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STATE OF CALIFORNIA DEPARTMENT OF NATURAL RESOURCES DIVISION OF FISH AND GAME BUREAU OF MARINE FISHES
FISH BULLETIN NO. 71
Growth of the Sardine, Sardinops caerulea, 1941–42 Through 1946–47[1]

by
Julius B. Phillips
1948

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1. INTRODUCTION

Starting with the 1941–42 sardine season, a comprehensive age-reading program on the Pacific sardine or pilchard, Sardinops caerulea, was undertaken along the Pacific Coast of North America. These readings were based on scales from fish in the commercial catch with collections made by the Fisheries Research Board of Canada, the Washington State Department of Fisheries, the Fish Commission of Oregon, the California Division of Fish and Game and the U. S. Fish and Wildlife Service. The actual age interpretations were made jointly by the members of the latter two agencies and were published by Felin and Phillips (1948).

Tables 1 – 6, reproduced from Felin and Phillips, list the number of fish, mean length and standard error of the mean for each year-class for each season, 1941–42 through 1946–47, by region of catch. In addition, Table 7 lists the number of fish and mean length for each age during the period 1941–42 through 1946–47, combined.

In the presentation of figures that follow, no averages have been plotted for any year wherein fewer than 10 fish are represented. The left-hand vertical scale of each figure shows the body length[2] in millimeters, while the right-hand vertical scale shows the corresponding total length in inches. The horizontal scale at the bottom of each figure lists the actual number of observed rings and also the corresponding approximate age that each ring represents.

As age is estimated from the number of annual rings present on the scale, 0-ring fish are those that are in their first year of life before the first winter ring is formed and 1-ring fish are those that have formed one winter ring between late fall and early spring, etc. Thus, a fish which is caught in the winter fishery and shows one annulus well inside the margin of the scale is in its second year of life. Since the commercial sardine fishery along the Pacific Coast is conducted almost entirely during the late summer, fall and winter months, the actual ages of the fish are approximately one year more than that indicated by the number of rings. Even though a second annulus has formed recently during a current winter, for example in a scale that already has one annulus formed during the previous winter, that fish is still referred to as a 1-ring fish, and the second annulus is indicated as "forming" or "new" until the end of that season.

The following general observations concerning the life-history of the sardine are reviewed as an aid in interpreting the results of this study: This species ranges from southern Alaska to Cape San Lucas and

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[2] Body length is measured from the anterior end of the jaw to the termination of the flesh part of the caudal peduncle after the scales are scraped away and corresponds to standard length. The body length of the sardine is approximately 85 percent of the total length.

into the Gulf of California. However, there is strong evidence that sardines found in southern Lower California and the Gulf of California constitute a separate population which rarely intermingles with the northern population but that a considerable, and perhaps variable, amount of interchange takes place throughout the range of the northern population from Alaska to Pt. San Eugenio in central Lower California. Exploratory work indicates that spawning may occur throughout the range of the sardine population, usually 50 to 200 miles offshore, but that the heaviest concentration is off Southern California. In this region, the spawning season extends from about January through June with a peak in April. Important nursery grounds are known off Southern California and Lower California and nursery areas of lesser importance may extend as far north as British Columbia. The young that result from the spring spawning in Southern California waters may remain on the nursery grounds in Southern California and Lower California for six months or a year. In their second year, if not earlier, they exhibit some northward movement and the extent of this northward movement increases year by year, with the largest and oldest fish eventually reaching the waters of the Pacific Northwest. A study of the size composition of samples and of tagging results indicates extensive migrations for a large portion of the stock, the largest and oldest fish undertaking the greatest movements. An influx of large fish into the Pacific Northwest fishery in the summer is followed by the appearance of these large fish in the California fishery in the winter preceding the spring spawning season. (Clark, 1935, 1940, 1947; Clark and Janssen, 1945; Hart, 1934, 1943; Scofield, 1934.)

2. AVERAGE GROWTH FOR THE SIX SEASONS

In Figure 1 are shown for each age, the average sizes of sardines, sexes combined, in the Pacific Northwest (British Columbia, Washington, Oregon), in Central California (San Francisco, Monterey) and in Southern California (San Pedro), for the six seasons, 1941–42 through 1946–47. 0-ring fish, approximately one year of age, appeared in appreciable numbers only in the Central California region in the 1946–47 season. These fish were taken in January and February and even though the winter annulus was forming on a number of scales, this group was classified as 0-ring until the season ended on February 15th.

The growth rate of the Southern California fish differs noticeably from that of the Central California and Pacific Northwest regions. The Central California region, even though it is more than twice as far removed from the Pacific Northwest as from the Southern California region, has a rate of growth that is more similar to the Pacific Northwest than to Southern California.

The average length of the 1-ring fish taken in the Southern California region is appreciably greater than for fish of the same age taken in Central California and the Pacific Northwest. But, this advantage is not maintained with succeeding ages. The 2-ring fish in Southern California are a little shorter than those taken in Central California but a little longer than those taken in the Pacific Northwest. For fish with three or more annual winter rings on their scales, the average growth attained at each age is greater progressing from Southern California

to Central California to the Pacific Northwest. The relatively high average length of the 1-ring fish in Southern California appears to be well-founded because it is based on 2,428 fish, and the average length of each season's 1-ring fish is also greater than that of the corresponding 1-ring fish in the regions to the northward.

There is an apparent inconsistency between the amount of growth shown for the 1-ring and 2-ring fish for the Pacific Northwest. Since
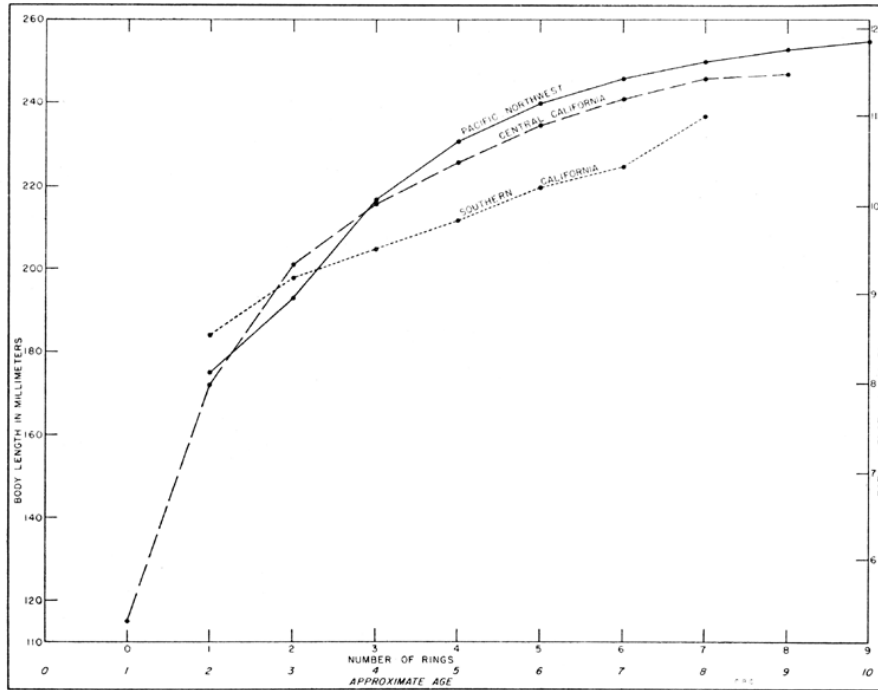
FIGURE 1. Average length of sardines at each age from the Pacific Northwest (British Columbia, Washington, Oregon), Central California (San Francisco, Monterey) and Southern California (San Pedro) for the six seasons, 1941-42 through 1946-47. Sexes combined.

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the average for the 1-ring fish is based on 63 fish whereas that for the 2-ring fish on 837 fish, more confidence may be placed in the latter average and presumably the anomalies occur in the 1-ring fish.

The larger average size of the 1-ring fish in the Southern California region may be due to a combination of the following factors, namely, that the larger fish of that age are more readily available to the fishermen; that there is a greater admixture of sardines from Lower California on the Southern California fishing grounds; and, that any spawnings that may occur to the northward of Southern California are apt to be a little later in the season because of the later warming of these waters.

According to Godsil (1931), at San Diego the population of spawning fish is quite distinct from that of the smaller ones, the demarcation between the two groups coming at about 180 mm., body length. The immature fish are found close to shore while mature sizes are ordinarily farther offshore but may move inshore to mingle with the immature at times. Because of this general segregation of fish and the fact that the potential fishing area in Southern California is relatively large, it would

appear that the commercial fishermen in Southern California are better able to avoid immature fish than are fishermen of Central California, particularly when larger-sized fish are available. In the Pacific Northwest, 1-ring fish are relatively scarce.

