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SELECTIVITY OF GILLNETS IN THE
CALIFORNIA PACIFIC HERRING ROE FISHERY

by
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ABSTRACT

Pacific herring, Clupea harengus, landings were sampled during the 1976 season in San Francisco, Tomales and Outer Bodega bays. Fish were sampled according to the type of gear used to catch them - - roundhaul nets (purse seines and lamparas), beach seines, and gillnets.

Analysis of the data indicated that gillnets caught larger fish and caught more females than did roundhaul nets. In San Francisco Bay, female herring caught by gillnets had a mean body length of 208 mm (8.2 inches) compared to 179 mm (7.0 inches) for roundhaul nets. The sex ratio was 72% females by gillnets to 55% for roundhaul nets. The larger size and larger number of females caught by gillnets resulted in a much higher ripe roe recovery - - an average of 17.2% compared to 9.8% for roundhaul nets by weight of all samples.

Although no definite comparisons of size and sex ratio of fish caught by different types of gear could be made in Tomales Bay and Outer Bodega Bay (because of insufficient sampling), herring in gillnet samples were comparable to those of San Francisco Bay in the two measured characters.

1/ Marine Resources Administrative Report No. 77-5. February 1977

2/ Marine Resources Region, 411 Burgess Drive, Menlo Park, California 94025.

Marine Resources Region personnel conducted sampling of Pacific herring, Clupea harengus, landings from January 13 to March 10, 1976. Fish were sampled at San Francisco, Tomales, and Outer Bodega bays. An effort was made to obtain 25 fish from each vessel sampled. A total of 16, 7, and 2 samples were obtained from San Francisco, Tomales, and Outer Bodega bays respectively. Fish from each sample were measured in millimeters from the tip of the snout to the point where the caudal fin begins (body length), sexed, and ripe gonads (roe) from females were removed and weighed. Fish were weighed individually and these weights were totaled to give a weight for the sample. This figure was used to determine percent-roee recovery. Included in the 25-fish sample was a 1,000-gm (2.2 lb) sample of fish from which otoliths were removed for aging. Samples were obtained from roundhaul net (purse seine and lampara), beach seine, and gillnet vessels.

RESULTS

San Francisco Bay

Roundhaul Net Samples

Male herring averaged 183 mm (7.2 inches) and ranged from 142 to 240 mm (5.6 to 9.4 inches) (Table 1). Female herring averaged 179 mm (7.0 inches) and ranged from 142 to 230 mm (5.6 to 9.1 inches). Females averaged 55% by number. Number of fish per lb averaged 5.36 and ranged from 3.2 to 7.1 per lb. Ripe roe recovery averaged 9.8% by weight and ranged from 5.7 to 14.6%

Gillnet Samples

Male herring averaged 210 mm (8.3 inches) and ranged from 196 to

TABLE 1. Pacific Herring Sampling in San Francisco Bay, 1976 - Roundhaul Net Vessels

Month - Day	Mean Size ♂ (mm)	Size Range ♂ (mm)	Mean Size ♀ (mm)	Size Range ♀ (mm)	Percent ♀	Number of fish/pound (both sexes)	Percent Ripe Roe Recovery (by weight)
January 26	159	146-190	164	148-172	40	7.04	5.7
January 26	200	154-222	190	148-224	64	4.53	11.5
January 27	185	160-202	170	158-212	48	3.20	10.0
January 27	211	192-222	200	164-228	60	3.73	9.8
February 2	166	142-206	168	142-220	44	6.45	6.6
February 4	175	161-214	185	164-213	52	5.37	9.7
February 26	215	196-240	202	180-230	72	4.68	14.6
February 26	175	156-216	169	144-186	48	6.17	7.5
March 10	162	146-180	165	142-190	68	7.10	13.0
Mean	183		179		55	5.36	9.8
Size Range		142-240		142-230			

227 mm (7.7 to 8.8 inches) (Table 2). Females averaged 208 mm (8.2 inches) and ranged from 182 to 234 mm (7.2 to 9.2 inches). Females averaged 72% by number and ranged from 2.86 to 3.23 per lb. Number of fish per lb averaged 3.13. Ripe roe recovery averaged 17.2% by weight and ranged from 12.2 to 20.4%.

Tomales Bay

Lampara and Beach Seine Samples

In this bay, male herring averaged 184 mm (7.2 inches) and ranged from 153 to 220 mm (6.0 to 8.7 inches) (Table 3). Females averaged 189 mm (7.4 inches) and ranged from 152 to 233 mm (6.0 to 9.2 inches). Females averaged 43% by number. Number of fish per lb averaged 5.0 and ranged from 4.1 to 6.2 per lb. Ripe roe recovery averaged 4.2% by weight and ranged from a low of 0.0 to a high of 9.8%. The lows of January 14 were due primarily to the catching of spawned-out and immature fish.

