of the herring fishery on December 28, 2003. While monitoring the school on December 26, 2003, we did not find any signs of spawning, so it seemed that fish might be available at the opening of the fishery. The fishery opened at noon on December 28, and we received reports that the herring had started spawning on Saturday, December 27, 2003. The fishermen expressed some concern over the amount of spent fish in the catch, but initial tests of the catches yielded roe counts of 11%. Fishermen decided to fish the tail end of the spawning event. Fishing effort yielded 22.3 tons at 10.9% roe, and an additional 32.0 tons were landed at 9.8% roe on December 29, 2003. The low roe counts found in the catch was due to the high percentage of spawn outs, abundance of males, and in later landings an increased amount of new unripe fish in the catch. This spawning event was the largest of the season and involved beds 29, MAF, MC, 28A, 28, 1B, 1C, 1A, HD, 1, 2, 2A, 3, and 4.

January

The beginning of January was spent in the laboratory working up spawn from the end of December. We arrived back on the water January 5, to find that fishermen were already catching herring. It was surprising that this new school would be caught so easily after the large spawn. As a result, there was, 71.0 tons landed at 12.4% roe from January 4 to January 7, 2004. In spite of our efforts to collect research samples of herring from this school, we were unable to find herring marks during the day, when we are fishing our research gear. The fishermen however, were able to catch herring at night while the school would run on and off the beaches and hang just off the vegetation beds. We did not find any evidence of spawning associated with these landings regardless of the activity. A storm arrived on January 7, 2004, and caused the herring schools to break up according to fishermen. By January 8, we determined that preliminary spawning escapement estimates, from the two spawning events that had already occurred this season, had surpassed both the 3,000 ton and 4,000 ton levels. Therefore, pursuant to regulation, the season quota was increased to the 500 ton maximum. Amidst the storm on January 9, 2004, we attempted to locate a reported spawn in the Sacramento Landing-Duck Cove area, but did not find any new spawn in that area. While continuing to search for spawn, we encountered a large area of dense marks of herring. We had not seen the same marks during the day but the weather was too rough for us to set a gill net on the marks. We arrived on January 12, to find that fishermen had landed 42.5 tons at 12.8 % roe. Spawning had begun late on January 9, and ended by January 11, so fishermen

were able to catch the tail end of the spawning event. This spawning event was located at beds MAF, MC, 28A, 28, 1B, 1C, 1A, 26, 27, and 30. We also found spawn on *Gracilaria* along Tomales Bay Oyster Company, and on eelgrass patches in the Inverness area.

After processing spawn samples, we were back out on the water by January 15, and were able to locate and catch herring holding in the mid-bay holes. On January 19, fishermen were able to catch herring, but only 2.8 tons at 12.0% roe was landed. On January 21, 5.9 tons were landed at 11.2 % roe. Our research vessel, *Ronquil* broke down on January 21, with a broken fuel pump and kicker motor. Appreciatively, Harold Ames took some time out from fishing and towed us back to the dock. Harold thanks again! Unfortunately, the *Ronquil* was out of commission for over a week due to difficulty finding a replacement fuel pump. While the r/v *Ronquil* was being repaired, we were still able to survey on the water with our smaller research vessel the *Macoma*. The herring school continued to ripen, and on January 26-27, 2004, 48.7 tons at 14.3% roe, and 20.2 tons and 14.4% roe were landed respectively. Associated with these landings were two very small spawns, one at the tip of the eelgrass bed in front of Maffucci's, and the other in front of Tony's Restaurant. The spawning in these areas may have been more likely due to heavy fishing effort in the area. The bulk of herring school was not spawning and the coverage in these spots was very light. The rest of the month herring teased fishermen by hanging just off of the bed areas.

February

Herring held throughout the weekend without spawning. One landing occurred on February 3, 2004, in the amount of 0.3 tons at 17.7 % roe. At bed 1B, we found a small trace spawn at Shell Beach. By Wednesday, February 4, 2004, the herring were in full spawning mode. Most of the fishing activity was along the western shoreline from Duck Cove to Marshall Beach. According to fishermen, there were a lot of small fish going through the nets. Total landings for the day were 33.3 tons at 14.5% roe. Spawning that occurred on February 3-4, was located at beds MC, 28A, 28, 1A, 1B, 1C, HD, 1, 2, DC, 3, 4, 5, 6, 7, and 8. Despite reports of herring schools in the bay, the remainder of February was uneventful. We were able catch a few herring in our research nets, but couldn't find any decent herring marks in the bay. Despite the March 5 closure date for the Tomales Bay fishery, the fish pump was removed on February 23. No further spawns were recorded in February.

March

On March 2, 2004, we found what we thought was a large school of herring being worked by cormorants and seals near Laird's Landing. We set our nets but only got shiner surfperch and a couple of sardines. The next day, we tried to locate and set on the school again. This time we caught a couple of herring along with

shiner surfperch, white croakers, and sardines. This mixed school broke up soon after and we were unable to find marks. While testing underwater video equipment, to assess its value as a survey tool, at bed 28A, we spotted herring eggs on *Gracilaria*. We decided to set our gill nets and were able to catch herring while they were spawning. The spawn was centralized at bed 28A, near the oyster racks, with trace spawns at beds 1, 1A, and 2.

