During the 1969 meeting of the Scientific Subcommittee of the Ad Hoc Committee on Abstention, International North Pacific Fisheries Commission, the Japanese Section submitted two documents, INPFC Docs. 1252 and 1253, containing a number of comments and inquiries regarding two reports on Alaska salmon fisheries and stocks which were submitted to the Subcommittee by the United States Section in 1968: "Information on recent changes in the salmon fisheries of Alaska and the condition of the stocks" (INPFC Doc. 1134), and "Status of commercial and subsistence salmon fisheries of western Alaska from Cape Newenham to Cape Prince of Wales" (INPFC Doc. 1135). The United States Section would like to respond to the Japanese inquiries and comments on INPFC Docs. 1134 and 1135, with a view toward providing the Japanese Section with a better understanding of recent changes in the salmon fisheries of Alaska, the condition of the stocks and their management and utilization.

At the outset, we would like to comment on some general remarks made by the Japanese Section with respect to INPFC Doc. 1134. First, Document 1134 dealt with substantially more than descriptions of historical changes in salmon catches and fishing effort. In addition to catch-effort statistics, data on sizes of runs, escapements and resultant returns were provided for a number of stocks. As for the catch-effort statistics, we analyzed changes in catches in relation to changes in fishing effort. Such analyses, in our opinion, provide a scientific basis for evaluation of stock conditions, determination of the relative effects of fishing and environmental conditions on salmon stocks, and management of the fisheries.

With respect to the effect of variations in survival conditions on salmon stocks, in numerous instances in Doc. 1134 we called attention to indications of both favorable and unfavorable survival conditions and their impact on stock changes and trends. Changes in stock conditions were attributed not only to changes in fishing effort but to variations in survival conditions as well.

Regarding variations in survival conditions, it is obvious that many factors affect survival of salmon at different stages of their life history. However, rarely is it possible to identify precisely the cause of variations in survival. Nor is it possible to predict changes in all of the environmental variables affecting salmon production. Thus, variations in survival or productivity of a salmon stock can be detected or measured only after the fact. Even if it were otherwise, control of all of the environmental factors affecting survival or productivity simply is not possible. What is amenable to control of salmon production, however, is fishing intensity and escapement. Conservation of a salmon stock therefore involves regulation of fishing to offset, insofar as possible, declines in catches; to protect a stock in years of low abundance, allowing a margin of safety against the possibility of adverse survival conditions; and to obtain the level of escapement which, given average survival conditions, can be expected to provide the maximum yield for the fishery in future years.
In Document 1134, we presented a considerable body of scientific data bearing on the principles of salmon conservation and their application to numerous salmon stocks in Alaska, the separation of which was based on our ability to manage them independently for conservation purposes. Instances where conservation measures for a predominant species in an area necessarily affect the utilization and management of other species of salmon in the area were pointed out in Document 1134.

Turning to the Japanese Section's comments and inquiries on specific salmon fisheries and stocks, we present the following views and clarifications:

1. Southeastern Alaska

In addition to catch-effort statistics, some information on escapements and resultant returns was given in Doc. 1134 for pink salmon, the most important of the five species of salmon in Southeastern Alaska. Although the quantity of escapement-return data for pink salmon was considered to be too limited for fitting of reproduction curves or calculation of correlation coefficients, we believe that they and the catch-effort statistics were entirely adequate to deal with matters of greater significance, namely, the condition of the stocks and conservation measures needed to restore and maintain the stocks at high productive levels.

As mentioned previously, Document 1134 deals with more than explanations of historical changes in catch and fishing effort. The two sets of statistics, examined together, indicate changes in stock conditions. Analysis of levels of catch and changing stock conditions in relation to levels of fishing effort provide valuable information as to the effects of fishing on the stock, the relative effect of variations in survival conditions on stock changes, and conservation measures needed to achieve the maximum production possible.

2. Copper-Bering River Area

At the time Document 1134 was prepared, catch-effort statistics for salmon caught in Copper and Bering Rivers were not separated according to river system. Recently, however, we have separated the catches for the two river systems back to 1953. Separation of data on fishing effort is now being made. We will provide information on annual salmon catches and fishing effort by river system when our compilations are completed. For the present, we should mention that the Copper River accounts for about 95 percent of the sockeye catch in the Copper-Bering River Area, about 70 percent of the coho catch, and practically all of the much smaller catches of chinooks, pinks, and chums.

The reason that no mention was made in Document 1134 of the relation between sockeye escapement and resultant return is that estimates of escapement are available only since 1967 for the Copper River. The Copper River and many of the lakes and tributary streams in the Copper River drainage carry much glacial silt, preventing accurate visual counts of spawners. In 1967, the U.S. Bureau of Commercial Fisheries (now the National Marine Fisheries Service) conducted a tagging study for purposes of estimating escapements of sockeye salmon in the upper part of the Copper River. The program has been continued since then by the Alaska Department of Fish and Game. Escapement estimates for sockeye in the upper Copper River are now available for four years. However, returns from these escapements will not be known until the resultant brood years complete their life cycles, the duration of which is 5 years for the predominant portion of Copper River sockeye.
The lack of escapement-return data for Copper River sockeye notwithstanding, we believe that the 5-year lag between the reduction in fishing effort in 1959-62 and the improvement in the condition of the run in 1964-67 indicates that the reduction in effort had a beneficial effect.

