

SUMMARY OF 1991-92 SPAWNING-GROUND SURVEYS IN TOMALES BAY
AND BODEGA BAY HERRING CATCH SUMMARY.

Prepared for
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by

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DAILY LANDINGS AND BIOLOGICAL
CHARACTERISTICS OF THE
1991-92 BODEGA BAY HERRING CATCH

Table 1. Daily Landings by Bodega Bay Gillnet Fleet

DATE	POUNDS	TONS	TRIPS	LBS/TRIP	ROE COUNT
01/13/92	928	0.46	2	464.00	8.258
02/13/92	20579	10.29	11	1870.82	15.414
02/14/92	25618	12.81	17	1506.94	14.183
TOTAL	47125	23.56	30	1570.83	14.604

QUOTA = 200 TONS

CATCH = 23.56

QUOTA REMAINING = 176.44

Table 2. Mean length (mm BL) of the gill net catch.

Date	Mean Length	Sex Ratio M/F
Jan 13, 1992	194.6	46/54 (n= 156)
Feb 13 & 14, 1992	192.8	40/60 (n= 420)
Feb 26, 1992	187.3	30/70 (n= 88)
Average	192.5	40/60
5 yr average	1990-91	1991-92
200	196	192.5

TABLE 3. Research Gillnet Catch From 2-inch Mesh Panel, Tomales Bay, January 16, 1992.

LENGTH INTERVAL	FREQUENCY				SEX	TOTAL
	UNRIPE	RIPE	MALE	TOTAL		
150 - 151	0	0	0	0	0	0
152 - 153	0	0	0	0	0	0
154 - 155	0	0	0	0	0	0
156 - 157	0	0	0	0	0	0
158 - 159	0	0	0	0	0	0
160 - 161	0	0	0	0	0	0
162 - 163	0	0	0	0	0	0
164 - 165	0	0	0	0	0	0
166 - 167	0	0	0	0	0	0
168 - 169	0	0	0	0	0	0
170 - 171	0	0	2	1	0	3
172 - 173	0	0	0	0	0	0
174 - 175	0	0	0	0	0	0
176 - 177	0	0	0	2	0	2
178 - 179	0	0	0	0	0	0
180 - 181	0	1	1	2	0	2
182 - 183	0	1	0	0	0	1
184 - 185	0	1	0	1	0	2
186 - 187	0	3	1	4	0	4
188 - 189	0	2	0	2	0	4
190 - 191	0	0	0	0	0	0
192 - 193	0	3	3	0	0	4
194 - 195	0	2	1	0	0	5
196 - 197	0	0	0	2	0	2
198 - 199	0	1	0	0	0	3
200 - 201	0	0	0	0	0	0
202 - 203	0	0	0	0	0	1
204 - 205	0	0	0	0	0	0
206 - 207	0	0	2	0	0	2
TOTALS	0	14	7	21	0	36
% TOTALS	0.0	38.9	19.4	58.3	0.0	100
MEAN	0.0	189.1	188.0	188.7	0.0	189.2
VARIANCE	0.0	26.2	234.0	87.5	0.0	84.7
STANDARD DEV	0.0	5.1	15.3	9.4	0.0	9.2
STANDARD ERROR	0.0	1.4	5.8	2.0	0.0	1.5

TABLE 4. Commercial Gill Net Catch Samples Bodega Bay, January 13, 1992 Through February 26, 1992.