Table. 1 2003-2004 Season Spawning Escapement Summary

Spawn Date	Bed	Area (m ²)	Spawning Escapement (tons)
12/3/2003	28	83,057	762
12/3/2003	28A	89,924	1,489
12/4/2003	1B	39,692	95
12/4/2003	1C	6,176	5
12/5/2003	1A	52,542	66
12/28/2003	1A	78,037	822
12/28/2003	28A	117,850	628
12/29/2003	28	97,611	272
12/29/2003	MC	19,407	119
12/29/2003	MAF	15,205	16
12/29/2003	29	1,819	2
12/29/2003	1B	70,626	1,753
12/29/2003	1C	16,974	247
12/29/2003	HD	11,084	133
12/29/2003	1	13,891	35
12/29/2003	2	18,399	128
12/29/2003	2A	3,220	2
12/29/2003	3	7,919	66
12/29/2003	4	53,004	4
1/9/2004	28	97,611	421
1/10/2004	INV & 30	28,382	30
1/10/2004	28A	117,850	1,114
1/10/2004	MC	19,407	38
1/10/2004	MAF	15,205	36
1/10/2004	27	24,595	81
1/10/2004	1B	70,627	1,096
1/11/2004	TOM	21,673	206
1/11/2004	26	196,758	170
1/11/2004	1A	31,930	31
1/11/2004	1C	16,974	25
1/11/2004	HD	11,084	21
1/11/2004	1	13,891	43
1/26/2004	MAF		TRACE
1/27/2004	TONY'S	2,779	2
2/3/2004	28	45,521	22
2/3/2004	28A	117,850	1,243
2/3/2004	MC	19,407	186
2/4/2004	1B		TRACE
2/4/2004	1C		TRACE
2/4/2004	1A	49,680	157
2/4/2004	HD	11,084	31
2/4/2004	1	13,891	3
2/4/2004	DC		TRACE
2/4/2004	2	18,399	30
2/4/2004	LAIRD'S	8,098	28
2/4/2004	3	7,919	9
2/4/2004	4	5,304	9
2/4/2004	5	5,747	2
2/4/2004	6	10,484	TRACE
2/4/2004	7	13,941	6

2/4/2004	8		TRACE
3/3/2004	28A	39,294	158
3/4/2004	1A		TRACE
3/4/2004	1		TRACE
3/4/2004	2		TRACE
		TOTAL	11,844

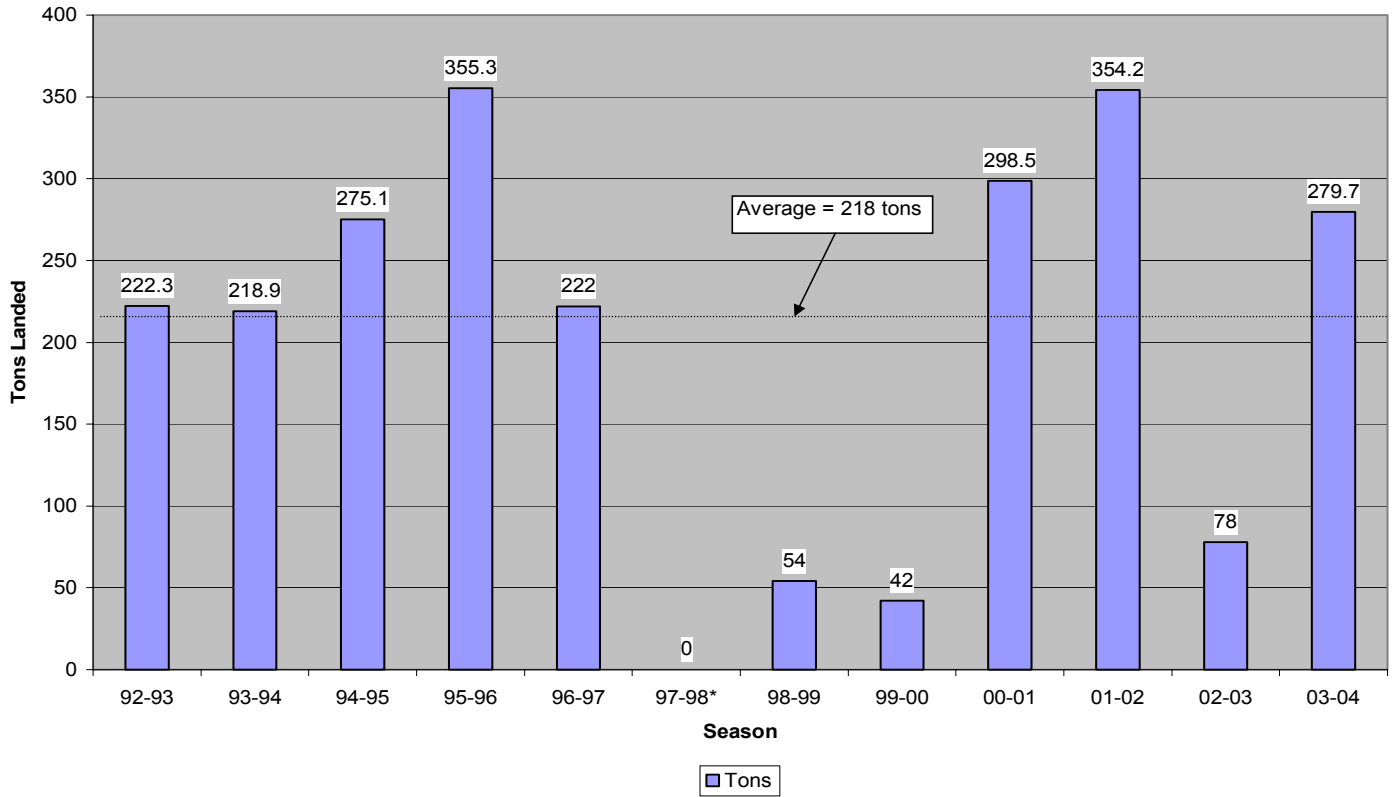
Table. 2 Daily Landings by Tomales Bay Gill Net Fleet for 2003-2004 Season

