COMMERCIAL FISHERIES REVIEW

January 1961 Washington 25, D.C. Vol. 23, No. 1

SHRIMP EXPLORATION IN CENTRAL ALASKAN WATERS BY THE M/V JOHN N. COBB, OCTOBER-NOVEMBER 1959

By Fred Wathne* and Harold C. Johnson*

SUMMARY

To assess the commercial potential of the shrimp populations of central Alaska during the fall season, the U. S. Bureau of Commercial Fisheries research vessel John N. Cobb conducted exploratory fishing operations in that area from October 14 to November 13, 1959. During the cruise, 101 shrimp-trawl drags were made using a 40/43-foot Gulf of Mexico-type shrimp trawl.

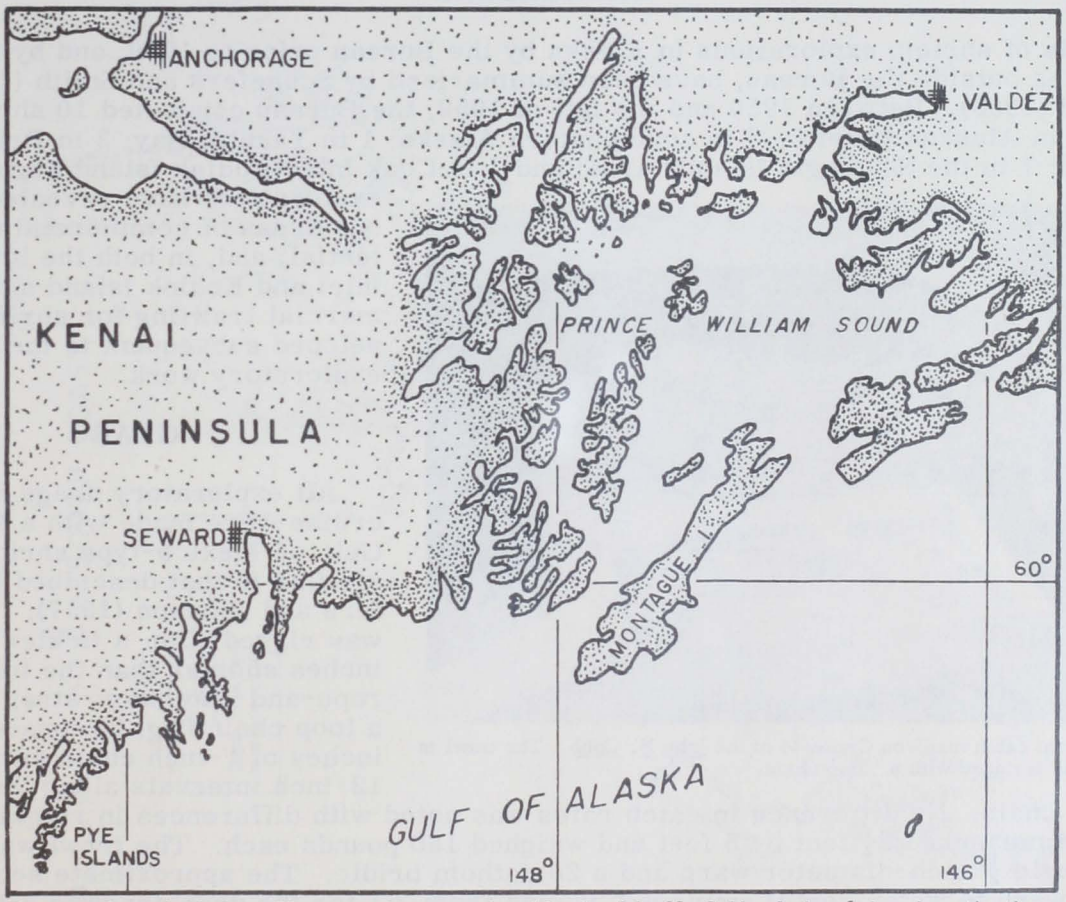

Fig. 1 - Central Alaska. The general area explored by the John N. Cobb, during shrimp investigations--October-November 1959.

Shrimp catches were poor throughout the area investigated. A commercial potential was uncovered only in a few drags--west of Seal Rocks, along the western shore of the outer portion of Day Harbor, and outside Whidbey Bay--where catch rates of from 550 to 660 pounds of heads-on shrimp per hour were achieved.

* Fishery Methods and Equipment Specialists, Branch of Exploratory Fishing, Division of Industrial Research, U. S. Bureau of Commercial Fisheries, Seattle, Wash.

U. S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
SEP. NO. 609

Pink shrimp (Pandalus borealis), sidestripe shrimp (Pandalopsis dispar), and coonstripe shrimp (Pandalus hypsinotus) were found in quantity. Spot shrimp (Pandalus platyceros) and gray shrimp (Crangon sp.) were taken frequently, but in very small quantities.