There are suggestions of a greater admixture of sardines from Lower California on the Southern California fishing grounds. Returns from tagged fish indicate that there is a movement of sardines into California waters from as far south as Cedros Island. (Clark and Janssen, 1945.) These fish were taken first in Southern California and one or two years later in Central California. Walford and Mosher (1943) state: "Young specimens collected in Lower California were larger than those of corresponding age taken in California; and those taken in Oregon, Washington and British Columbia were smaller." Even though conditions may be favorable for some spawning throughout the year in Lower California waters, Tibby (1937) found indications that the heaviest spawning in that region occurs earlier than the heaviest spawning in the Southern California region. This would allow a greater period for growth during the first year. Conversely, spawnings that might occur to the northward of Southern California are apt to be a little later in the season than in the Southern California region because of the later warming of these waters, and this would tend to result in a lower growth for the first year. In succeeding years, the fish in northern waters can overcome the handicap of a reduced growing period in the first year, by the apparent more favorable conditions for growth in the more northerly latitudes. Age readings on a limited number of sardines taken along the Lower California coast indicate that, after the first or second
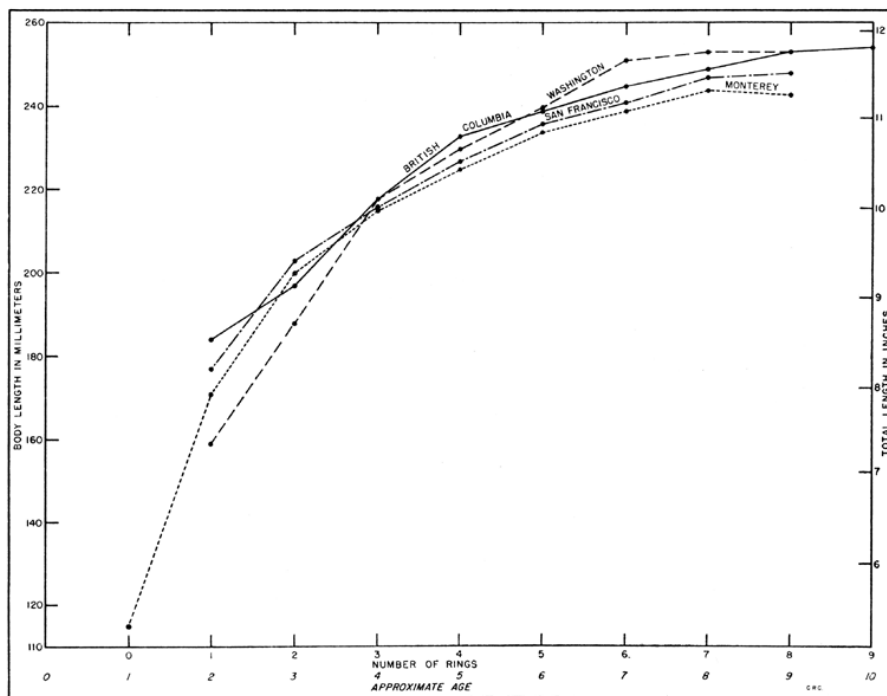

FIGURE 2.   Average length of sardines by ages, for British Columbia, Washington, San Francisco and Monterey for the seasons 1941-42 through 1946-47. Sexes combined

FIGURE 2. Average length of sardines by ages, for British Columbia, Washington, San Francisco and Monterey for the seasons 1941–42 through 1946–47. Sexes combined

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year, the amount of annual growth attained falls below that found for fish taken in Southern California.

The relative flatness of the Southern California growth curve (Fig. 1) for the intermediate sizes may result from the presence of residual, slow-growing fish that failed to undertake a northward migration, or at most only a limited one, perhaps accompanied by slower-growing fish that had shifted from Lower California. Also, there is an annual return during the winter months of at least some of the older fish that had migrated to northern waters after completion of spawning in southern waters in the spring. These sardines, however, are present on the Southern California fishing grounds for only a few weeks and only a small proportion are taken in the fishery.

In Figure 2 are shown the average size of fish, by ages, for British Columbia, Washington, San Francisco and Monterey for the six seasons 1941–42 through 1946–47. (See Table 7.) These regions were represented in all six seasons except Washington where no data were collected in 1944–45. Oregon was not included because sampling of the catch was conducted only during the 1941–42 season. (See Table 1 for values.) San Pedro was not included because it is shown as "Southern California" in Figure 1.

3. ESTIMATED GROWTH CURVE FOR THE SARDINE POPULATION

The evidence presented so far indicates variations in growth of the sardine between areas. Later, evidence will be presented that shows differences in growth between seasons, between year-classes and between sexes. In addition, when the effects of migrations are considered it is apparent that there are a number of complexities involved in attempting to calculate a growth curve that represents the population of sardines as a whole.

The problem of determining a growth rate that is descriptive of the entire population of sardines, at least during the period 1941–42 through 1946–47, may be solved in part, however, by the graphic growth transformation method developed by Walford (1946) applied to the average annual lengths represented for the Pacific Northwest, Central California and Southern California. For the growths of a number of species of animals this transformation gives a straight line when the lengths at year 1, 2, 3, 4, ... n, represented on the x-axis, are plotted against the lengths at year 2, 3, 4, 5, ... n + 1, on the y-axis.

The data as plotted in Figure 1, showing the average length of fish at each age for the six seasons 1941–42 through 1946–47 for the Pacific Northwest, Central California and Southern California, were subjected to the graphic transformation treatment (Fig. 3). A straight line does not fit all of the data for any of the three regions. However, this is not unexpected in light of the complexities noted previously. Nevertheless, a basis for estimating the probable growth of the population, at least for the six-season period under study, occurs in the Pacific Northwest data since the last six of the eight points fall practically in a straight line. This means that from 3-ring fish to and including 9-ring fish there is a consistently uniform growth increase. The growth increase between 1-ring and 2-ring fish is obviously farther out of line than is the increase between 2-ring and 3-ring fish. This is evident in Figure 1, also. Figure 4 indicates
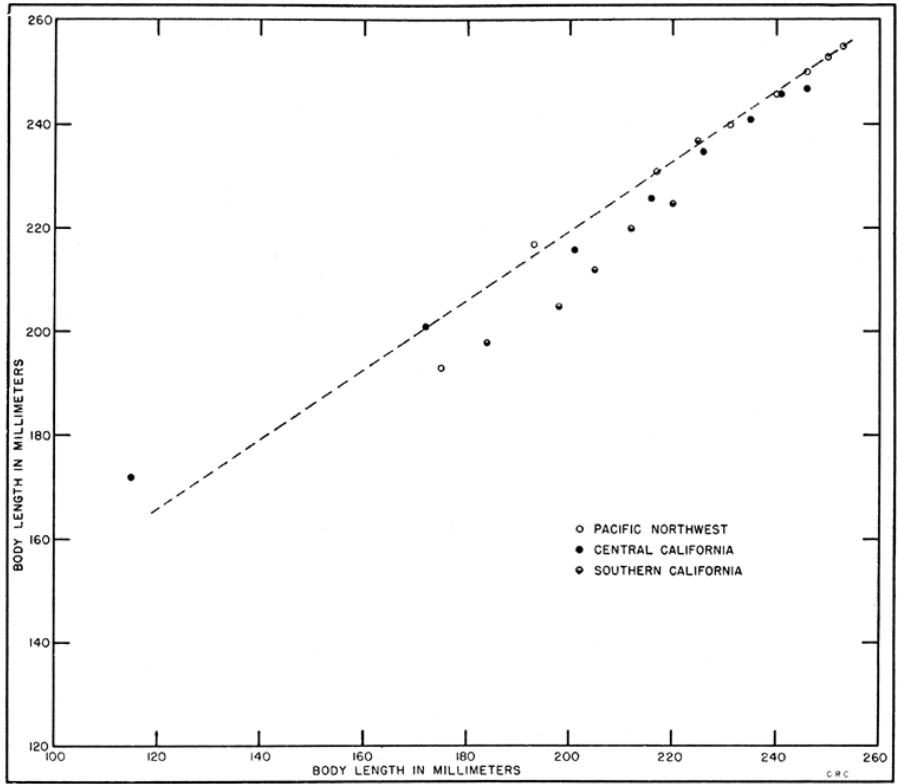
FIGURE 3. Average length of sardines of one year (x-axis) plotted against the average
length in the succeeding year (y-axis). Sexes combined

FIGURE 3. *Average length of sardines of one year (x-axis) plotted against the average length in the succeeding year (y-axis). Sexes combined*

that peak availability in the fishery of the Pacific Northwest was attained with the 4-ring fish. Evidently, the 4-ring and older fish represented in the Pacific Northwest have reached the northward limit of their migrations and are living under comparable conditions. Because of this, the straight line shown for the average lengths of the Pacific Northwest fish between 3-ring and 9-ring fish, extrapolated to younger fish sizes, might indicate the amount of growth that would be expected at those sizes.
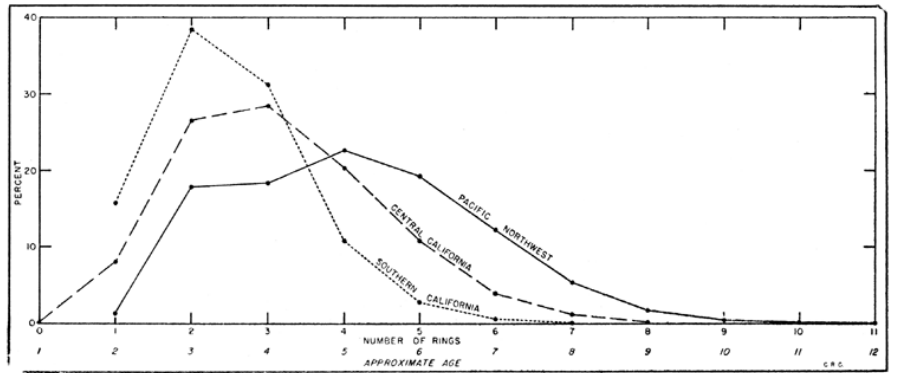
FIGURE 4. Percentage of fish at each age during the period 1941-42 through
1946-47, in the Pacific Northwest, Central California and Southern California. Sexes
combined.