Date	Pounds	Tons	Tickets	Pounds/Ticket	Tons/Ticket	Roe Count
12/28/2003	44,730	22.4	11	4,066.4	2.0	10.7
12/29/2003	64,021	32.0	22	2,910.0	1.5	9.7
1/4/2004	5,198	2.6	2	2,599.0	1.3	10.8
1/5/2004	86,221	43.1	23	3,748.7	1.9	11.8
1/6/2004	48,870	24.4	18	2,715.0	1.4	13.0
1/7/2004	1,876	0.9	4	469.0	0.2	12.3
1/12/2004	84,981	42.5	22	3,862.8	1.9	13.1
1/19/2004	5,690	2.8	13	437.7	0.2	11.8
1/21/2004	11,821	5.9	19	622.2	0.3	11.0
1/22/2004	874	0.4	2	437.0	0.2	15.8
1/26/2004	97,330	48.7	20	4,866.5	2.4	14.4
1/27/2004	40,483	20.2	19	2,130.7	1.1	14.8
2/3/2004	569	0.3	2	284.5	0.1	17.7
2/4/2004	66,656	33.3	18	3,703.1	1.9	14.6
Totals	559,320	279.7	195			
Average				2,868.3	1.4	12.6

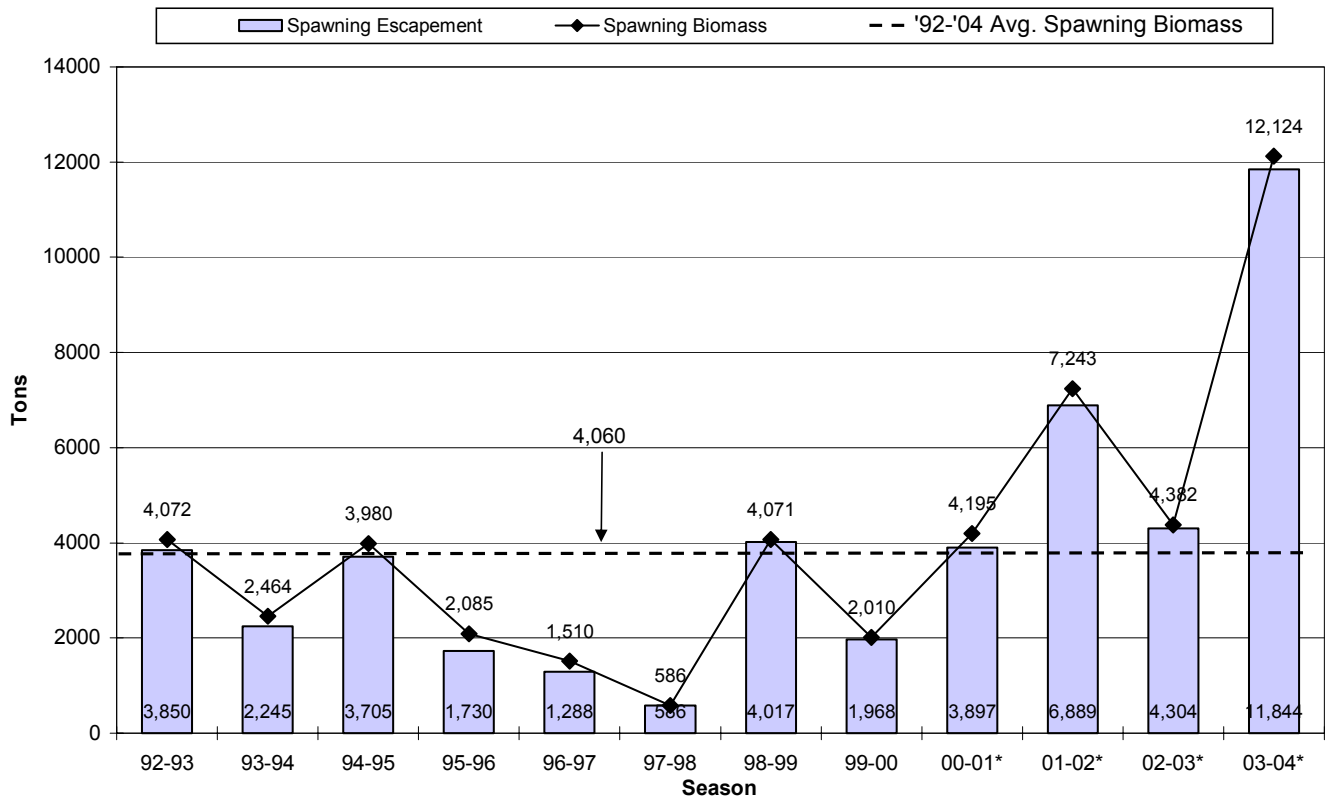
Table. 3 Season Landings from the Tomales Bay Gill Net Fleet

