

PROGRESS REPORT

AN ANALYSIS OF MORPHOLOGICAL DIFFERENCES BETWEEN SALMON
OF VARIOUS GEOGRAPHIC ORIGINS

by

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INTRODUCTION

In September of 1955 the Service commenced an experiment to determine the utility of morphological and morphometric characters as indices for the racial separation of species of Pacific salmon (genus Oncorhynchus). The morphological characters examined, the areas from which specimens were obtained, method of data analysis and the results in part for the analysis of red salmon data were presented in a previous report.^{1/} The following augments the previous report and summarizes the progress to date.

RED SALMON

Table I lists the number of red salmon examined and the areas from which they were obtained. The areas indicated by asterisks were completed since the last report.

^{1/} Fukuvara, Francis M.
Racial Studies--Morphology and Morphometrics.
Progress Report Pac. Salmon Inv. US FWS Seattle, Wn. Apr. 1956.

Table 1.--Red Salmon examined by area.

<u>Area</u>	<u>No. of Red Salmon</u>
Bristol Bay	
Egegik Fishery	100
Nushagak River	15
Naknek-Kvichak Fishery	89
Naknek Weir	49
Ugashik Fishery	97
Attu (Lake Cories, Lake Nicholas, Gravel Pit)	52
Japanese Oceanic <u>1/</u>	
Okhotsk Sea	91
Eastern Kamchatka	117
Western Aleutian	203
American Oceanic	
<u>Paragon</u>	67
<u>Mitkof</u>	92
<u>Cobb</u>	268
Kodiak Island	
Karluk Weir and Larson Bay**	219
Alitak Bay	50
Red River**	50
Southeast Alaska**	
Anchorage <u>2/</u>	102
Ketchikan	141
Petersburg	96
Seldovia	69
Alaska Peninsula**	
Chignik Bay	47
Shumagin Islands)	
Pavlof Bay)	86
Cold Bay)	
Canada	
Fraser River	291
Skeena River**	169
Nass River**	58
Rivers Inlet**	50
Columbia River	<u>47</u>
Total	2715

** Areas examined since previous report.

1/ Fish from 1955 Japanese mothership operations in North Pacific and Okhotsk Sea, May through September.

2/ Not included in analyses.

Previously gill rakers and branchiostegal rays were counted by direct examination of those structures. These structures have now been included in the array of body parts on the radiographs. This innovation has resulted in greater ease in enumeration and pictorial documentation of these structures. These factors contribute toward reducing or eliminating experimental error with respect to these counts. A method has been developed whereby scale counts will also be documented on radiographs.

The anatomical characters used in analyses of red salmon data to date remains unchanged with one exception. Due to the persistence of some experimental error in obtaining the number of rows of scales below the lateral line, this character has been replaced with the number of circuli in the growth zone between the nucleus and the first annulus in the fresh water portion of the scale. This scale character of itself showed promise in racial separation of red salmon from various areas.^{2/}

The addition of new areas and the substitution with a new character, resulted in no significant alteration of the spatial relationship (relative similarities) between areas as presented in April. The relative distance relationships between Asian samples and all other areas is shown in Figure 1. The configuration in its entirety is certainly too complex to be illustrated in two dimension; therefore, it is not included in this report. However, a complete model is on display in the laboratory.

^{2/} Anas, Raymond E.

The Application of a Distance Function to Circuli Counts of the Red Salmon Scales as a Means of Separating Stocks of Fish.

Progress Report Pac. Salmon Inv. US FWS Seattle, Wn. Mar. 1956.