FIGURE 4. *Percentage of fish at each age during the period 1941–42 through 1946–47, in the Pacific Northwest, Central California and Southern California. Sexes combined*

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The slope of the line and the average lengths were calculated for the size of 2-ring, 1-ring and 0-ring fish, according to the Walford method:

$$\frac{L_9\text{-}L_8}{L_8\text{-}L_7} = \frac{L_8\text{-}L_7}{L_7\text{-}L_6} = \frac{L_7\text{-}L_6}{L_6\text{-}L_5} = \frac{L_6\text{-}L_5}{L_5\text{-}L_4} = \frac{L_5\text{-}L_4}{L_4\text{-}L_3} = .667$$

FORMULA

Two of the five ratios used do not give a slope value of exactly .667. However, when the total of the five increments represented by the dividends are divided by the total of the five increments represented by the divisors, the slope value of .667 is obtained. This value is the proportion that one increment is of a preceding increment. The actual decrease in successive increments is 1.000–.667, or 33.3 percent.
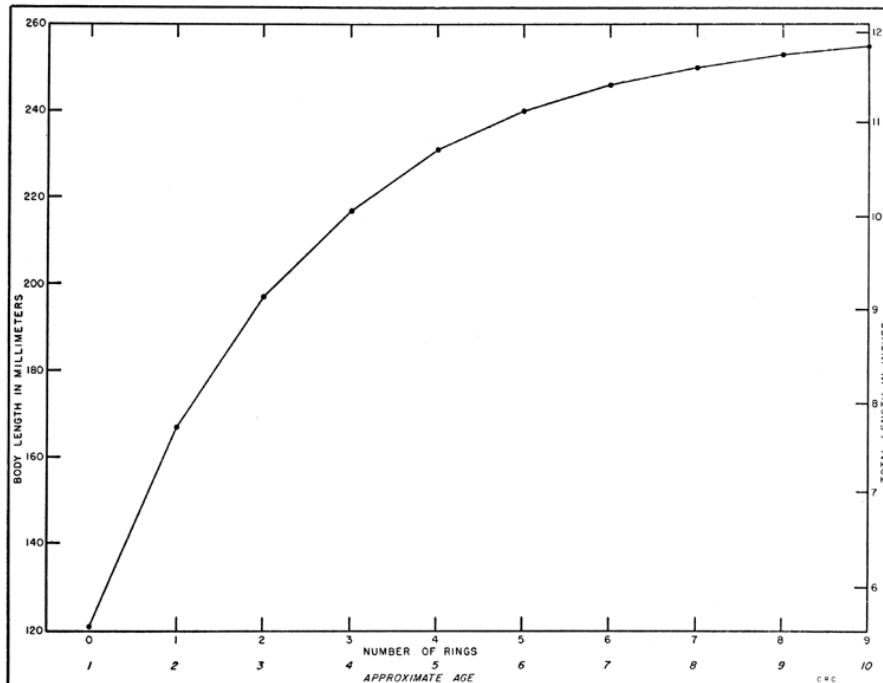
FIGURE 5. Calculated average length of sardines, at different ages for the population along the Pacific Coast, 1941-42 through 1946-47. Sexes combined

FIGURE 5. Calculated average length of sardines, at different ages for the population along the Pacific Coast, 1941–42 through 1946–47. Sexes combined

By the above method, the following values are calculated: 197 mm. for 2-ring fish, 167 mm. for 1-ring fish and 121 mm. for 0-ring fish. The lengths for the 3-ring fish and older remain the same because these are on a straight line as indicated in Figure 3. (See Table 9 and Fig. 5.) The calculated values are close to some observed values. For example, the 0-ring fish, that appeared in the Central California region during January and February of the 1946–47 season, averaged 115 mm., body length. Walford and Mosher (1943) observed that in the California fishery: "Fish of the 1938 year class had a modal length around 70 mm. when they first appeared in the bait fishery in June 1938, growing to near 120 mm. by the following April by which time the first annual mark had been formed; and fish of the year class 1937 had a modal length near 160 mm. when their second mark had formed."

It is recognized that this method of extrapolation introduces undeterminable errors especially since it is doubtful that the growth rate at least
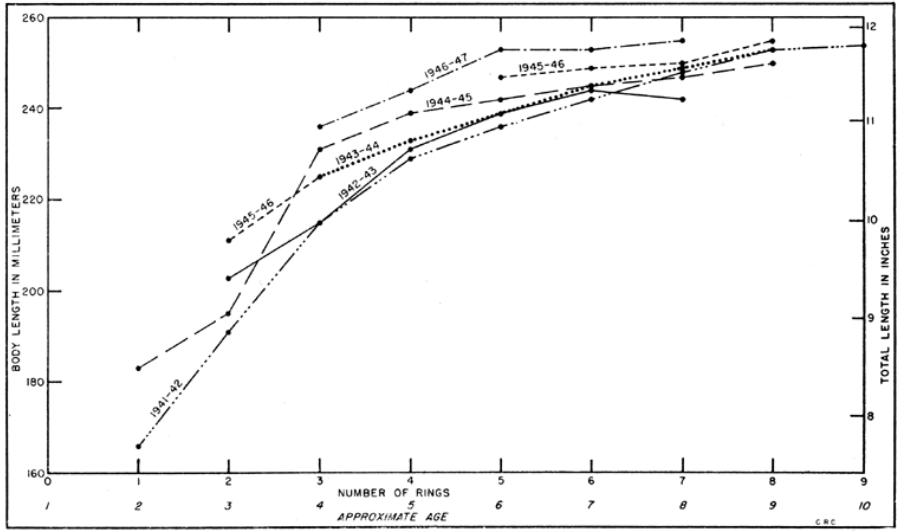
FIGURE 6. Average length of sardines by ages, for each season, 1941-42 through 1946-47, for the Pacific Northwest. Sexes combined

FIGURE 6. Average length of sardines by ages, for each season, 1941–42 through 1946–47, for the Pacific Northwest. Sexes combined

FIGURE 7. Average length of sardines by ages, for each season, 1941-42 through 1946-47, for Central California. Sexes combined

FIGURE 7. Average length of sardines by ages, for each season, 1941–42 through 1946–47, for Central California. Sexes combined

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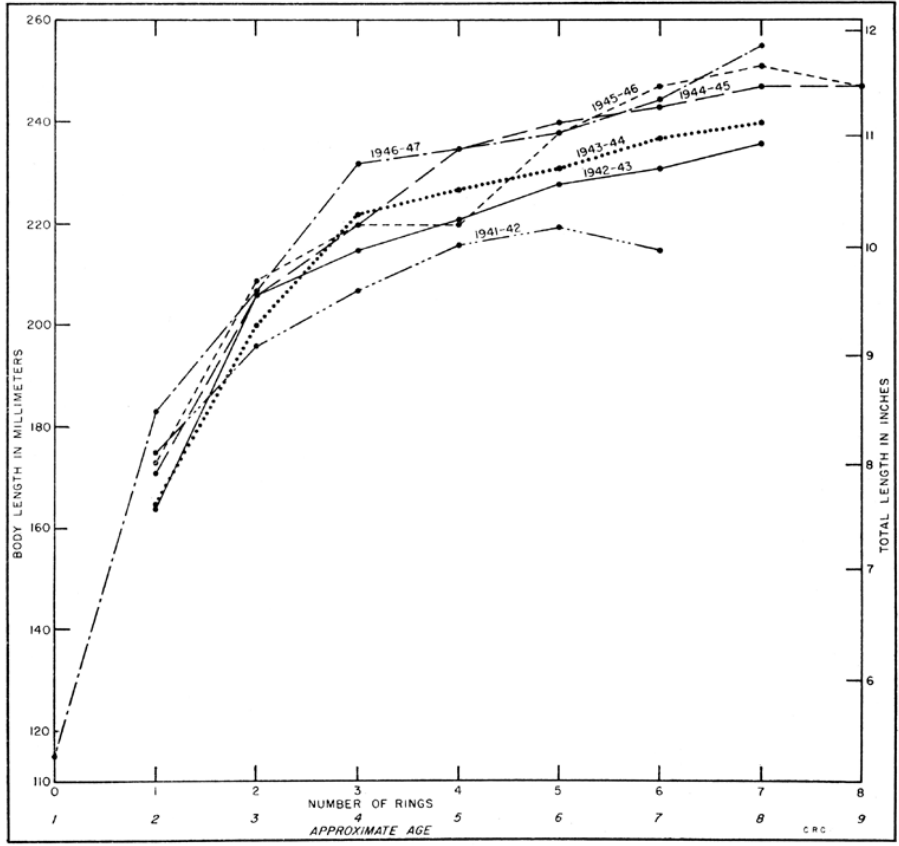
during the first few months is such that the true values would fall on a straight line with later years. It represents, however, the best approximation for the growth rate of the sardine population obtainable from present data.
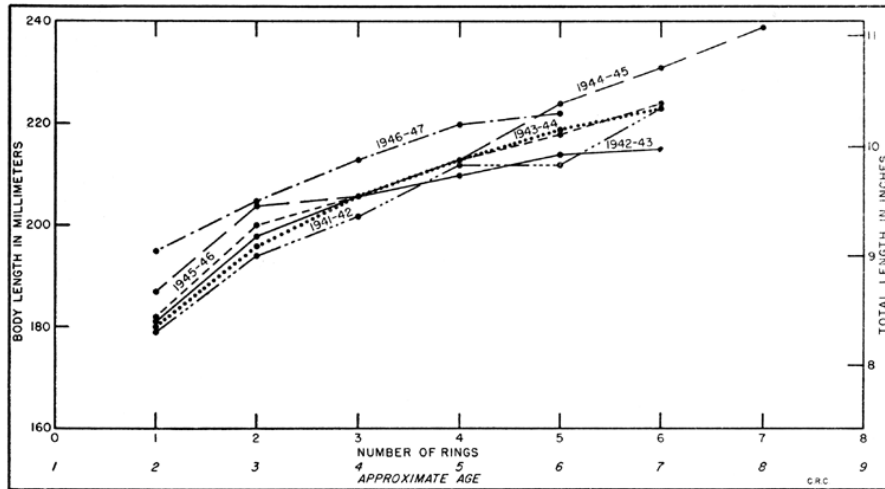
FIGURE 8. Average length of sardines by ages, for each season, 1941-42 through 1946-47, for Southern California. Sexes combined.