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
Average	435,923	218	13.2

Figure. 1 Tomales Bay Herring Fishery Season Landings



**Figure. 2 Tomales Bay
Herring Spawning Biomass and Escapement by Season**



* Indicates change from 2 1/8" mesh to 2" mesh

Table. 4 Tomales Bay Herring Biomass Estimates 1992-93 through 2003-04 Seasons

Season	Spawn Escapement (tons)	Catch (tons)	Percent Catch (Exploitation Rate)	Spawning Biomass (tons)
1992-93	3850	222	5.5%	4,072
1993-94	2245	219	8.9%	2,464
1994-95	3705	275	6.9%	3,980
1995-96	1730	355	17.0%	2,085
1996-97	1288	222	14.7%	1,510
1997-98	586	0	0.0%	586
1998-99	4017	54	1.3%	4,071
1999-00	1968	42	2.1%	2,010
2000-01*	3897	298	7.1%	4,195
2001-02*	6889	354	4.9%	7,243
2002-03*	4304	78	1.8%	4,382
2003-04*	11844	280	2.3%	12,124
AVERAGE	3,860	200	4.9%	4,060
Mesh Study Average	6,734	253	3.6%	5,273

Table. 5 Tomales Bay Escapement Data in Tons

Season	November	December 1-15	December 16-31	January 1-15	January 16-31	February 1-15	February 16-28	March	Totals
92-93	0	116	1,230	345	0	2,140	18	0	3,850
93-94	19	370	0	290	906	660	0	0	2,245
94-95	27	90	2	2,614	0	970	0	2	3,705
95-96	84	600	431	2	225	0	387	0	1,730
96-97	292	0	722	116	132	21	0	5	1,288
97-98	6	0	195	T	0	236	83	66	586
98-99	0	507	0	1,544	T	1,966	0	T	4,017
99-00	T	105	29	985	376	473	T	T	1,968
00-01	T	344	2,478	0	934	140	1	0	3,897
01-02	577	46	4,522	0	1,597	0	147	T	6,889
02-03	26	71	2,319	1,118	219	551	0	T	4,304
03-04	0	2,416	4,229	3,312	2	1,727	0	158	11,844
Avg. Tons Per Month	103	389	1,346	939	399	740	58	29	3,860

Table. 6 Tomales Bay Percent Escapement

Season	November	December 1-15	December 16-31	January 1-15	January 16-31	February 1-15	February 16-28	March	Totals
92-93	0	3	32	9	0	56	0	0	100
93-94	1	16	0	13	40	29	0	0	100
94-95	1	2	0	71	0	26	0	0	100
95-96	5	35	25	0	13	0	22	0	100
96-97	23	0	56	9	10	2	0	0	100
97-98	1	0	33	0	0	40	14	11	100
98-99	0	13	0	38	0	49	0	0	100
99-00	0	5	1	50	19	24	0	0	100
00-01	0	9	64	0	24	4	0	0	100
01-02	8	1	66	0	23	0	2	0	100
02-03	1	2	54	26	5	13	0	0	100
03-04	0	20	36	28	0	15	0	1	100
Avg. % Per Month 92-04	3.3	8.8	30.6	20.3	11.2	21.5	3.3	1.1	100
Cumulative % Per Month 92-04	3.3	12.1	42.6	63.0	74.2	95.7	98.9	100.0	100

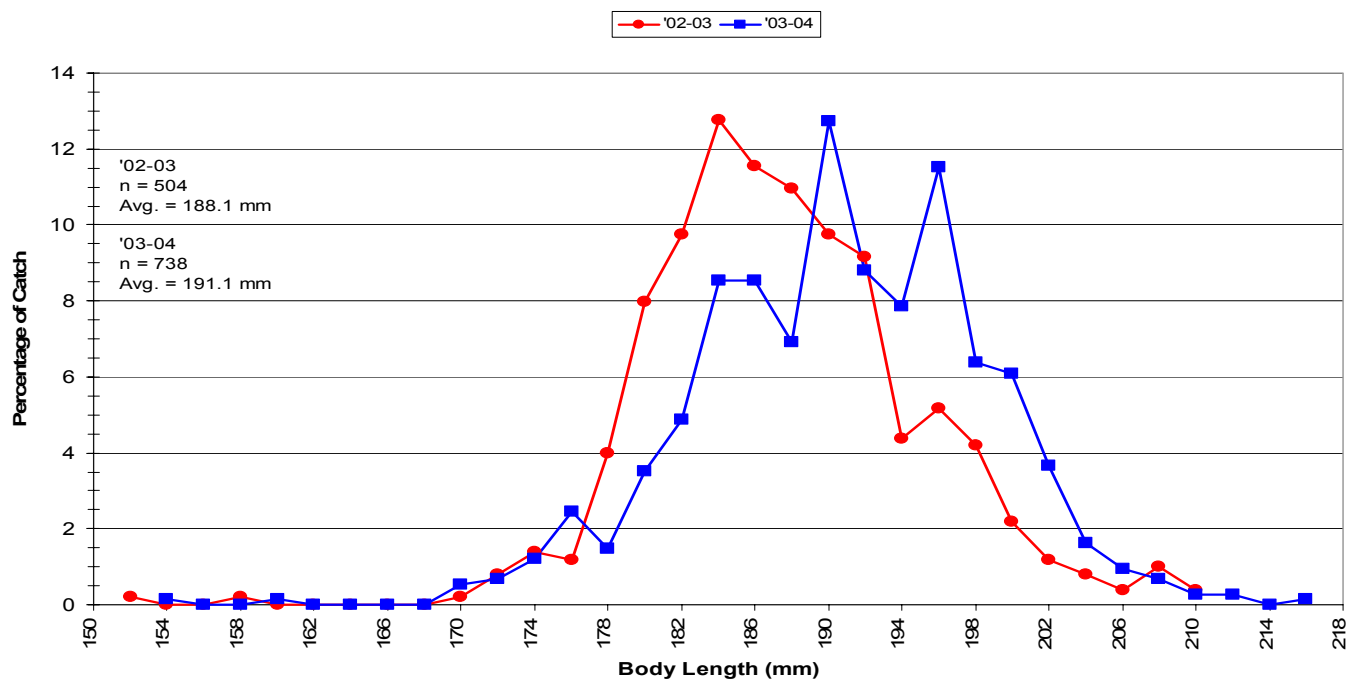
Table. 7 Mean Length and Sex Ratio of Commercial Gill Net Catch and Research Catch

