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SECOND SURVEY OF THE OCCURRENCE OF PARASITES AND BLEMISHES IN PACIFIC OCEAN PERCH, *Sebastodes alutus*, MAY-JUNE 1959

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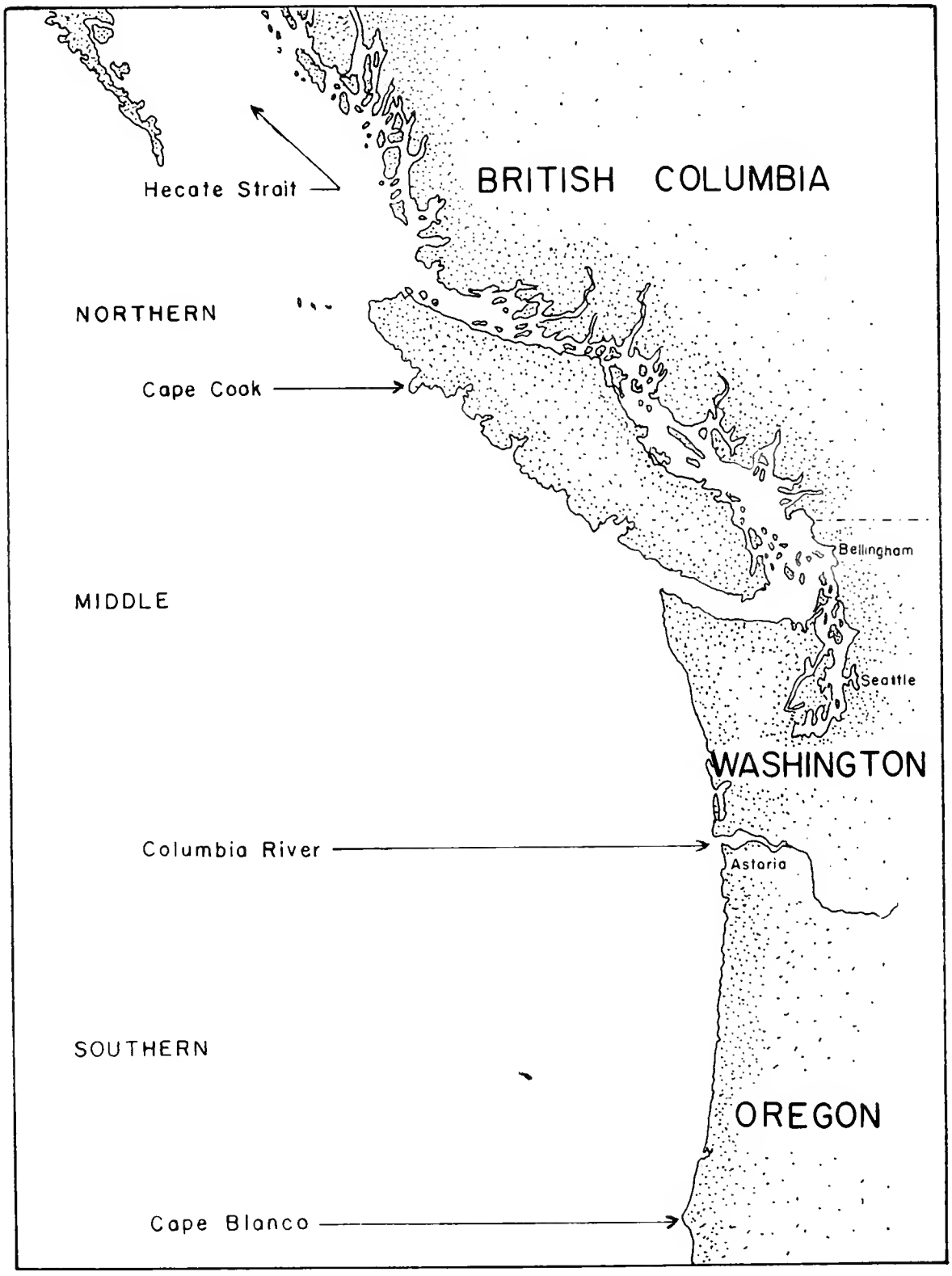

Figure 1.--Fishing areas.