FIGURE 8. Average length of sardines by ages, for each season, 1941–42 through 1946–47, for Southern California. Sexes combined
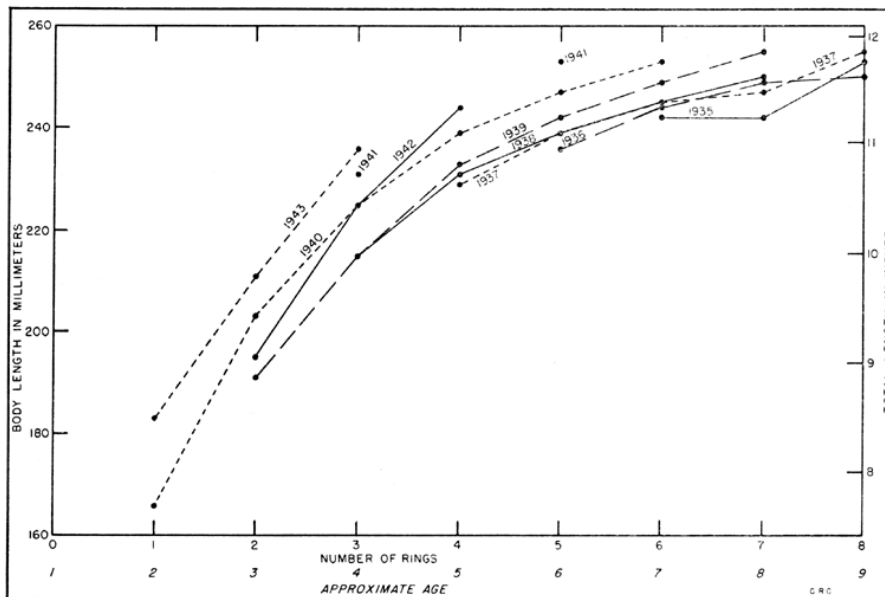
FIGURE 9. Average length of year-classes in successive seasons, 1941-42 through 1946-47, in the Pacific Northwest. Sexes combined

FIGURE 9. Average length of year-classes in successive seasons, 1941–42 through 1946–47, in the Pacific Northwest. Sexes combined

4. AVERAGE ANNUAL GROWTH BY SEASONS

Figures 6, 7 and 8 show the average size of fish for each age for each season, 1941–42 through 1946–47, in the Pacific Northwest, Central California and Southern California. (See Tables 1 2 3 4 5 6). The Pacific Northwest and the Central California regions show a wider dispersion of

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average growth for the different ages during the different seasons than does the Southern California region. This suggests a greater uniformity in season to season conditions in the Southern California region.

One striking feature of the seasonal growth curves, particularly for the Pacific Northwest and Central California is the apparent increase in growth at similar ages during the last three seasons compared to the first three seasons. This is true also of the Southern California region but is less striking than in the regions to the northward.

5. AVERAGE ANNUAL GROWTH BY YEAR-CLASSES

The average growth attained by each year-class for the six-year period is shown for the Pacific Northwest in Figure 9, for Central California in Figure 10 and for Southern California in Figure 11. As is the case with all figures presented in this study, only the average sizes that represent 10 or more fish are shown. A year-class is designated by the year in which that group of fish was spawned.
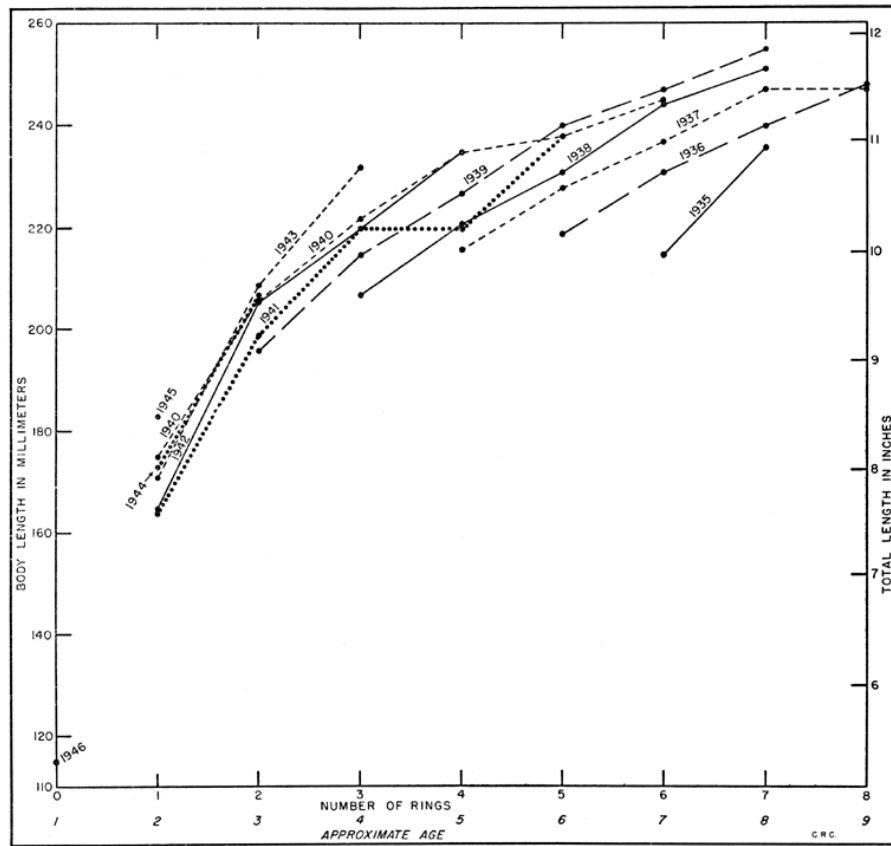
FIGURE 10.   Average length of year-classes in successive seasons, 1941-42 through 1946-47, in Central California. Sexes combined

FIGURE 10. Average length of year-classes in successive seasons, 1941–42 through 1946–47, in Central California. Sexes combined

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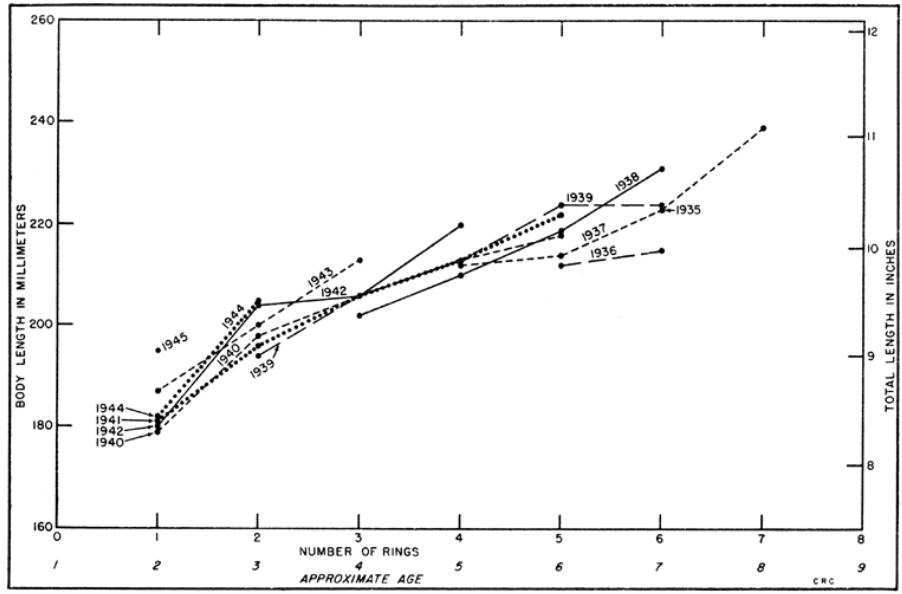
FIGURE 11. Average length of year-classes in successive seasons, 1941-42 through 1946-47, in Southern California. Sexes combined

FIGURE 11. Average length of year-classes in successive seasons, 1941–42 through 1946–47, in Southern California. Sexes combined

When the age-reading program started in the 1941–42 season, the 1940 year-class consisted of 1-ring fish, the 1939 year-class of 2-ring fish, etc. The year-classes since that of 1940 are included at the earliest age at which they entered the fishery, which is usually as a 1-ring fish but occasionally 0-ring.