INTRODUCTION

Exploratory shrimp fishing was conducted by the U. S. Bureau of Commercial Fisheries research vessel John N. Cobb in the central Alaska region, from the Pye Islands to and including Prince William Sound, from October 14 to November 13, 1959 (fig. 1). The exploration was the eleventh Bureau investigation conducted since 1950 to evaluate the potential of the shrimp resources in Alaskan waters.

Objectives of the cruise were to: (1) determine the species and abundance of shrimp available in this area during October and November; (2) determine bottom conditions and assess current and tidal characteristics, which could affect fishing operations; and (3) collect oceanographic data, which could be helpful in understanding shrimp distribution as related to the environment.

The work was carried out in cooperation with biologists of the Alaska Department of Fish and Game and members of the industry in the area.

BACKGROUND

Results of shrimp explorations in Alaska by the Bureau prior to 1950, and by individuals and agencies outside the Bureau, have been summarized by Schaefers and Smith (1954) and Greenwood (1959). Between 1950 and the fall of 1959, the Bureau conducted 10 shrimp explorations in Alaskan waters: 5 in southeastern Alaska; 1 in Yakutat Bay; 2 in Prince William Sound; 1 in the Shumagin Islands area; and 1 in Cook Inlet-Kodiak Island region.[1/] These explorations have revealed numerous areas of commercial shrimp potential; and, in both the lower Cook Inlet and Kodiak Island areas, commercial trawling for shrimp has developed subsequent to the Bureau's exploratory work.

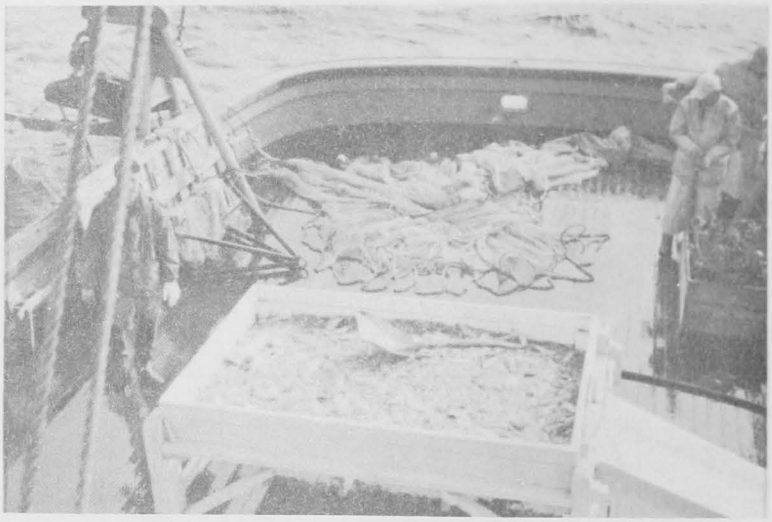

Fig. 2 - A typical catch made on Cruise 44 of the John N. Cobb. The trawl in the background is rigged with a "loop chain."

GEAR

All exploratory drags during this cruise were made with a 40/43-foot, Gulf-of-Mexico-type shrimp trawl, similar to that described by Schaefers and Johnson (1957). The net was rigged with: a tickler chain, 10 inches shorter than the total footrope-and-extension-strap distance; a loop chain (fig. 2) consisting of 15 inches of $\frac{1}{4}$-inch chain secured at 12-inch intervals along the footrope; or with no chain. No difference in catch rates was noted with differences in rigging. The doors used measured $2\frac{1}{2}$ feet by 5 feet and weighed 160 pounds each. The trawl was dragged using a single $\frac{1}{2}$-inch-diameter warp and a 25-fathom bridle. The approximate scope ratios (ratios of warp to water depth) employed, varied from 3:1 for the deep drags to 5:1 for the shallower drags. Trawling speed varied between $2\frac{1}{2}$ and 3 knots. Drags were of 30-minute duration.

1/ For results of those surveys see: Schaefers 1951, 1953; Ellson and Livingstone, 1952; Schaefers and Smith, 1954; Schaefers, Smith, and Greenwood, 1955; Greenwood 1958, 1959; and Johnson 1959.