LENGTH INTERVAL	FREQUENCY				SEX	TOTAL				
	UNRIPE	RIPE	SPENT	MALE						
	UNRIPE	RIPE	MALE	UNRIPE	RIPE	FEMALE	SPENT	FEMALE	MALE	TOTAL
150 - 151	0	0	0	0	0	0	0	0	0	0
152 - 153	0	0	0	0	0	0	0	0	0	0
154 - 155	0	0	0	0	0	0	0	0	0	0
156 - 157	0	0	0	0	0	0	0	0	0	0
158 - 159	0	0	0	0	0	0	0	0	0	0
160 - 161	0	0	0	0	0	0	0	0	0	0
162 - 163	0	2	0	0	0	0	0	0	0	2
164 - 165	0	1	0	0	0	0	0	0	0	1
166 - 167	0	1	0	0	0	0	0	0	0	1
168 - 169	0	1	0	0	0	0	0	0	0	1
170 - 171	0	0	0	0	0	0	0	0	0	0
172 - 173	0	3	0	0	0	0	0	0	0	3
174 - 175	0	3	0	0	0	0	0	0	0	3
176 - 177	1	4	0	0	0	0	0	0	0	5
178 - 179	0	7	0	0	0	0	0	0	0	7
180 - 181	0	10	0	0	0	0	0	0	0	10
182 - 183	3	18	0	0	0	0	0	0	0	21
184 - 185	1	10	0	0	0	0	0	0	0	11
186 - 187	3	20	0	0	0	0	0	0	0	23
188 - 189	1	17	0	0	0	0	0	0	0	18
190 - 191	1	24	0	0	0	0	0	0	0	25
192 - 193	1	16	0	0	0	0	0	0	0	17
194 - 195	2	14	0	0	0	0	0	0	0	16
196 - 197	2	22	0	0	0	0	0	0	0	24
198 - 199	0	13	0	0	0	0	0	0	0	13
200 - 201	2	12	0	0	0	0	0	0	0	14
202 - 203	1	10	0	0	0	0	0	0	0	11
204 - 205	1	6	0	0	0	0	0	0	0	7
206 - 207	2	8	0	0	0	0	0	0	0	10
208 - 209	0	2	0	0	0	0	0	0	0	2
210 - 211	0	2	0	0	0	0	0	0	0	2
212 - 213	0	1	0	0	0	0	0	0	0	1
214 - 215	0	5	0	0	0	0	0	0	0	5
216 - 217	0	3	0	0	0	0	0	0	0	3
218 - 219	0	1	0	0	0	0	0	0	0	1
220 - 221	0	0	0	0	0	0	0	0	0	0
222 - 223	0	1	0	0	0	0	0	0	0	1
224 - 225	0	3	0	0	0	0	0	0	0	3
226 - 227	0	2	0	0	0	0	0	0	0	2
228 - 229	0	1	0	0	0	0	0	0	0	1
230 - 231	0	1	0	0	0	0	0	0	0	1
232 - 233	0	0	0	0	0	0	0	0	0	0
TOTALS	21	245	0	266	38	360	0	398	0	664
% TOTALS	3.2	36.9	0.0	40.1	5.7	54.2	0.0	59.9	0.0	100
MEAN	192.5	193.1	0.0	193.1	195.5	191.8	0.0	192.1	0.0	192.5
VARIANCE	77.5	144.4	0.0	138.9	83.7	108.4	0.0	107.0	0.0	119.8
STANDARD DEV	8.8	12.0	0.0	11.8	9.1	10.4	0.0	10.3	0.0	10.9
STANDARD ERROR	1.9	0.8	0.0	0.7	1.5	0.5	0.0	0.5	0.0	0.4

TABLE 5. Tomales Bay Herring Spawn Data, 1991-92 season.

Date	Location	* Area m ²	Eggs per m ²	Millions of eggs	Conversion factor X 10 ⁻⁸	Tons
22 Nov 91	1A	4,000	6,800	27	1.20	Trace
19 Dec 91	28	41,800	260,500	10,900	1.07	117
19 Dec 91	28A	12,900	198,000	2,640	1.07	30
16 Jan 92	28	41,800	940,000	39,300	.97	380
16 Jan 92	28A	11,700	356,300	4,160	.97	40
18 Jan 92	**	16,900	900,000	15,200	.97	150
18 Jan 92	1B	3,000	330,300	990	.97	10
18 Jan 92	1A	30,800	656,400	20,220	.97	195
18 Jan 92	1	6,100	1,124,500	6,850	.97	66
18 Jan 92	1C	1,100	1,297,500	1,430	.97	15
18 Jan 92	2	8,700	286,900	2,500	.97	25
6 Feb 92	1A	30,800	522,500	16,090	.97	155
14 Feb 92	28A	7,000	27,000	189	.97	2
15 Feb 92	1B	1,700	70,100	119	.97	1
16 Feb 92	1C	1,100	3,000	3	.97	Trace
16 Feb 92	2	4,000	206,200	825	.97	8
16 Feb 92	25					Trace
17 Feb 92	5	4,200	6,000	25	.97	.25
17 Feb 92	6	4,400	11,600	51	.97	.5
17 Feb 92	7	6,200	19,000	117	.97	1
17 Feb 92	8	4,700	800	3	.97	Trace
17 Feb 92	9	17,900	1,200	22	.97	.25
17 Feb 92	11	1,500	3,300	5	.97	Trace
17 Feb 92	11A	400	5,800	2	.97	Trace
15 Mar 92	3	3,000	59,400	180	.88	2
Total		265,700		121,821		1,198

* See Figure 1.

** Intertidal spawn from Reynolds to past Marconi Cove.

TABLE 6. Average Herring Spawning Escapement by Area for Tomales Bay, Expressed as % of Season Total.

Vegetation bed no.	Season		
	1983-84 to 1987-88	1988-89 to 1990-91	1991-92
1	0.98	1.17	5.5
1A	7.69	8.20	29.2
1B	0.50	0.47	0.9
1C	--	--	1.3
2	4.05	--	2.8
2A	0.29	--	--
3	0.62	--	0.2
3A	0.15	--	--
4	--	--	--
5	1.63	--	0.02
6	2.96	--	0.04
7	1.95	--	0.1
8	3.54	--	--
9	4.49	--	0.02
10	--	--	--
10A	--	--	--
11	2.96	--	--
12	0.06	--	--
13	--	--	--
14	0.06	--	--
15	--	--	--
16	0.20	--	--
16A	1.24	--	--
17	--	--	--
18	--	--	--
19	--	--	--
20	1.92	--	--
20A	--	--	--
21	15.97	--	--
22	24.10	--	--
23	3.84	--	--
24	--	--	--
25	6.86	--	--
26	5.17	--	--
27	2.99	--	--
28	--	47.54	41.5
28A	2.13	21.08	6.0
28B	--	20.14	--
29	0.59	--	--
Intertidal	2.96	1.40	12.5
Total	100.00	100.00	100.00
Tons average escapement *	3,382	427	1,198