The average lengths indicate an apparent increased growth in the more recent year-classes. This is more evident in the data for the Pacific Northwest and Central California than for Southern California.

The suggested increase in rate of growth in recent years may be a consequence of a decrease in the available supply of sardines. That is, a reduced stock of fish may be living under more nearly optimum conditions than did a large population.

6. DIFFERENTIAL GROWTH BETWEEN SEXES

Published reports on length frequencies of sardines have indicated that the average size of females is greater than that of males by a few millimeters (Scofield, 1926; Higgins, 1926; Hart, 1934). These results have been based on total frequencies of groups of sardines irrespective of age. In the present analysis, the length differences between sexes are compared by ages in Figure 12, for the Pacific Northwest, Central California and Southern California during the period 1941–42 through 1946–47. (See Table 7). At least 10 fish are represented by each average.

In all three regions, the females average a little longer than the males at the same ages. This difference tends to be relatively small in young fish, but increases as the fish become older. An obvious exception to this trend is found in the 1-ring fish for the Pacific Northwest, wherein the males are noticeably larger than the females. For the population of sardines as a whole, the females average approximately 1 mm. longer
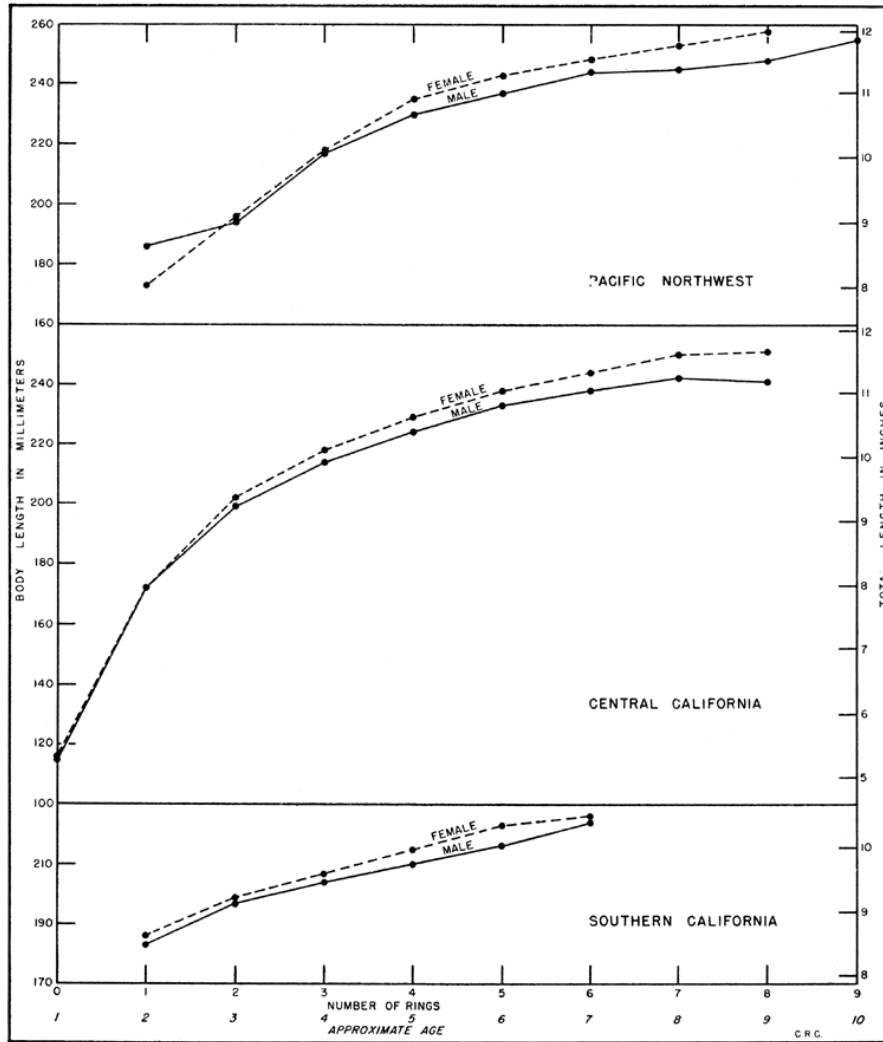
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FIGURE 12. Average size of males and females at different ages for sardines sampled in the Pacific Northwest, Central California and Southern California, for the period 1941-42 through 1946-47, combined.

FIGURE 12. Average size of males and females at different ages for sardines sampled in the Pacific Northwest, Central California and Southern California, for the period 1941–42 through 1946–47, combined

than the males as 0-ring fish, this difference increasing to about 10 mm. in the 8-ring fish and perhaps older.

Hart (1933) presents data giving the average size of male and female pilchards (sardines) in the British Columbia catch during the five-year period 1929–1933. The five-year average indicated a length of 244.8 mm. for males and 249.8 mm. for females, a difference of 5 mm. According to the average sizes of fish aged for British Columbia for the 1941–42 through 1946–47 period, this would approximate fish with 6 rings on their scales, and a similar differ-ence is indicated for that age in the present study. Scofield (1926) found that females averaged 4 mm. larger than males in the Monterey catches for the period 1919–1923 for fish in the 190–220 mm. group "within the range of sizes most abundantly represented in the catch." Higgins (1926) describes fluctuations in the

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sardine fishery at San Pedro in which he noted the progression of various size groups through the fishery during the period 1919–1923; "In any year-class, especially among older fish, the females apparently have a greater mean size than have the males, and this difference increases with increasing age."

During the period 1941–42 through 1946–47, 46,045 fish were aged, of which 50.9 percent were males, in the Pacific Northwest and in California. Compilations of the sex ratio in the total length samples over the same period show 49.4 percent males in a total of 240,929 fish. Since the scales samples were taken from the total samples in a random manner as far as length was concerned, this suggests a tendency for males to be over-represented in the scale samples. Since sardines tend to lose scales readily, it is necessary to substitute fish of similar length, at times, for the scale sample. Therefore, the slightly larger percentage of male fish in the scale samples may indicate a tendency for male fish to retain their scales better than do female fish.

7. SUMMARY

1. The growth of the sardine (pilchard) was determined from scale samples taken from the commercial catch in British Columbia, Washington, Oregon and California for the period 1941–42 through 1946–47.

2. The average length of the 1-ring fish caught in the Southern California region is noticeably greater than for those fish caught in the Central California and Pacific Northwest regions. But, with 3-ring, or older fish, the average growth attained at each age is progressively greater from Southern California to Central California to the Pacific Northwest.

3. Although the Central California fishing grounds are more than twice as far removed from those of the Pacific Northwest as those of Southern California, the growth curve approximates that determined for the Pacific Northwest more closely than that determined for Southern California.

4. There is a trend toward an increased average length during the more recent seasons, and also for the more recent year-classes. However, the annual variations are less in the Southern California region than in the regions to the northward.

5. Female fish attain a greater length each year than do the male fish. Females may be only 1 mm. longer than males as 1-ring fish, but the increase progresses to about 10 mm. for 8-ring fish or older.

6. Forty-six thousand forty-five fish were aged during the period 1941–42 through 1946–47, and 50.9 percent of these were males. In the same period, a total of 240,929 fish were sexed, of which the scale samples were a representative part, and in this case 49.4 percent were males. A tendency for male fish to retain their scales longer than do female fish is indicated.