Date	Commercial Gill Net (2-inch mesh) Mean Body Length (mm)	Sex Ratio (% M/F)
12/29/2003	193.7	56.25 / 43.75
1/5/2004	190.4	38.75 / 61.25
1/6/2004	192.2	41.25 / 58.75
1/21/2004	187.9	47.5 / 52.5
1/26/2004	190.9	42 / 58
1/27/2004	189.1	43.75 / 56.25
2/2/2004	186.0	55 / 45
2/3/2004	188.2	50 / 50
2/4/2004	191.4	30 / 70
Average	191.1	47.3 / 52.7
School	Research Multi-Panel Gill Net Mean Body Length (mm)	Sex Ratio (% M/F)
1	183.9	60.5 / 39.5
2	167.3	42.8 / 57.2
3	171.8	50 / 50
4	166.4	46.1 / 53.9
5	177.4	72.4 / 27.6
Average	171.5	51.4 / 48.6

Table. 8 Historical Lengths of Tomales Bay Commercial Gill Net Catches, 1992-93 to 2003-04

Year	Commercial Gill Net Mesh Size	Average Length (mm)
<i>Tomales Bay Gill Net Fishery Re-Opens with 2 1/8-in Mesh</i>		
1992-93	2.125 inches	196.4
1993-94	2.125 inches	197.3
1994-95	2.125 inches	195.5
1995-96	2.125 inches	189.2
1996-97	2.125 inches	194.8
1997-98*	2.125 inches	196
1998-99	2.125 inches	186.3
1999-00	2.125 inches	187.6
<i>Tomales Bay Mesh Study- Mesh Size Reduced to 2.0-in</i>		
2000-01	2.0 inches	188
2001-02	2.0 inches	187.7
2002-03	2.0 inches	188.1
2003-04	2.0 inches	191.1
Average	---	191.5