Gillnet Samples

Male herring averaged 217 mm (8.5 inches) and ranged from 206 to 232 mm (8.1 to 9.1 inches) (Table 4). Females averaged 206 mm (8.1 inches) with a range of 188 to 232 mm (7.4 to 9.1 inches). Females averaged 63% by number. Number of fish per lb averaged 3.3 with a range of 3.0 to 3.5 per lb. Ripe roe recovery for one sample was 12.8%.

Outer Bodega Bay

No roundhaul samples were obtained. Two gillnet samples were collected. Male herring averaged 222 mm (8.7 inches) and ranged from 208 to 246 mm (8.2 to 9.7 inches) (Table 5). Females averaged 212 mm (8.3 inches) and ranged from 198 to 224 mm (7.8 to 8.8 inches). Females averaged 62% by number. Number of fish per lb averaged 3.1 with a range of 2.9 to 3.3 per per lb. Ripe roe recovery averaged 14.6% by weight.

TABLE 2. Pacific Herring Sampling in San Francisco Bay, 1976 - Gillnet Vessels

Month - Day	Mean Size ♂ (mm)	Size Range ♂ (mm)	Mean Size ♀ (mm)	Size Range ♀ (mm)	Percent ♀	Number of fish/pound (both sexes)	Percent Ripe Roe Recovery (by weight)
January 29	212	206-227	200	190-234	68	2.86	18.6
February 2	214	204-226	210	192-228	72	3.04	15.0
February 4	210	198-218	212	200-226	56	3.17	12.2
February 27	211	202-216	209	182-230	84	3.20	19.5
March 5	207	196-216	205	194-220	72	3.22	18.7
March 9	208	198-216	210	188-222	72	3.23	16.4
March 9	211	200-222	211	198-226	80	3.19	20.4
Mean	210		208		72	3.13	17.2
Size Range		196-227		182-234			

TABLE 3. Pacific Herring Sampling in Tomales Bay, 1976 - Lampara and Beach Seine Vessels

Month - Day	Mean Size ♂ (mm)	Size Range ♂ (mm)	Mean Size ♀ (mm)	Size Range ♀ (mm)	Percent ♀	Number of fish/pound (both sexes)	Percent Ripe Roe Recovery (by weight)
January 13*	186	158-212	183	161-194	36	4.83	6.5
January 14**	180	154-220	191	170-208	52	4.98	0.0
January 14**	194	153-213	202	185-233	44	4.12	0.6
February 25**	178	158-200	180	152-204	40	6.17	9.8
Mean	184		189		43	5.02	4.2
Size Range		153-200		152-233			

* Lampara

** Beach Seine

TABLE 4. Pacific Herring Sampling in Tomales Bay, 1976 - Gillnet Vessels

Month - Day	Mean Size	Size Range	Mean Size	Size Range	Percent	Number of fish/pound (both sexes)	Percent Ripe Roe Recovery (by weight)
	♂ (mm)	♂ (mm)	♀ (mm)	♀ (mm)	♀		
January 6	219	209-232	198	188-212	50	3.53	not determined
January 14	215	206-220	214	192-232	76	2.98	12.8
Mean	217		206		63	3.26	12.8
Size Range		206-232		188-232			

TABLE 5. Pacific Herring Sampling in Outer Bodega Bay, 1976 - Gillnet Vessels

Month - Day	Mean Size	Size Range	Mean Size	Size Range	Percent	Number of fish/pound (both sexes)	Percent Ripe Roe Recovery (by weight)
	♂ (mm)	♂ (mm)	♀ (mm)	♀ (mm)	♀		
January 14	222	208-246	211	202-220	44	3.31	11.7
February 24	222	218-238	212	198-224	79	2.90	17.5
Mean	222		212		62	3.10	14.6
Size Range		208-246		198-224			

DISCUSSION

In comparison with roundhaul net catches, gillnet catches in San Francisco Bay were composed of larger and older fish - - approximately two fish less per lb. According to Spratt (1976), the dominant age groups in roundhaul net landings were 2 and 3. Also, roundhaul net catches averaged 55% females while those of gillnets averaged 72%. The larger size and larger number of females in the gillnet fishery were the chief contributors to the wide differences in percentage of ripe roe recovery. Gillnet samples averaged 17.2% and roundhaul net (purse seine and lampara) samples averaged 9.8% ripe roe recovery by weight.

Although only a few samples of fish from each type of fishing gear were obtained at Tomales Bay, the data suggests that the pattern is similar to that of San Francisco Bay, with gillnets being more size selective. Sampling on January 14 revealed virtually no ripe females from beach seine catches, whereas the gillnet sample showed a ripe roe recovery of 12.8%.

No roundhaul samples were obtained at Outer Bodega Bay, but two gillnets sampled revealed the fish to be as large or larger than those of Tomales and San Francisco bays for the same type of gear. The female ratio and the percent of ripe roe recovery were also comparable.

REFERENCES

- Spratt, Jerome D. 1976. The Pacific herring resource of Tomales and San Francisco Bays: Its size and structure. Calif. Dept. Fish Game, Mar. Resour. Tech. Rep., (33):1-44.