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ABSTRACT

A brief study was made of the occurrence of parasites and blemishes in the Pacific Ocean perch, *Sebastodes alutus*, caught in the waters of Hecate Strait and those southward to Cape Blanco, Oregon, to test the findings made during a similar study in 1958.

INTRODUCTION

Parasites and blemishes (aberrant tissue structures resembling in size and appearance of an unpolished rice kernel) are of common occurrence in some species of fish. Although these defects are harmless to man, the average consumer does not know this fact. Furthermore, the presence of such defects reduces the esthetic appeal of the product. The result is economic loss for the fishing industries. The present series of investigations was undertaken with the thought that greater knowledge of these defects may help the industries to reduce their loss.

An initial brief survey on the extent of parasitization and blemishes in fillets of Pacific Coast rockfish, mainly *Sebastodes alutus*, was carried out during the summer of 1958 (Liston, Peters, and Stern, 1960).[1] The fish used in that work were caught in the waters of Hecate Strait and in those southward to Cape Blanco, Oregon (fig. 1). The parasites observed were mainly *Prosorhynchus* and *Porracaecum*. In addition, the incidence of blemishes, which occur in the musculature, was noted. Parasitization was found to be greatest in fish taken in the northern waters and least in those taken in the southern ones.

The purpose of the present study was to check on the findings of the first survey to see whether they could be confirmed in the second year.

PROCEDURE

In the present study, methods and sources of samples used were essentially the same as those used in 1958. Briefly, fillets of *Sebastodes alutus* from known geographical areas[2] were selected at random from the end of a commercial filleting line and were candled over an illuminated glass plate to permit detection of parasites. In addition, the incidence of blemishes was noted. In order that the distribution of the defects could be recorded, each fillet was arbitrarily divided into areas--A, B, C, and so on--as illustrated in figure 2.

One difference from the procedure of last year was that many of the fillets were examined unskinned, which is the state in which one producer in whose

Note.--Charles R. Hitz presently employed with the Exploratory Fishing and Gear Research Base, Bureau of Commercial Fisheries, U. S. Fish and Wilflife Service, Seattle, Washington.

[1] Liston, John, John Peters, and Joseph A. Stern. 1960. Parasites in summer-caught Pacific Ocean rockfish. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 352, July, 10 pp.

[2] The geographical areas were divided into northern--Hecate Strait to Cape Cook, middle--Cape Cook to Columbia River, and southern--Columbia River to Cape Blanco.

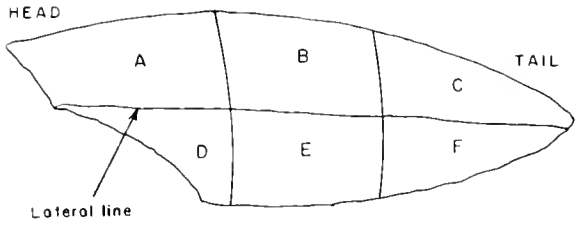

Figure 2.--Division of the fillet into arbitrary areas for parasite count.

plant we worked markets his product. Inasmuch as the skin interferes with the detection of parasites, a correction factor had to be applied to the data found with these unskinned fillets.

Since unskinned fillets were not available at the time set aside for the determination of the correction factor, skinned fillets taken at random from a fillet line were used instead. In determining the factor, we candled each fillet from the bone side and noted the presence or absence of parasites; the fillet then was turned over and was candled from the skin side for the detection of any parasites not previously discovered, which gave the data needed to calculate the correction factor:

$$\frac{\text{No. from both sides}}{\text{No. bone side}}$$

RESULTS AND DISCUSSION

Since the results obtained in the study of the parasites and that of the blemishes differ somewhat, these two topics are conveniently considered under separate headings.

Parasites

Correction factor.--The data obtained in the evaluation of the correction factor are given in table 1. The factor described here is conservative, since the removal of the skin permits somewhat better transmission of light through the fillet than is possible when the skin is present and thus aids in the detection of parasites from the bone side. In short, the correction factor does not overly correct.