Estimates of sockeye escapements for the Bering River system are available for 1964-70 and will be provided to the Japanese Section when data on resultant returns become available.

With regard to the subsistence fishery in the Copper River, its expansion in recent years has been due to the development of a dip-net fishery. The number of permits issued for dip-net fishing increased from 60 in 1960 to 1,300 in 1966-68 (and 1,600 in 1969). Annual catches of sockeye salmon have been about 15,000 fish in most of the recent years (28,000 fish in 1969), compared to practically no dip-net catch prior to 1960. In comparison with catches by the commercial fishery, dip-net catches are relatively minor. Regulation of the dip-net fishery consists of a seasonal catch limit of 40 salmon per permit.

3. Prince William Sound

Although escapement-return data for the 1953-54 and 1957-63 broods of chum salmon show that escapements of 0.1-0.2 million spawners produced larger returns than escapements of 0.3-0.5 million fish and the escapement was somewhat over 0.4 million fish in 1964, we do not believe it is correct to conclude that escapements in recent years have been excessive. Escapements in 1965-67 were all approximately about 0.2 million fish, within or close to the range of escapements that previously produced the largest returns. Escapement was 0.196 million fish in 1968 and 0.163 million fish in 1969.

Information on returns from escapements since 1963 will, of course, be useful in determining the level of optimal escapement for chum salmon in Prince William Sound. We should point out that achievement of optimal escapements will depend in large part on the measures required for the conservation of the predominant species, pink salmon, which accounts for over 85 percent of the total catch of salmon in the Sound.

4. Cook Inlet

Sport fishing for sockeye salmon in Cook Inlet is carried out almost entirely in the Russian River, a tributary stream in the Kenai River system. Only small numbers of sockeye are caught by sport fishermen in the Kenai River itself or elsewhere in Cook Inlet.

The run in the Russian River is separated into two components: an early run which enters the mouth of the river before June 20, and a late run which enters after June 20. Commercial fishing on the early segment of the Russian River run has been negligible since 1964 because of closures (through June 17) imposed in an attempt to restore the chinook salmon runs in Cook Inlet. Hence, regulation of sport fishing on the early segment of the Russian River sockeye run essentially has been independent of the commercial fishery. As for the late segment of the run, management of the sport fishery is coordinated with management of the commercial fishery, involving the use of sonar equipment for enumeration of escapement to the Kenai River.
With regard to the matter of sustainable yields for coho salmon, a species which has accounted for slightly under 10 percent of the salmon catch in Cook Inlet over the past 30 years, annual catches during 1953-67 averaged about 115,000 fish less than the average catch during 1936-52 even though fishing effort was substantially greater in the more recent period. From these data, we conclude that the catches of coho salmon in Cook Inlet could be increased from recent levels, but only by decreasing, not increasing, fishing effort. Regulation of fishing on coho salmon, of course, is dependent to a large extent on conservation measures taken with respect to pink and sockeye salmon, the two species that have provided about 80 percent of the salmon catch in Cook Inlet since the mid-1930's.

Concerning chinook salmon in Cook Inlet, we shall attempt to clear up what appears to have been a misunderstanding resulting from the wording of Document 1134. First, fishing time allowed for catching of chinook salmon was drastically curtailed in 1964 in an attempt to stop the steady decline in catches observed during 1951-63. Second, the restrictions on fishing time have remained in force since 1964. As a result, the catches of chinook salmon have remained at a very low level. The catches do not, of course, reflect changes in abundance since 1964. For this purpose, we provide the following data on escapements to a number of clear-water streams in the Susitna drainage in the upper part of Cook Inlet:

<table>
<thead>
<tr>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Alexander R.</td>
<td>205</td>
<td>400</td>
<td>300</td>
<td>500</td>
<td>727</td>
<td>735</td>
<td>817</td>
</tr>
<tr>
<td>Dashka R.</td>
<td>2,422</td>
<td>2,749</td>
<td>2,000</td>
<td>2,500</td>
<td>4,863</td>
<td>5,652</td>
<td>6,500</td>
</tr>
<tr>
<td>Lake C.</td>
<td>290</td>
<td>172</td>
<td>300</td>
<td>1,000</td>
<td>1,300</td>
<td>1,540</td>
<td>1,700</td>
</tr>
<tr>
<td>Montana R.</td>
<td>75</td>
<td>57</td>
<td>100</td>
<td>x</td>
<td>75</td>
<td>250</td>
<td>500</td>
</tr>
<tr>
<td>Sheep R.</td>
<td>x</td>
<td>3</td>
<td>100</td>
<td>x</td>
<td>30</td>
<td>150</td>
<td>200</td>
</tr>
<tr>
<td>Little Willow R.</td>
<td>7</td>
<td>3</td>
<td>38</td>
<td>6</td>
<td>12</td>
<td>150</td>
<td>x</td>
</tr>
<tr>
<td>Big Willow R.</td>
<td>51</td>
<td>35</td>
<td>103</td>
<td>24</td>
<td>125</td>
<td>90</td>
<td>1,000</td>
</tr>
<tr>
<td>Chunilna C.</td>
<td>319</td>
<td>8</td>
<td>300</td>
<td>x</td>
<td>1,000</td>
<td>375</td>
<td>x</td>
</tr>
<tr>
<td>Campbell C.</td>
<td>x</td>
<td>119</td>
<td>15</td>
<td>300</td>
<td>125</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Ship C.</td>
<td>94</td>
<td>207</td>
<td>50</td>
<td>200</td>
<td>500</td>
<td>710</td>
<td>1,200</td>
</tr>
</tbody>
</table>