1955 RED SALMON

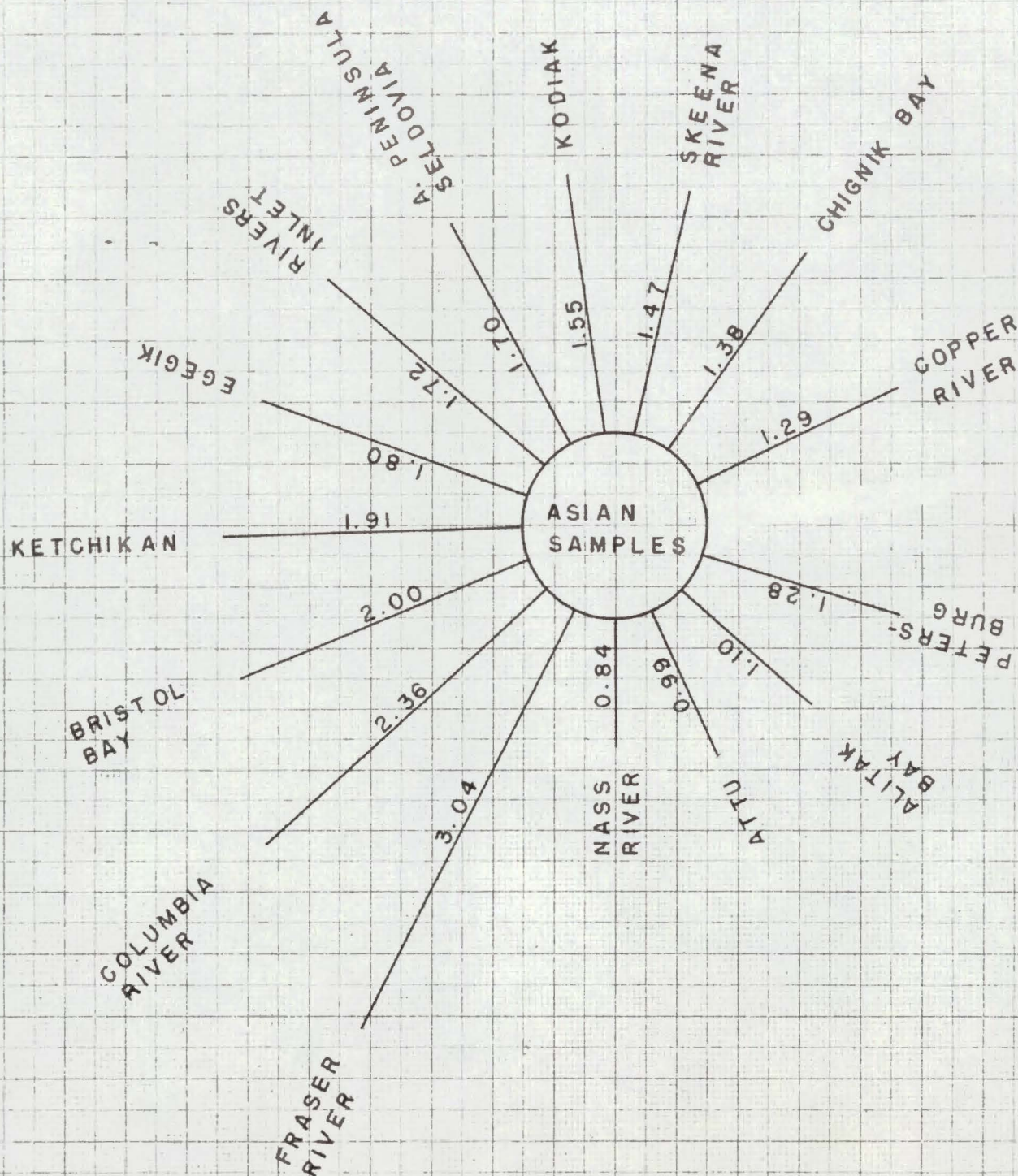


FIG. 1

RELATIONSHIP OF NORTH AMERICAN AREAS FROM JAPANESE
MOTHERSHIP SAMPLES

CHUM SALMON

Areas from which chum salmon samples were obtained and their numbers is shown in Table II.

Table II. -- Areas and numbers of chum salmon completed to date. ^{1/}

<u>Areas</u>	<u>Number of Chum Salmon</u>
King Cove	108
Petersburg	150
Ketchikan	147
Nana River, B. C.	60
Fraser River, B. C.	158
Eastern Kamchatka	
Area I	91
Area II	55
Okhotsk Sea	67
Western Aleutians	
Area I	58
Area II	52
Area III	60
Paragon	
Area I	83
Area II	104
Area III	82
Area IV	<u>79</u>
Total	1,354

^{1/} August 15, 1956.

The body characters examined are essentially the same as those for the red salmon which were described in the previous report. The characters from the chum salmon which were used in the distance function analysis are listed below.

1. Number of scales along the lateral line.
2. " branchiostegal rays.
3. " ventral gill rakers.
4. " pectoral fin rays.
5. " dorsal fin rays
6. " circuli to the first annulus.
7. " of caudal vertebrae.

All of these characters with the exception of 1 and 6 were obtained from radiographs and in the future 1 (Number of scales along the lateral line) shall be obtained similarly.