TABLE 1
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN 1941-42 BY REGION OF CATCH

Year-Class	Pacific Northwest												California								
	British Columbia			Washington			Oregon			Total			San Francisco			Monterey			San Pedro		
	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.
1940																					
Male	4	184	4.73	4	158	4.61	3	171	.71	11	171	4.17	15	179	2.30	213	176	.56	248	178	.52
Female	6	169	3.58	5	160	7.50	3	169	4.81	14	166	3.28	6	182	3.68	234	175	.56	171	180	.60
Total[1]	10	175	3.60	19	160	2.50	6	170	2.24	35	166	2.60	21	180	1.92	447	175	.40	419	179	.39
1939																					
Male	119	193	1.07	44	190	2.04	79	190	1.04	242	191	.74	640	198	.32	1284	194	.25	873	193	.24
Female	126	194	1.14	35	196	1.99	82	193	.91	243	194	.72	546	200	.38	1203	196	.28	883	195	.28
Total[1]	255	193	.76	264	188	.73	161	192	.70	680	191	.45	1186	199	.25	2487	195	.19	1756	194	.19
1938																					
Male	77	214	1.42	32	212	2.37	28	208	2.54	137	212	1.12	450	208	.36	466	205	.36	551	201	.37
Female	65	217	1.98	37	220	2.24	23	212	3.54	125	217	1.40	412	211	.38	437	207	.46	539	204	.39
Totals[1]	142	216	1.18	101	216	1.28	51	210	2.12	294	215	.82	862	209	.27	903	206	.29	1090	202	.27
1937																					
Male	165	228	.52	47	227	1.03	17	224	2.15	229	227	.46	101	215	.86	89	212	.98	70	209	1.59
Female	142	233	.56	45	232	1.06	14	229	1.27	201	232	.47	85	219	1.22	75	218	1.07	70	215	1.49
Totals[1]	307	230	.40	145	228	.75	31	226	1.39	483	229	.36	186	217	.71	164	215	.75	140	212	.98
1936																					
Male	112	233	.52	22	236	1.92	8	226	2.26	142	233	.69	20	214	2.06	20	214	1.60	19	209	2.64
Female	125	239	.75	21	235	2.06	12	241	3.38	158	239	.70	24	226	2.46	16	222	2.48	24	216	3.32
Totals[1]	237	236	.56	74	235	1.17	20	235	2.70	331	236	.51	44	220	1.86	36	218	1.55	43	212	2.16
1935																					
Male	48	240	1.17	6	238	3.31	2	240	......	56	240	1.05	3	217	7.93	2	215	1.00	6	222	4.48
Female	32	243	1.54	15	242	1.82				47	242	1.21	2	219	2.00	4	212	4.39	5	224	4.00
Totals[1]	80	241	.94	30	243	2.16	2	240	......	112	242	.93	5	218	4.40	6	213	2.95	11	223	2.91
1934																					
Male	18	239	2.52	5	242	4.90				23	240	2.22	2	222	2.00				1	248	......
Female	22	250	3.07	6	251	5.02	3	250	3.11	31	250	2.13	1	220	......	2	244	18.0			
Totals[1]	40	245	1.64	19	249	2.50	3	250	3.11	62	248	1.63	3	221	.43	2	244	18.0	1	248	......

TABLE 1
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN 1941–42 BY REGION OF CATCH

1933																		
Male	12	249	1.93	1	240	.....	1	246	.....	14	248	1.78	1	212	.....			
Female	6	262	3.55	5	253	5.30	1	256	.....	12	258	3.02			.....			
Totals[1]	18	253	2.28	12	252	2.65	2	251	5.00	32	253	1.61	1	212	.....			
1932																		
Male	5	252	3.80	2	253	9.00			.....	7	252	3.35						
Female	3	259	4.10			.....			.....	3	259	4.10						
Totals	8	255	2.95	2	253	9.00			.....	10	254	2.73						
1931																		
Male			.....	2	249	9.00			.....	2	249	9.00						
Female			.....	2	262	2.00			.....	2	262	2.00						
Totals			.....	4	256	5.31			.....	4	256	5.31						
1930																		
Male			.....			.....	1	266	.....	1	266	.....						
Female	2	269	1.00			.....	1	258	.....	3	265	3.68						
Totals[1]	2	269	1.00	1	254	.....	2	262	4.03	5	263	3.10						

[1] Washington and Pacific Northwest totals include some fish, sex unknown.
[2] British Columbia, Washington and Pacific Northwest totals include some fish, sex unknown.

TABLE 1—Cont'd.

TABLE 2

NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN 1942-43 BY REGION OF CATCH

Year-Class	PACIFIC NORTHWEST[1]									CALIFORNIA								
	British Columbia			Washington			Total			San Francisco			Monterey			San Pedro		
	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.
1941																		
Male	4	212	3.58				4	212	3.58	4	178	2.30	73	163	1.18	240	179	.45
Female	2	218	2.00				2	218	2.00				64	164	1.34	236	182	.51
Totals	6	214	2.59				6	214	2.59	4	178	2.30	137	164	.88	476	181	.35
1940																		
Male	38	203	1.25	3	194	3.11	41	202	1.23	94	206	.81	322	204	.42	657	197	.39
Female	46	205	1.16	3	199	6.50	49	204	1.15	111	210	.67	319	206	.58	716	199	.40
Totals[2]	84	204	.86	7	197	2.94	91	203	.84	205	208	.53	641	205	.36	1373	198	.28
1939																		
Male	155	216	1.03	30	217	1.11	185	216	.89	682	215	.28	896	213	.25	666	205	.33
Female	158	214	1.08	47	219	1.12	205	215	.88	664	218	.31	788	216	.28	635	207	.38
Totals	313	215	.75	77	218	.80	390	215	.63	1346	216	.21	1684	214	.19	1301	206	.25
1938																		
Male	52	229	1.40	3	239	3.39	55	229	1.36	398	220	.41	381	218	.45	244	209	.48
Female	52	232	1.65	4	243	6.46	56	232	1.62	338	224	.44	319	222	.53	204	212	.60
Totals	104	230	1.08	7	241	3.76	111	231	1.07	736	222	.30	700	220	.35	448	210	.39
1937																		
Male	39	237	1.49	1	250	---	40	237	1.47	140	224	.76	87	227	1.06	36	212	1.12
Female	53	241	1.44	2	238	4.00	55	241	1.39	116	231	.84	74	232	1.10	22	216	1.48
Totals	92	239	1.07	3	242	4.66	95	239	1.03	256	227	.59	161	229	.78	58	214	.93
1936																		
Male	24	241	1.54	1	226	---	25	241	1.59	46	228	1.34	23	229	2.94	5	217	3.60
Female	27	247	2.12	1	254	---	28	247	2.08	40	236	1.54	32	233	1.16	10	214	3.93
Totals	51	244	1.36	2	240	14.0	53	244	1.39	86	231	1.08	55	231	1.72	15	215	2.83

TABLE 2
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN 1942–43 BY REGION OF CATCH

1925																		
Male	5	240	5.20			5	240	5.20	7	233	4.41	8	225	3.25	1	220	----	
Female	7	244	2.78			7	244	2.78	5	250	6.40	3	250	8.06	1	202	----	
Totals	12	242	2.60			12	242	2.60	12	240	4.26	11	232	4.55	2	211	9.00	
1934																		
Male	2	252	6.00			2	252	6.00	1	234	----							
Female	4	256	3.58			4	256	3.58	2	255	13.0							
Totals	6	255	2.95			6	255	2.95	3	248	10.3							
1933																		
Male																		
Female	1	250	----			1	250	----										
Totals	1	250	----			1	250	----										
1931																		
Male																		
Female	2	262	2.00			2	262	2.00										
Totals	2	262	2.00			2	262	2.00										

[1] Samples from British Columbia and Washington only.
[2] Washington and Pacific Northwest totals include one fish, sex unknown.

TABLE 2—Cont'd.

TABLE 3

NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN 1943-44 BY REGION OF CATCH

| | Pacific Northwest[1] | | | | | | | | | California | | | | | | | | |
| | British Columbia | | | Washington | | | Total | | | San Francisco | | | Monterey | | | San Pedro | | |
Year-Class	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.
1942																		
Male	1	150	-----	---	---	---	1	150	-----	18	171	2.33	292	164	.59	261	179	.62
Female	1	150	-----	---	---	---	1	150	-----	30	175	1.93	278	163	.68	224	182	.72
Totals[2]	3	139	11.3	1	148	-----	4	141	8.31	48	173	1.53	570	164	.45	485	180	.47
1941																		
Male	---	---	---	---	---	---	---	---	---	25	203	3.68	139	197	1.35	575	195	.38
Female	---	---	---	---	---	---	---	---	---	26	209	2.84	116	199	1.56	537	198	.43
Totals	---	---	---	---	---	---	---	---	---	51	206	2.32	255	198	1.03	1112	196	.29
1940																		
Male	58	223	1.27	8	218	1.36	66	222	1.14	268	221	.39	481	219	.36	403	204	.53
Female	31	230	2.30	4	218	2.66	35	229	2.16	306	225	.44	468	223	.39	431	208	.52
Totals	89	226	1.19	12	218	1.21	101	225	1.10	574	223	.31	949	221	.27	834	206	.38
1939																		
Male	157	231	.65	17	227	2.15	174	231	.62	463	226	.36	611	224	.34	237	210	.72
Female	130	237	.81	18	230	2.23	148	236	.79	496	231	.36	556	228	.37	206	216	.87
Totals	287	234	.54	35	228	1.51	322	233	.51	959	228	.26	1167	226	.26	443	213	.57
1938																		
Male	90	235	1.06	6	230	2.68	96	235	1.01	161	229	.71	188	227	.63	55	216	1.25
Female	58	245	1.14	10	238	2.33	68	244	1.08	187	235	.62	179	232	.75	42	222	1.50
Totals	148	239	.87	16	235	2.08	164	239	.82	348	232	.49	367	230	.50	97	219	1.00
1937																		
Male	49	242	1.56	2	222	8.00	51	241	1.61	40	235	1.15	54	233	1.40	12	221	2.66
Female	51	250	1.67	2	237	13.0	53	250	1.69	53	241	1.33	44	237	1.43	10	225	3.53
Totals	100	246	1.23	4	230	5.08	104	245	1.24	93	239	.96	98	235	1.01	22	223	2.14

TABLE 3
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN 1943–44 BY REGION OF CATCH

	No.	Length	S.D.	No.	Length		No.	Length	S.D.	No.	Length	S.D.	No.	Length	S.D.	No.	Length	S.D.
1936																		
Male	23	245	2.04	1	234	......	24	244	2.01	16	241	2.74	10	231	3.54	2	233	7.0
Female	16	257	2.64				16	257	2.64	17	241	2.15	8	246	3.93			
Totals	39	250	1.85	1	234	......	40	249	1.86	33	241	1.70	18	237	3.20	2	233	7.0
1935																		
Male	8	248	5.29				8	248	5.29	2	227	1.00	1	244	......			
Female	4	262	8.32				4	262	8.32	3	249	11.6	1	224	......			
Totals	12	253	4.65				12	253	4.65	5	240	8.40	2	234	10.0			
1934																		
Male	3	251	10.5				3	251	10.5				1	252	......			
Female	1	256	......				1	256	......				1	244	......			
Totals	4	252	7.50				4	252	7.50				2	248	4.00			
1933																		
Male	1	260	......				1	260	......									
Female																		
Totals	1	260	......				1	260	......									
1932																		
Male	1	270	......				1	270	......									
Female																		
Totals	1	270	......				1	270	......									