Geographical distribution.--Data on parasitic infestation of Pacific ocean perch according to fishing area, by individual trip, are given in table 2. Summarizing data are given in table 3. Weighted mean values and range of variability in parasitic infestation from catch to catch are given in table 4. The weighted mean values for percent infestation shown in table 4, which take into account the weight of fish in each of the catches sampled, differ little from the calculated means shown in table 3. The standard deviations (table 4) of the weighted mean parasitization was greatest this year for the nothern area. Last year it was greatest for the middle and southern areas.

In general, the results of the present survey confirm our previous findings

Table 1.--Correction factor

Number of fillets examined	Number of fillets observed with parasites when candled from:	
	Bone side	Both sides
215.....	83	103
355.....	97	114
Total.....	180	217

$$\text{Correction factor} = \frac{\text{(No. from both sides)}}{\text{No. bone side}} = \frac{217}{180} = 1.20$$

Table 2.--Parasitic infestation of Pacific ocean perch

Fishing ground and trip number	Estimated landing (lbs.) (1)	Number of fillets examined (2)	Fillets parasitized			Total observed parasites (6)	Mean number of parasites per fillet[2] (7)
			Observed number (3)	Corrected number[1] (4)	Relative percent (5)		
Northern							
No. 1....	25,000	471	175	210	44.6	439	2.51
No. 2....	60,000	478	211	253	52.9	755	3.58
No. 3....	35,000	350	104	124	35.4	317	3.05
Middle							
No. 1....	37,000	357	153	--	42.9	400	2.61
No. 2....	8,000	215	103	--	47.9	187	1.81
No. 3....	26,000	462	169	202	43.7	458	2.71
No. 4....	8,000	150	56	67	44.6	120	2.14
Southern							
No. 1....	14,000	676	135	162	24.0	201	1.49
No. 2....	44,000	355	114	--	32.1	249	2.18

[1] Corrected value for unskinned fillets.
[2] Value obtained by dividing column 6 by column 3. For the mean number of parasites per fish, multiply by 2.

regarding the relationship between parasitization and geographic location. More fish are parasitized, and more fish have a large number of parasites per fish in the northern area than in the middle area, and in the middle area than in the southern area. Higher levels of infestation were observed this year than in 1958 (45 percent, 44 percent, and 27 percent, respectively, for the northern, middle, and southern areas in 1959 as compared with 39 percent, 21 percent, and 15 percent for the corresponding areas in 1958). Although it is possible that this difference was due to seasonal effects, since this year's investigation was carried out in late spring and last year's in summer, other factors--such as the migratory habits of the fish, the year class of fish sampled, environmental effects, abundance of the intermediate host, and so on--could have caused the increase.

Table 3.--Percentage incidence of parasitization of Pacific ocean perch according to fishing ground

Fishing ground	Incidence		
	Parasites in all fish	One and two parasites	Five or more parasites
Northern....	45.2	62.6	18.0
Middle.....	44.3	71.1	12.2
Southern....	26.8	82.2	4.4

Prosorhynchus was the most commonly observed parasite, infesting some 39.4 percent of the fillets examined. *Porracaecum decipiens* was encountered rarely, in only 0.001 percent of the fillets. This finding, similar to that made last year, confirms that the trematode *Prosorhynchus* presents the major commercial parasite problem in rockfish of the Pacific Northwest area.

No further light has been shed by this second survey on the reasons for

Table 4.--Statistical analysis of percentage infestation data

Fishing ground	Weighted mean parasitization	Standard deviation	Confidence limits (95%)	
			Lower limit	Upper limit
Northern.....	46.9	10.5	26.3	67.5
Middle.....	43.6	4.4	35.0	52.2
Southern.....	29.0	3.3	22.6	35.4

the north-south distribution of rockfish parasites. The solution of this problem and the related problem of the life cycle of *Prosorhynchus* would require a detailed, biological investigation. Such an investigation might well be worthwhile if it yielded information that could be used to eliminate or at least to alleviate the parasitic infestation that presently is a decided limiting factor in the utilization of rockfish.