Figure. 3 Tomales Bay Commercial Gill Net Catch 2002-03 versus 2003-04



**Figure. 4 Tomales Bay 2003-2004
Commercial Gill Net Catch
Size Range with Mean Length per Catch**

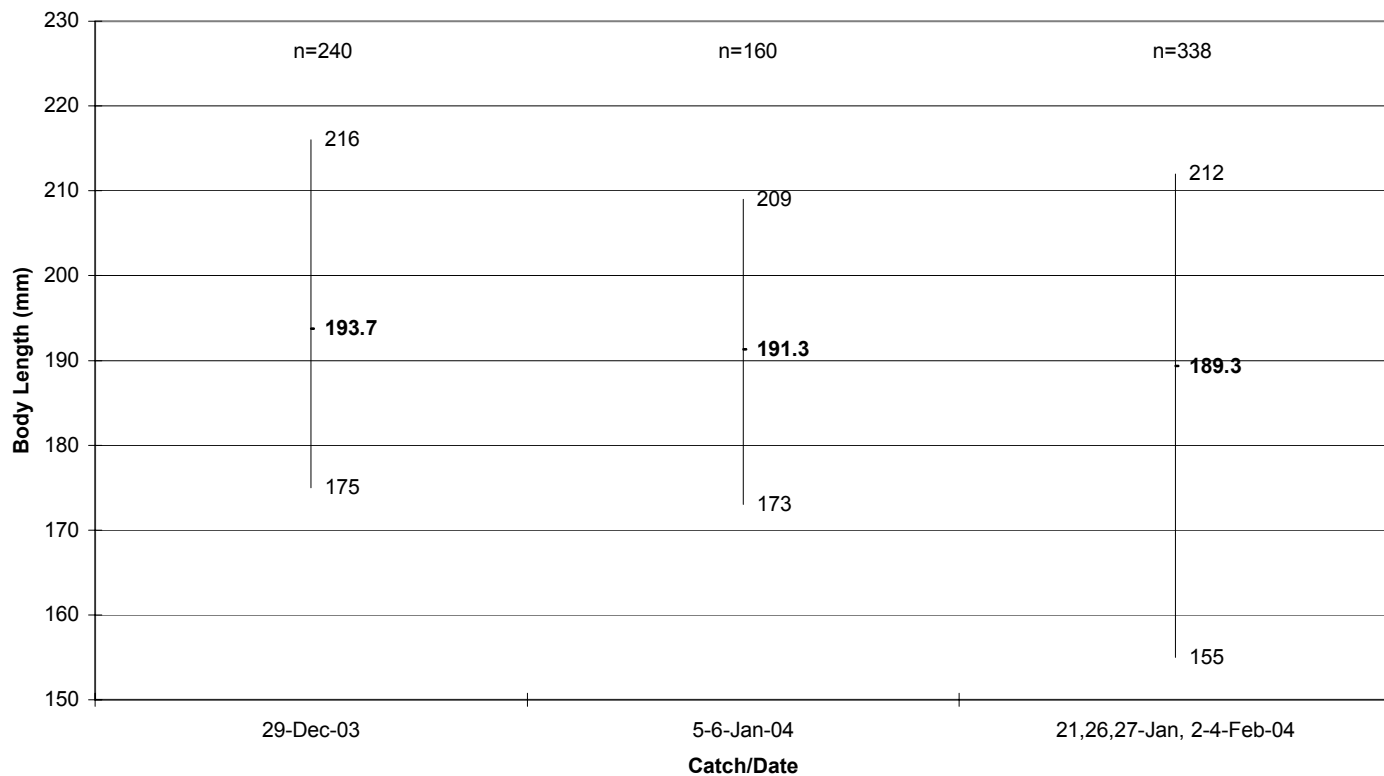
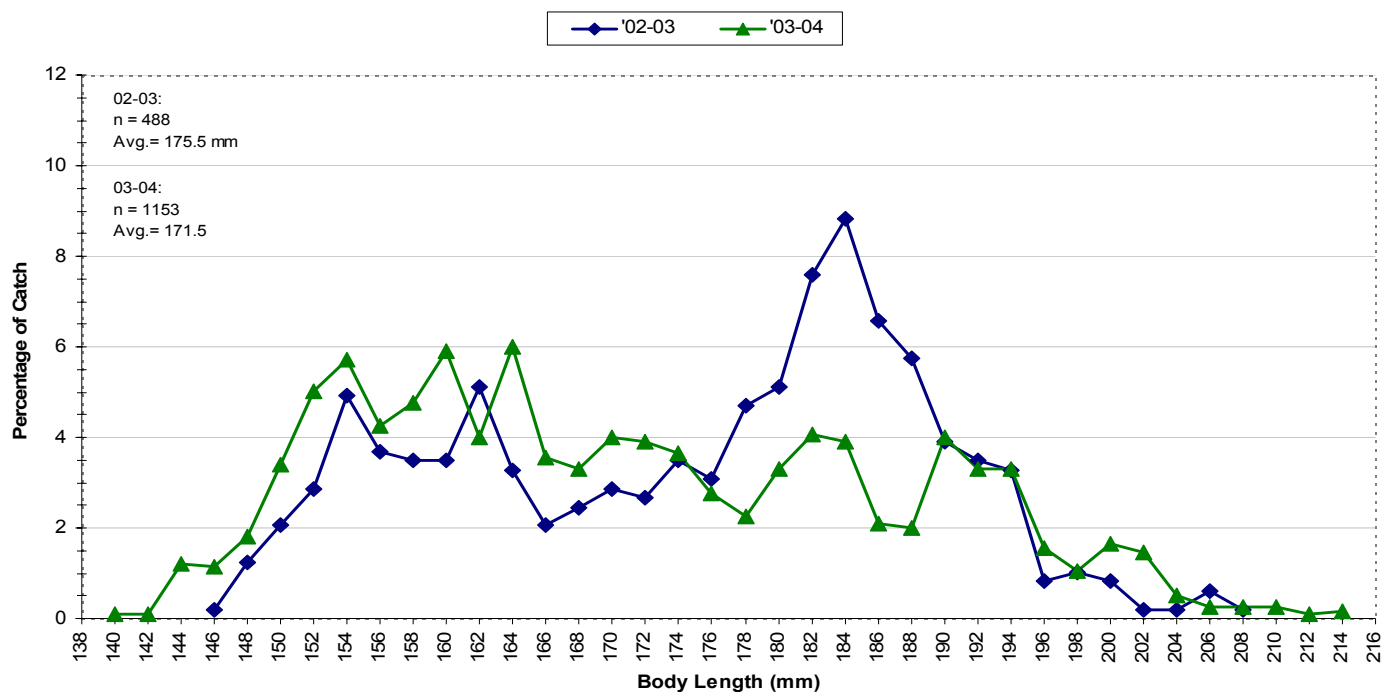
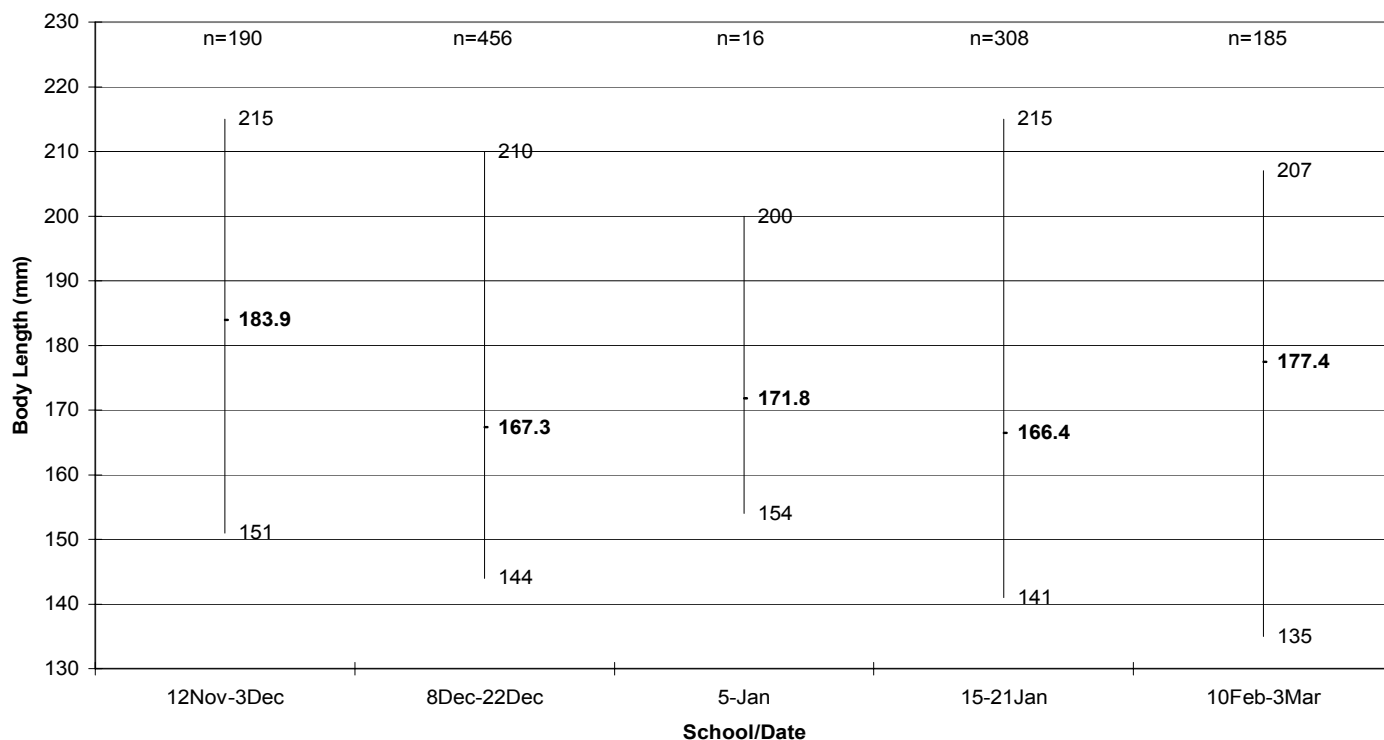