TABLE 7. Comparison of Tomales Bay Eelgrass Bed Measurements

Vegetation bed no.	2		Percent Change
	Area m 1988-1990	Area m 1991-1992	
1	5,000	6,083	+ 22
1A	43,400	30,838	- 29
1B	5,400	13,874	+ 157
1C	2,700	1,129	- 58
2	9,500	8,715	- 8
2A	0	--	--
3	4,300	3,098	- 28
3A	0	0	0
4	2,500	0	- 100
5	6,500	4,155	- 36
6	8,300	4,431	- 47
7	9,500	6,187	- 35
8	4,000	4,700	+ 18
9 North	14,400	9,750	- 32
9 South	17,900	--	--
10	1,500	--	--
10A	3,000	--	--
11 North	10,500	--	--
11 Middle	3,800	--	--
11 South	1,750	1,288	- 26
11A	3,010	331	- 89
12	1,700	--	--
13	0	0	0
14	700	--	--
15	0	--	--
16	4,500	--	--
16A	7,800	--	--
17	2,000	--	--
18	0	0	0
19	38,000	--	--
20	135,000	--	--
20A	33,000	--	--
21	1,488,000	--	--
22	140,000	--	--
23	1,209,000	--	--
24	45,500	--	--
25	102,000	--	--
26	120,000	--	--
27	27,800	--	--
28	65,000	41,805	- 36
28A	5,900	12,939	+ 119

TABLE 8. Eelgrass Density Estimates (kg/m²) for Most Tomales Bay Eelgrass Beds, Calculated from Multiple Regression.

Bed no.	89-90 Density	90-91 Density	91-92 Density	Percent Change 90-91 vs. 91-92
1	1.67	.88	1.39	+ 58
1A	1.44	1.99	1.85	- 7
1B	2.03	2.10	1.94	- 8
1C	1.41	1.61	1.24	- 23
2	1.61	1.46	1.63	+ 12
3	1.23	1.11	0.93	- 16
3A	no data	0.77	no data	--
4	0.93	1.22	no data	--
5	1.24	0.69	0.34	- 51
6	1.04	1.08	0.60	- 44
7	1.24	1.13	1.17	+ 4
8	1.33	no data	0.48	--
9S	1.46	0.83	0.72	- 13
9N	1.18	0.83	0.92	+ 11
10	2.06	1.45	1.09	- 25
10A	no data	0.94	no data	--
11	1.19	1.07	0.95	- 11
11A	no data	0.94	1.19	+ 27
12	1.16	no data	1.03	--
13	no data	"	no data	--
14	0.68	"	0.47	--
15	no data	"	0.44	--
16	1.76	1.09	no data	--
16A	2.03	no data	0.83	--
17	1.59	1.17	2.16	+ 85
18	0	no data	no data	--
19	1.79	"	no data	--
20	1.14	0.42	no data	--
20A	0.86	0.43	no data	--
21	2.78	0.96	1.18	+ 23
22	1.98	1.99	2.08	+ 5
23	1.75	0.98	1.35	+ 38
24	1.28	1.83	1.86	+ 2
25	1.55	no data	0.14	--
26	1.47	0.63	0.30	- 52
27	1.11	2.07	0.72	- 65
28	1.35	1.91	1.09	- 43
28A	1.83	2.08	1.17	- 44

TABLE 9. Tomales/Bodega Bay Area Herring Biomass Estimates.^{1/}

Season	Tomales Bay	Bodega Bay	Catch ^{2/} in tons	Total tons
1988-89	167	NO SURVEY	213	380
1989-90	345	350	95	790
1990-91	779	NO SURVEY	95	874
1991-92	1,198	NO SURVEY	24	1,222

^{1/} Biomass estimates are from spawning ground surveys in Tomales Bay and hydroacoustic surveys in Bodega Bay.

^{2/} Herring catch is from Bodega Bay.

TABLE 10. Tomales Bay Herring Biomass Estimates 1973-74 Through 1991-92 seasons.

Season	Spawn escapement (tons)	Catch (tons)	Spawning biomass (tons)
1973-74	6,041	521	6,562
1974-75	4,210	518	4,728
1975-76	7,769	144	7,913
1976-77	4,739	344	5,083
1977-78	21,513	646	22,163
1978-79	--	448	--
1979-80	5,420	603	6,023
1980-81	5,128	448	5,576
1981-82	6,298	851	7,149
1982-83	10,218	822	11,040
1983-84	1,170	110	1,280
1984-85	6,156	430	6,586
1985-86	435	771	6,000 *
1986-87	4,931	867	5,798
1987-88	1,311	750	2,061
1988-89	167	213	380
1989-90	345	--	345
1990-91	779	--	779
1991-92	1,198	--	1,198

* Biomass estimated by cohort analysis; for all other years biomass was estimated from spawning-ground surveys.