Chum salmon data were analyzed by a distance function analysis and the tentative results are represented by a spatial configuration which is too complex to be illustrated in two dimensions. The configuration in its entirety may be seen at this laboratory; however, for this report it should suffice to illustrate the relationship of Asian chum salmon with chum salmon of other areas with respect to the seven afore-mentioned meristic characters (Figure 2). From this figure it can be seen that Petersburg is closest to Okhotsk Sea than any other area (more so than the E. Kamchatkan sample). However, further analyses of other characters such as length (see Figure 3) should enhance greater separation between these areas.

1955 CHUM SALMON

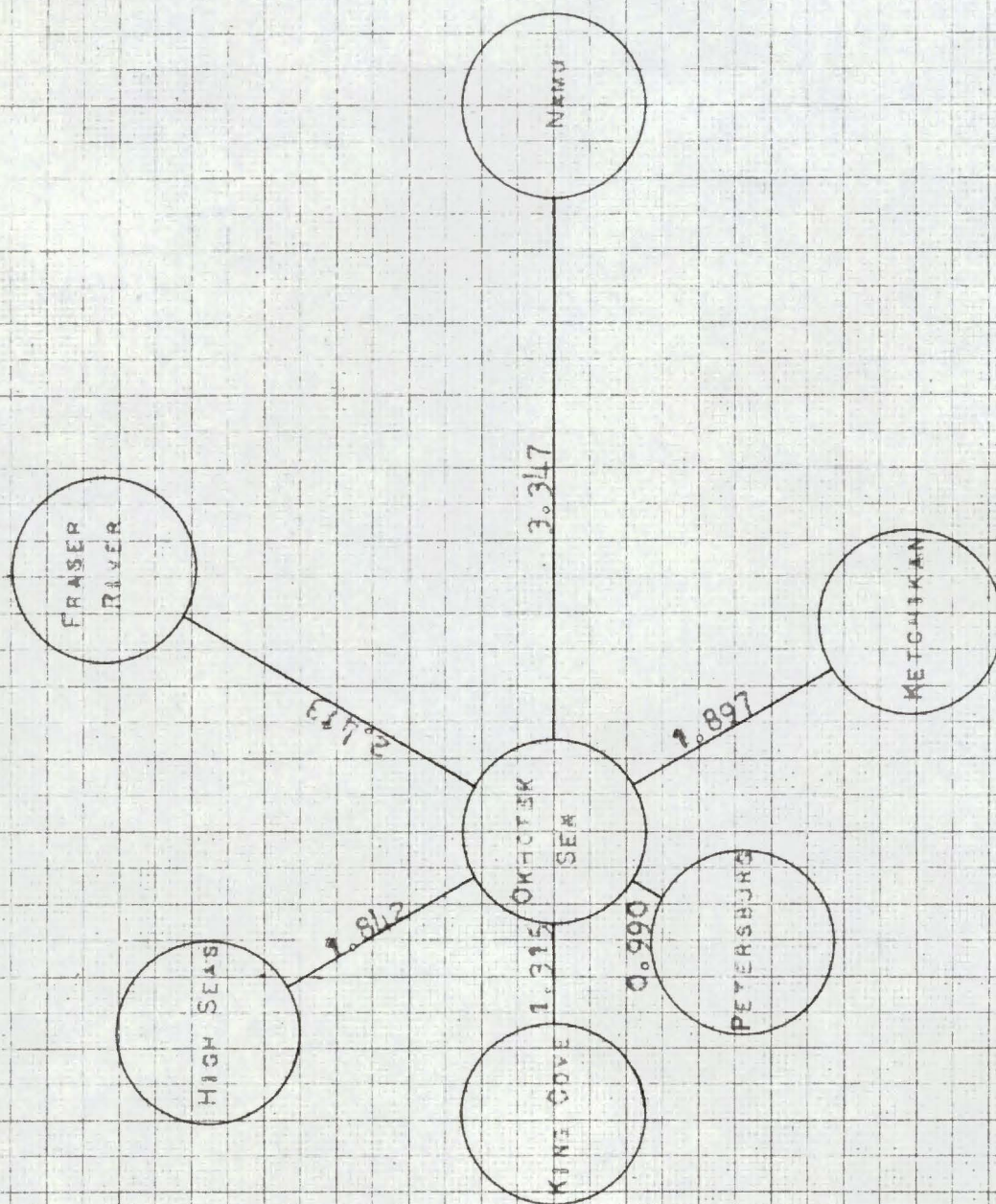
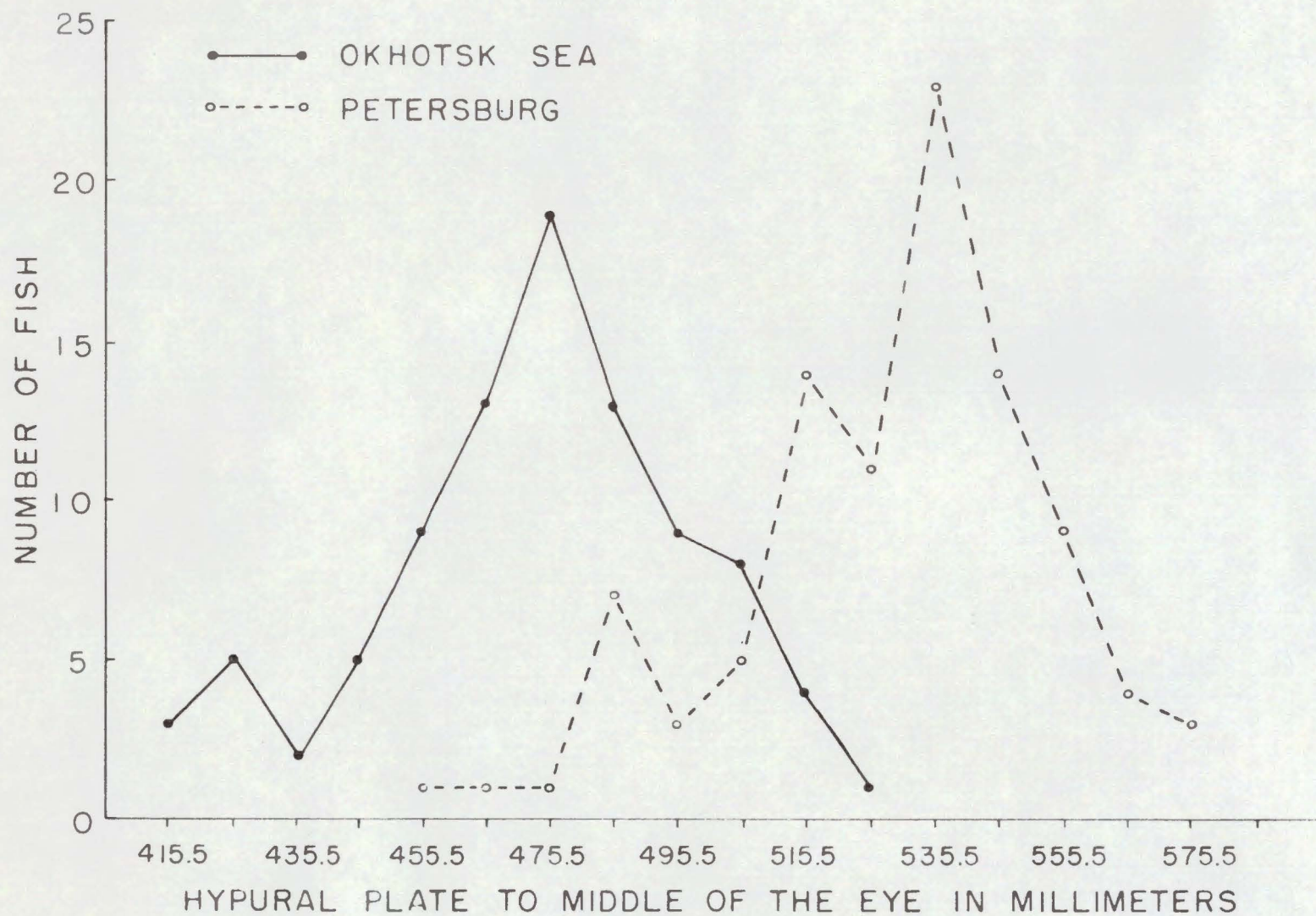


FIG. 2 RELATIONSHIPS OF NORTH AMERICAN SAMPLES TO
OKHOTSK SEA SAMPLES

FIGURE 3. HYPURAL PLATE TO MIDDLE OF EYE LENGTH FREQUENCY DISTRIBUTION 1955 CHUM SALMON



PINK SALMON

Laboratory examination has been completed on all pink salmon from Asian sources. Acquisition of three walk-in freezers (surplus), and refinement in laboratory techniques should expedite relatively rapid processing of specimens in the future and it is anticipated that data from all specimens of red chum and pink salmon from all major collection areas will be obtained and analyzed before the Annual Commission Meeting of 1956.