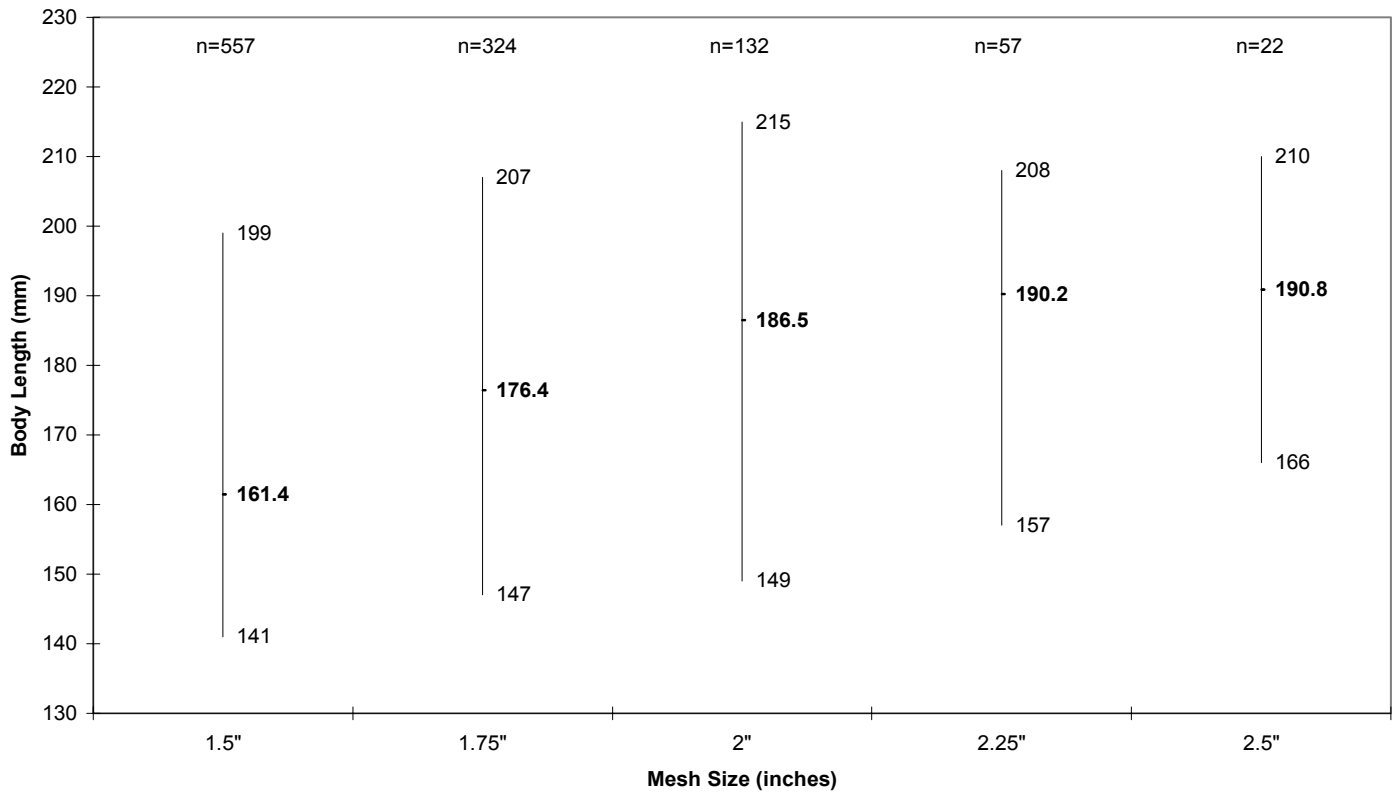
Figure. 5 Tomales Bay Research Multi-Panel Gill Net Catch 2002-03 versus 2003-04