Note: An x denotes no count.

The foregoing escapement data show that there has been some improvement in the condition of the chinook salmon runs in Cook Inlet, reflecting the benefits of the curtailment of commercial fishing.

5. Kodiak Area

Pink salmon, by far the most abundant species of salmon in the Kodiak Area, spawn in numerous streams in the area. During their migrations from the sea, fish destined to spawning streams in one part of the area are intermingled in various fishing districts with fish destined to streams in other parts of the area. Because of the complex intermingling, the Kodiak Area was treated as a unit in our analyses of catch-effort data.
Regarding Figure 36 of Document 1134, it is our interpretation of the data that the 1966 and 1967 pink salmon runs were indeed fully utilized. The 1966 escapement index was smaller than any previous even-numbered year except 1958. The 1967 escapement index was the smallest on record, even though severe restrictions were imposed on the fishery that year: the commercial catch was less than 0.2 million fish, the smallest in 35 years.

Escapement indices for pink salmon in the Kodiak Area in 1968 and 1969 were about 1.2 and 1.6 million fish, respectively.

Regarding the relation between escapement and resultant return for sockeye salmon in the Kodiak Area, our conclusion that the decline in productivity of the 1940-49 brood years was not caused by excessive escapements was based on evidence that the larger escapements observed in the middle and late 1930's were not excessive. In addition, the near-vertical drop in the size of the runs resulting from escapements during the 1940's strongly suggests that factors other than numbers of spawners affected productivity.

6. Chignik and Alaska Peninsula (South Side)

As information on escapements and resultant returns for pink salmon in these two areas is compiled, it will, of course, be furnished to the Japanese Section. In the meantime, it is our opinion that catch-effort statistics, such as were presented in Document 1134, provide clear indications as to stock conditions and the conservation measures needed to protect the stocks.

7. Bristol Bay Sockeye

a. Kvichak River. Information on the size and capacity of sockeye spawning and nursery areas in the Kvichak system (and in other river systems in Bristol Bay) is included in a paper, "Biological studies and estimates of optimum escapements of sockeye salmon in the major river systems of southwestern Alaska," by Burgner, Di Costanzo, et al. (Fishery Bulletin, U.S. Fish and Wildlife Service, Vol. 67, No. 2, 1969). Copies of this paper will be made available to the Japanese Section.

Regarding competition among year classes in the Kvichak River, there is a strong indication that progeny from escapements in peak years (1952, 1956 and 1960) in some way suppress the production from escapements in the years immediately following (1953, 1957 and 1961). The suppressant effect could be caused by competition for food in the nursery area, carry over of predators from one year to the next, etc. Competition between other pairs of adjacent brood years in the cycle does not appear to be as great.

b. Naknek River. We concur with the Japanese Section that only scanty data on returns from escapements of 1.5 million fish or more are available. Because of this, the placement of the right hand portion of the reproduction curve (Figure 61, Doc. 1134) must be viewed as a rough approximation. We consider the remainder of the return-escapement data adequate support for the conclusions drawn in Doc. 1134.
c. Egegik River. As mentioned in Document 113, an escapement goal of about 1.0 million spawners in the Egegik system was based on surveys of available spawning area and the large return from the 1956 escapement. The return from the 1960 escapement clearly indicated that escapements of 1.0 million fish or more were not excessive. However, returns from the 1962-64 escapements (which were in the range of 0.850 to 1.0 million spawners) have been relatively small (approximately 1.3 to 2.0 million fish). Such information, together with information on returns from escapements in prior years other than 1956 and 1960, has been used in setting of escapement goals of less than 1.0 million fish in recent non-peak years. Forthcoming data on returns from the 1965-70 escapements will be used in further study of escapement goals.

d. Ugashik, Wood and Igushik Rivers. We would appreciate specification of the points that the Japanese Section wishes to have clarified concerning return-escapement relationships for sockeye of these river systems.

8. Salmon fisheries of western Alaska, Cape Newenham to Cape Prince of Wales

Additional information regarding stock conditions and the status of commercial and subsistence fisheries for salmon from Cape Newenham to Cape Prince of Wales in western Alaska will be submitted to the Ad Hoc Committee on Abstention as it becomes available. In this regard, data contained in Tables 1-14 of INPFC Doc. 113 are updated through 1969 in a separate document being submitted to the Committee this year.