[1] Samples from British Columbia and Washington only.
[2] Pacific Northwest total includes two fish, sex unknown.

TABLE 3—Cont'd.

TABLE 4
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS
IN 1944-45 BY REGION OF CATCH

| Year-Class | Pacific Northwest[1] | | | California | | | | | | | | |
| | | | | San Francisco | | | Monterey | | | San Pedro | | |
	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.
1943												
Male	5	194	4.10	20	181	2.16	210	171	.76	271	187	.55
Female	9	177	7.64	26	183	1.68	239	170	.78	275	188	.59
Totals[2]	14	183	5.44	46	182	1.37	450	170	.55	546	187	.40
1942												
Male	18	196	3.59	140	212	.93	693	202	.44	524	202	.36
Female	19	194	3.21	173	212	.84	684	205	.48	536	205	.39
Totals[2]	37	195	2.36	313	212	.62	1,379	204	.32	1,060	204	.26
1941												
Male	11	231	1.33	91	222	1.08	172	217	.92	609	204	.32
Female	9	232	5.02	94	224	1.18	179	221	.94	531	209	.36
Totals[2]	20	231	2.29	185	223	.80	352	219	.67	1,141	206	.25
1940												
Male	53	237	1.05	322	234	.49	231	232	.69	223	211	.75
Female	64	241	1.03	343	239	.46	238	237	.66	192	216	.90
Totals[2]	117	239	.76	665	236	.35	470	234	.49	415	213	.58
1939												
Male	102	239	.70	480	239	.36	288	236	.51	88	220	1.59
Female	102	245	.74	416	244	.37	248	242	.51	89	228	1.51
Totals[2]	204	242	.56	896	241	.27	537	239	.38	178	224	1.13
1938												
Male	49	243	1.18	217	241	.56	87	239	.88	16	228	3.67
Female	44	248	1.58	186	248	.57	76	247	.99	15	234	3.85
Totals	93	245	1.02	403	244	.43	163	242	.74	31	231	2.66

TABLE 4
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN
1944–45 BY REGION OF CATCH

1937														
Male	11	242	2.46	69	246	1.02	19	241	1.75	5	235	3.00		
Female	16	250	2.69	63	250	1.30	25	248	1.31	5	242	1.90		
Totals	27	247	2.00	132	248	.84	44	245	1.16	10	239	2.00		
1936														
Male	7	243	3.67	12	246	3.19	6	241	5.01					
Female	5	262	3.60	14	254	1.72	2	239	3.00	1	244	----------		
Totals	12	250	3.80	26	251	1.80	8	240	3.78	1	244	----------		
1935														
Male	2	259	1.00											
Female	1	248	----------											
Totals	3	255	3.68											
1933														
Male	1	232	----------											
Female														
Totals	1	232	----------											

[1] Samples from British Columbia only.
[2] Monterey totals include one or two fish, sex unknown.
[3] Monterey and San Pedro totals include one fish, sex unknown.

TABLE 4—Cont'd.

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TABLE 5
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN 1945-46 BY REGION OF CATCH

Year-Class	Pacific Northwest[1]									California								
	British Columbia			Washington			Total			San Francisco			Monterey			San Pedro		
	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.
1944																		
Male	3	209	14.7				3	209	14.7	4	184	7.16	37	173	1.53	54	181	1.46
Female	1	176	......				1	176	......	4	180	.58	36	172	1.72	51	182	1.12
Totals	4	200	13.2				4	200	13.2	8	182	3.48	73	172	1.15	105	182	1.08
1943																		
Male	17	209	1.55				17	209	1.55	82	209	1.31	129	209	.53	170	198	.63
Female	12	213	3.80				12	213	3.80	65	212	1.27	126	210	.90	167	203	.68
Totals	29	211	1.81				29	211	1.81	147	210	.93	255	209	.61	337	200	.48
1942																		
Male	17	223	2.20	2	234	2.00	19	223	2.20	81	221	1.27	155	217	.74	124	204	.88
Female	21	227	2.32	4	246	9.35	25	227	2.32	110	223	.82	164	230	.85	118	209	1.07
Totals	38	225	1.61	6	242	6.45	44	225	1.61	191	222	.71	320	219	.57	242	206	.71
1941																		
Male	1	234	......	1	238	......	2	236	2.00	40	220	1.63	76	217	1.20	75	211	.95
Female	4	244	4.96	2	253	3.00	6	247	3.76	40	225	1.63	74	221	1.29	76	215	.95
Totals	5	242	4.30	3	248	5.23	8	244	3.32	80	222	1.17	150	219	.88	151	213	.68
1940																		
Male	38	243	1.25	12	253	2.54	50	245	1.26	36	237	2.20	33	231	2.54	20	214	2.38
Female	29	247	1.29	7	260	3.43	36	250	1.45	42	243	2.05	38	240	2.10	24	222	3.46
Totals	67	245	.04	19	255	2.22	86	247	.98	78	240	1.55	71	236	1.72	44	218	2.22

TABLE 5
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN
1945–46 BY REGION OF CATCH

1939																		
Male	51	246	1.16	18	254	1.99	69	248	1.09	20	244	2.34	21	243	2.24	8	222	6.80]
Female	44	249	1.09	9	256	1.91	53	250	1.03	35	249	2.40	37	250	1.57	6	227	7.70
Totals	95	247	.80	27	255	1.45	122	249	.76	55	247	1.77	58	247	1.35	14	224	4.94
1938																		
Male	25	248	1.51	4	250	3.81	29	248	1.36	7	247	1.71	8	245	2.42			
Female	20	252	2.02	4	254	4.73	24	253	1.83	21	254	1.65	7	249	3.18	1	248	......
Totals	45	250	1.27	8	252	2.57	53	250	1.16	28	253	1.42	15	247	1.98	1	248	......
1937																		
Male	7	252	2.28	1	252	......	8	252	1.96	1	242	......	2	241	9.00			
Female	5	258	4.60	2	256	6.00	7	257	3.43	4	251	5.54	4	249	3.46	1	254	......
Totals	12	254	2.35	3	255	3.68	15	255	1.92	5	249	4.70	6	246	3.58	1	254	......
1936																		
Male	2	263	4.20				2	263	4.20	1	238	......						
Female	1	232	......				1	232	......									
Totals	3	253	12.7				3	253	12.7	1	238	......						

[1] Samples from British Columbia and Washington only.

TABLE 5—Cont'd.

TABLE 6
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN 1946-47 BY REGION OF CATCH

Year-Class	PACIFIC NORTHWEST[1]									CALIFORNIA								
	British Columbia			Washington			Total			San Francisco			Monterey[2]			San Pedro		
	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.	No.	M.	S.E.
1946																		
Male													19	115	.24	1	152	......
Female													26	116	.44			
Totals													45	115	.27	1	152	......
1945																		
Male										10	171	2.93	150	183	.91	192	194	.55
Female										8	166	2.49	174	184	.81	205	196	.56
Totals										18	168	1.99	324	184	.60	397	195	.39
1944																		
Male										9	208	3.74	40	206	2.40	131	202	.46
Female										5	212	1.30	43	209	2.25	152	207	.80
Totals										14	209	2.50	83	207	1.55	283	205	.57
1943																		
Male	2	229	7.00	3	240	6.36	5	236	5.00	8	231	1.89	65	229	.98	91	211	1.22
Female	4	236	5.77	1	232	......	5	236	4.50	5	239	2.70	70	234	.77	95	215	1.36
Totals	6	234	4.38	4	238	4.96	10	236	3.13	13	234	1.84	135	232	.66	186	213	.93
1942																		
Male	3	237	4.80	5	244	2.90	8	241	2.57	12	236	1.63	47	232	1.53	35	217	1.51
Female	7	243	1.96	7	247	2.12	14	245	1.55	6	242	2.06	30	236	1.60	24	224	2.46
Totals	10	241	2.00	12	246	1.75	22	244	1.35	18	238	1.51	77	234	1.15	59	220	1.39
1941																		
Male	3	245	8.20	8	255	4.24	11	252	3.79	2	242	2.00	22	231	1.92	15	220	2.78
Female	2	247	7.00	6	256	1.52	8	254	2.26	3	246	6.08	21	243	2.64	11	225	2.72
Totals	5	246	5.00	14	255	2.44	19	253	2.36	5	244	3.50	43	237	1.85	26	222	2.00