**Figure. 6 Tomales Bay 2003-2004
Research Gill Net Catch
Size Range with Mean Length per School**



**Figure. 7 Tomales Bay 2003-2004 Research Gill Net Catch
Size Range with Mean Length by Mesh Size**



**Figure. 8 Tomales Bay 2003-04
Commercial (2" Mesh) Gillnet Catch versus Research Multi-Panel Gill Net Catch**

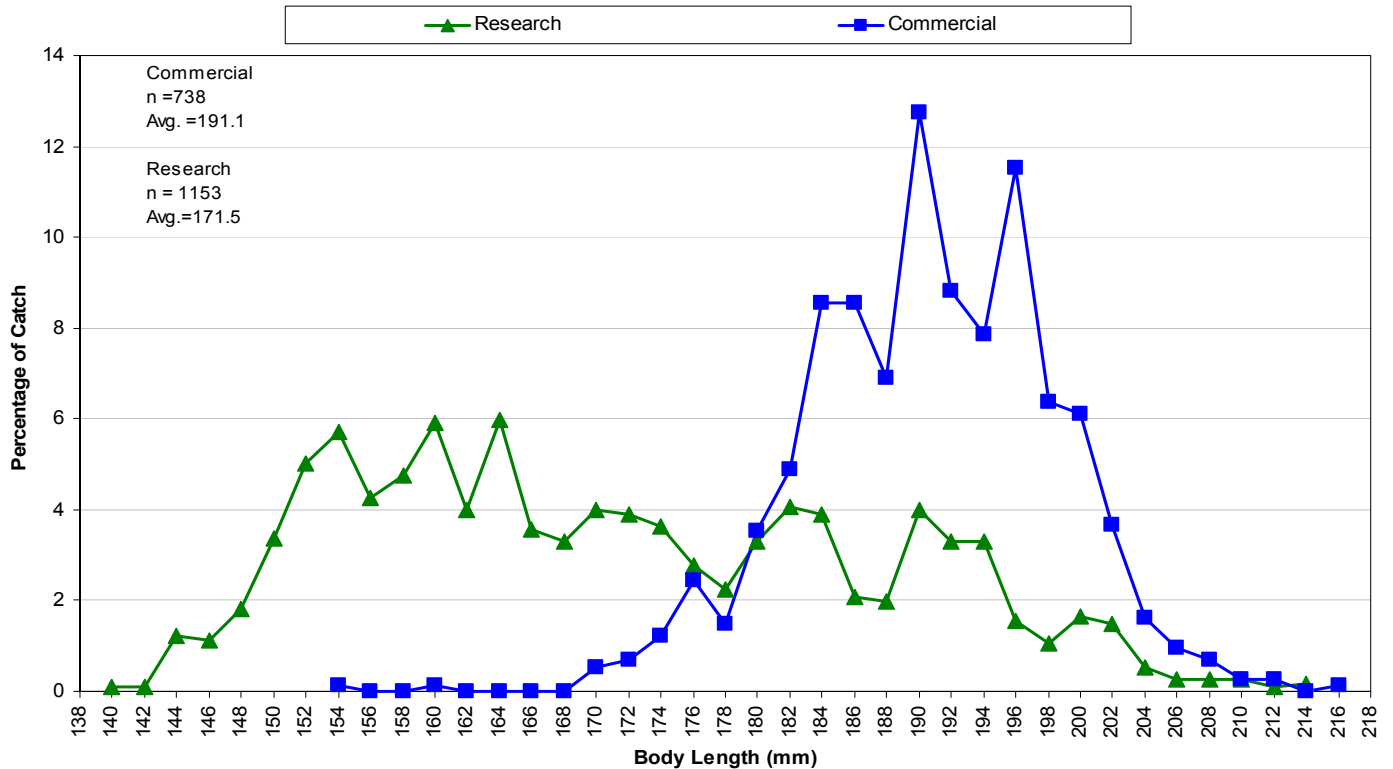


Figure. 9 Tomales Bay 2003-2004 Sex Ratios By Mesh Size