Distribution in fillet.--The distribution of parasites according to the area of the fillet (figure 2) is shown in table 5. Most parasites occurred either in the meaty shoulder portion of the fillet or in the tail portion. A more even distribution of the parasites was noted in this year's survey than in last year's. Only the D area was observed to be consistently low in parasites.

Blemishes

Examination of sample lots of fillets showed that over 90 percent of the blemishes occurred on the skin side of the fillet. For this reason, only results from skinned fillets were considered in evaluating the occurrence of blemishes. Unfortunately, this restriction limited the source of our data to two catches (45,000 pounds) from the middle area and one catch (44,000 pounds) from the southern area. The incidence of blemishes is shown in table 6. A comparison of the incidence of blemishes in the middle and southern areas is given in table 7. Apparently there is little difference in the number of blemishes in fish from the middle area and from the southern area.

The distribution of blemishes in the fillets is shown in table 8. The meaty shoulder area appeared to contain the least number of blemishes; the tail area, the greatest number.

Although blemishes were observed in 52.3 percent of all of the skinned fillets examined, these bodies are

Table 5.--Average number of parasites in designated area of parasitized Pacific ocean perch fillet, according to fishing grounds

Fishing ground	Number of parasites per fillet area					
	A	B	C	D	E	F
Northern.....	0.63	0.43	0.54	0.09	0.60	0.67
Middle.....	0.76	0.34	0.47	0.18	0.38	0.31
Southern.....	0.38	0.22	0.40	0.06	0.26	0.46

Table 6.--Blemish infestation in skinned fillets

Fishing area	Number of fillets		Blemishes observed	
	Examined	With blemishes	Total number	Mean number per fillet
Middle.....	572	282	1,067	3.78
Southern.....	355	203	824	4.06

Table 7.--Percentage incidence of blemishes in Pacific ocean perch according to fishing ground

Fishing ground	Incidence		
	Blemishes in all fish	Two or less blemishes	Five or more blemishes
Middle.....	49.3	51.0	28.2
Southern.....	57.2	49.8	28.1

Table 8.--Average number of blemishes in designated area of blemished Pacific ocean fillet, according to fishing grounds

Fishing ground	Number of parasites per fillet area					
	A	B	C	D	E	F
Middle.....	0.13	0.70	1.07	0.45	0.75	0.76
Southern.....	0.10	0.38	0.97	0.22	0.86	0.98

harmless and edible. Their presence in fillets nevertheless has caused difficulty for more than one producer in the Northwest area. Fortunately, nearly half the blemishes apparently occur in the tail portion of the fillet and therefore can probably be eliminated without much economic loss if this portion is cut off and discarded.

CONCLUSIONS

In general, the findings of this year confirm those of 1958.

1. The level of infestation of parasites in *Sebastodes alutus* was highest in the northern area of catch (Hecate Strait to Cape Cook) and lowest in the southern area (Columbia River to Cape Blanco), but higher levels of infestation were observed in all areas this year than last (45 percent, 44 percent, and 27 percent, respectively, for the northern, middle, and southern areas in 1959 as compared with 39 percent, 21 percent, and 15 percent for the corresponding areas in 1958).

2. *Prosorhynchus* was the most commonly observed parasite, infesting

some 39 percent of the fillets examined, confirming that this trematode presents the major parasite problem in *Sebastodes alutus*.

Most parasites occurred in the meaty shoulder portion of the fillet or in the tail portion. Only the lower shoulder area was observed to be consistently low in parasites.

4. Over 50 percent of the skinned fillets had blemishes, and of these blemishes over 90 percent occurred in the skin side of the fillet.

5. No correlation was seen between the occurrence of blemishes and the geographical area of catch.

6. The meaty shoulder area of the fillet was the least heavily affected by blemishes, and the tail area the most heavily affected, with nearly half the blemishes occurring in the tail area.

7. The findings point to the desirability of making a biological survey into the factors related to the life cycle of *Prosorhynchus*.

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