TABLE 6
NUMBER OF FISH, MEAN LENGTH AND STANDARD ERROR OF THE MEAN FOR EACH YEAR-CLASS IN
1946–47 BY REGION OF CATCH

1940																		
Male	14	247	1.94	24	251	1.08	38	249	1.02	2	250	2.00	13	238	2.77	2	232	6.00
Female	12	253	3.08	33	258	1.20	45	257	1.24	3	251	.57	8	251	3.85	2	240	8.00
Totals	26	250	1.88	57	255	.96	83	253	.91	5	251	.80	21	243	2.59	4	236	4.73
1939																		
Male	10	251	2.80	18	254	1.41	28	253	1.35	4	248	4.04	6	250	6.26	1	252	____
Female	22	255	1.70	10	258	2.94	32	256	1.44	8	258	2.80	10	256	1.73			
Totals	32	254	1.47	29	256	1.40	61	255	1.01	12	255	2.66	16	254	2.58	1	252	____
1938																		
Male				2	249	9.00	2	249	9.00	1	252	____				1	242	____
Female	1	250	____	4	258	4.38	5	257	3.80	1	252	____	1	262	____			
Totals	1	250	____	6	255	4.11	7	255	3.59	2	252	____	1	262	____	1	242	____
1937																		
Male				2	261	7.00	2	261	7.00	2	247	3.00						
Female				2	263	5.00	2	263	5.00	1	262	____						
Totals				4	262	3.58	4	262	3.58	3	252	5.36						

[1] Samples from British Columbia and Washington only.
[2] Includes samples of fish caught locally; excludes six samples from boats which fished in Southern California waters and made deliveries in Monterey.
[3] Washington and Pacific Northwest totals include one fish, sex unknown.

TABLE 6—Cont'd.

TABLE 7

NUMBER OF FISH AND MEAN LENGTH FOR EACH AGE DURING THE PERIOD 1941-42 THROUGH 1946-47, COMBINED

Number of rings	Sex	Pacific Northwest								California									
										Central California						Southern California		California total*	
		British Columbia		Washington		Oregon		Total*		San Francisco		Monterey		Total*		San Pedro			
		Number fish	Mean	Number fish	Mean	Number fish	Mean	Number fish	Mean	Number fish	Mean	Number fish	Mean	Number fish	Mean	Number fish	Mean	Number fish	Mean
0	Male	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	19	115	19	115	1	152	20	117
0	Female	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	26	116	26	116	--------	--------	26	116
0	Totals	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	45	115	45	115	1	152	46	116
1	Male	17	196	4	158	3	171	24	186	71	177	975	171	1,046	172	1,266	183	2,312	178
1	Female	19	177	5	160	3	169	27	173	74	178	1,025	171	1,099	172	1,162	186	2,261	179
1	Totals	37	184	20	159	6	170	63	175	145	177	2,001	171	2,146	172	2,428	184	4,574	178
2	Male	192	197	47	190	79	190	318	194	990	202	2,607	199	3,597	199	2,930	197	6,527	198
2	Female	203	198	38	196	82	193	323	196	926	205	2,491	201	3,417	202	2,991	199	6,408	202
2	Totals	405	197	271	188	161	192	837	193	1,916	203	5,100	200	7,016	201	5,921	198	12,937	199
3	Male	320	218	75	216	28	208	423	217	1,580	215	2,236	214	3,816	214	2,444	204	6,260	210
3	Female	288	218	93	221	23	212	404	218	1,591	218	2,106	217	3,697	218	2,349	207	6,046	214
3	Totals	608	218	200	218	51	210	859	217	3,171	216	4,343	215	7,514	216	4,794	205	12,308	212
4	Male	431	230	73	229	17	224	521	230	1,336	225	1,435	223	2,771	224	884	210	3,655	221
4	Female	399	237	76	234	14	229	489	235	1,308	230	1,292	227	2,600	229	772	215	3,372	226
4	Totals	830	233	202	230	31	226	1,063	231	2,644	227	2,728	225	5,372	226	1,656	212	7,028	223
5	Male	384	237	49	243	8	226	441	237	839	234	638	231	1,477	233	233	216	1,710	230
5	Female	369	242	46	242	12	241	427	243	788	239	576	237	1,364	238	212	223	1,576	236
5	Totals	753	239	126	240	20	235	899	240	1,627	236	1,215	234	2,842	235	446	220	3,288	233

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TABLE 7
NUMBER OF FISH AND MEAN LENGTH FOR EACH AGE DURING THE PERIOD 1941–42 THROUGH 1946–47, COMBINED

Age	Sex																		
6	Male	235	243	51	249	2	240	288	244	328	238	200	236	528	238	49	224	577	236
6	Female	210	248	60	253	....	....	270	249	319	245	201	243	520	244	48	226	568	243
6	Totals	445	245	120	251	2	240	567	246	647	241	401	239	1,048	241	97	225	1,145	239
7	Male	92	245	28	251	....	....	120	245	105	244	51	238	156	242	9	235	165	242
7	Female	102	252	20	255	3	250	125	253	115	250	55	249	170	250	8	239	178	249
7	Totals	194	249	57	253	3	250	254	250	220	247	106	244	326	246	17	237	343	246
8	Male	36	248	4	248	1	246	41	248	18	241	9	241	27	241	....	....	27	241
8	Female	25	260	11	255	1	256	37	258	24	253	8	245	32	251	3	247	35	251
8	Totals	61	253	21	253	2	251	84	253	42	248	17	243	59	247	3	247	62	246
9	Male	12	255	4	257	....	....	16	255	3	244	1	252	4	246	....	....	4	246
9	Female	7	252	2	263	....	....	9	254	1	262	1	244	2	253	....	....	2	253
9	Totals	19	254	6	259	....	....	25	255	4	249	2	248	6	248	....	....	6	248
10	Male	2	246	2	249	....	....	4	248	....	....	....	....	....	....	....	....	....	....
10	Female	2	262	2	262	....	....	4	262	....	....	....	....	....	....	....	....	....	....
10	Totals	4	254	4	256	....	....	8	255	....	....	....	....	....	....	....	....	....	....
11	Male	1	270	....	....	1	266	2	268	....	....	....	....	....	....	....	....	....	....
11	Female	2	269	....	....	1	258	3	265	....	....	....	....	....	....	....	....	....	....
11	Totals	3	269	1	254	2	262	6	264	....	....	....	....	....	....	....	....	....	....

* Totals contain some fish which were not sexed.

TABLE 7—Cont'd.

TABLE 8

NUMBER AND PERCENTAGE OF FISH AT EACH AGE DURING THE PERIOD 1941-42 THROUGH 1946-47 IN THE PACIFIC NORTHWEST, CENTRAL CALIFORNIA AND SOUTHERN CALIFORNIA

Number of rings	Approximate age	Pacific Northwest		Central California		Southern California	
		Number of fish	Percent	Number of fish	Percent	Number of fish	Percent
	0						
0	1	--------	--------	45	.2	1	--------
1	2	63	1.4	2,146	8.1	2,428	15.8
2	3	837	17.9	7,016	26.6	5,921	38.5
3	4	859	18.4	7,514	28.5	4,794	31.2
4	5	1,063	22.8	5,372	20.4	1,656	10.8
5	6	899	19.3	2,842	10.8	446	2.9
6	7	567	12.2	1,048	4.0	97	.6
7	8	254	5.4	326	1.2	17	.1
8	9	84	1.8	59	.2	3	--------
9	10	25	.5	6	--------	--------	--------
10	11	8	.2	--------	--------	--------	--------
11	12	6	.1	--------	--------	--------	--------
Totals		4,665	100.0	26,374	100.0	15,363	99.9

TABLE 8
NUMBER AND PERCENTAGE OF FISH AT EACH AGE DURING THE PERIOD 1941–42 THROUGH 1946–47 IN THE PACIFIC NORTHWEST, CENTRAL CALIFORNIA AND SOUTHERN CALIFORNIA

TABLE 9

CALCULATED AVERAGE LENGTH OF SARDINES AT DIFFERENT AGES FOR THE POPULATION ALONG THE PACIFIC COAST, 1941-42 THROUGH 1946-47

Number of rings	Approximate age	Body length (mm.)	Total length (inches)	Number of rings	Approx. age	Body length (mm.)	Total length (inches)
	0						
0	1	121	5.6	5	6	240	11.1
1	2	167	7.7	6	7	246	11.4
2	3	197	9.1	7	8	250	11.6
3	4	217	10.0	8	9	253	11.7
4	5	231	10.7	9	10	255	11.8

TABLE 9
CALCULATED AVERAGE LENGTH OF SARDINES AT DIFFERENT AGES FOR THE POPULATION ALONG THE PACIFIC COAST, 1941–42 THROUGH 1946–47

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