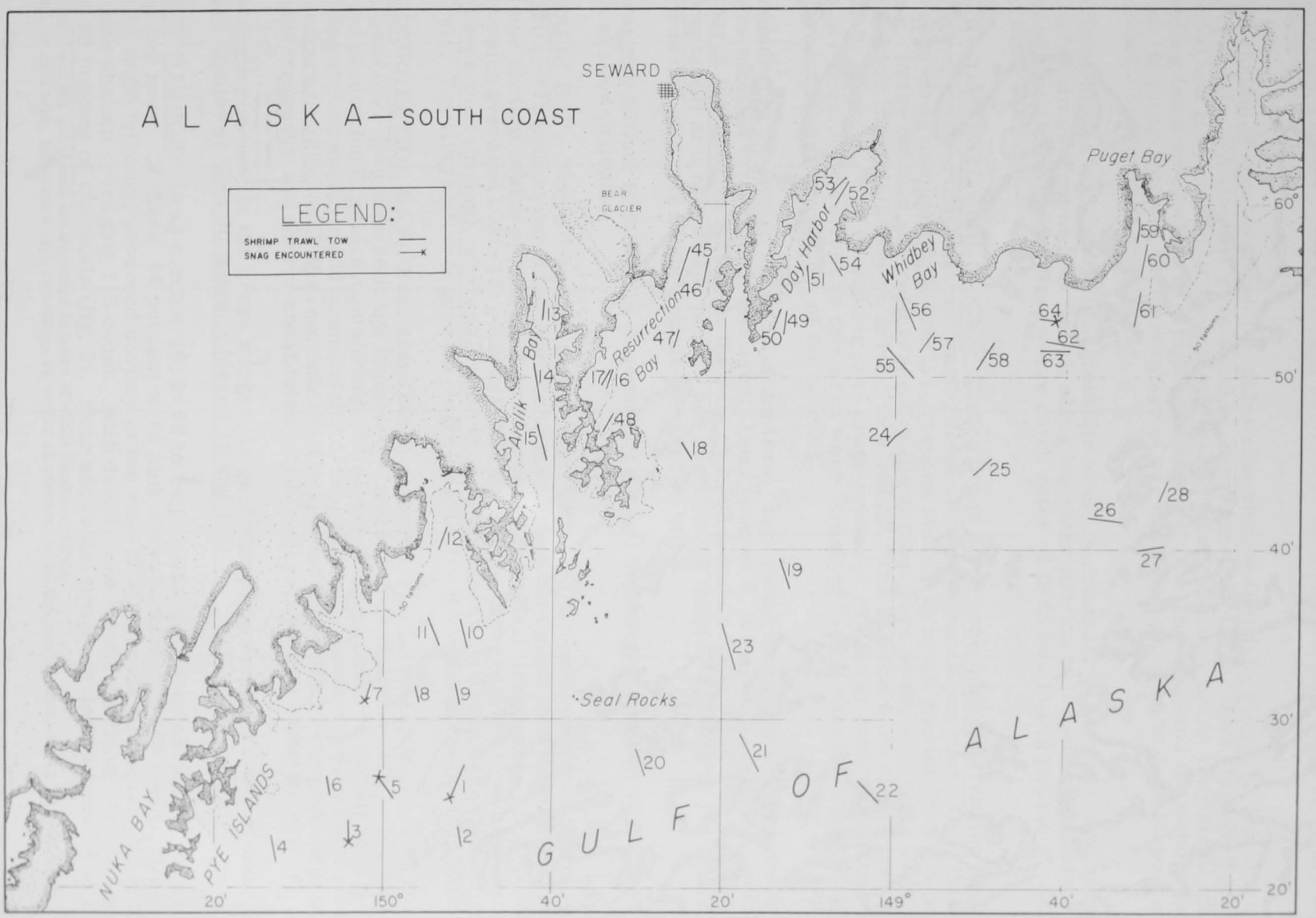

Fig. 3 - Location of shrimp-trawl drags made by the John N. Cobb during October-November 1959.

Fig. 4 - Location of shrimp-trawl drags made by the John N. Cobb during October and November 1959. Northeastern portion of the cruise.

FISHING RESULTS

During the explorations, 101 drags were made in depths ranging from 20 to 233 fathoms (figs. 3 and 4).

Pink shrimp (Pandalus borealis), sidestripe shrimp (Pandalopsis dispar), and coonstripe shrimp (Pandalus hypsinotus) were found in significant quantities. Spot shrimp (Pandalus platyceros) and gray shrimp (Crangon sp.) were taken frequently but in very small quantities. Egg-bearing females constituted a high percentage of pink shrimp found throughout the area explored. In many catches, the percentage of egg bearers ranged as high as 90 percent and it was at least 50 percent in most cases.

Shrimp catches were poor throughout the area. A commercial potential was uncovered only in a few drags west of Seal Rocks, along the outer portion of the western shore of Day Harbor, and outside Whidbey Bay, where catch rates of from 550 to 660 pounds of whole shrimp were achieved.[2/]

PYE ISLANDS TO SEAL ROCKS: Eleven drags made here in depths ranging from 74 to 115 fathoms, took shrimp at rates ranging from 20 to 600 pounds per hour. Only three of these drags (drag numbers 8, 9, and 11) produced shrimp at rates greater than 400 pounds per hour. In the catches, 74 to 80 percent of the shrimp were pinks, averaging 87 to 119 count (number of whole heads-on shrimp in a pound). The balance were sidestripes ranging from 31 to 34 count. The remaining nine drags produced shrimp at rates lower than 150 pounds per hour. The catches in this area were "trashy[1/]" with shrimp constituting only 5 to 55 percent of the total weight of the catches.

Considering the design and size of the trawl, significant quantities of marketable food fish were taken in two drags in this area. Drag number 2, in 90 to 102 fathoms, took Pacific ocean perch (Sebastodes alutus) at the rate of 1,200 pounds per hour and true cod (Gadus macrocephalus) at a rate of 280 pounds per hour. Drag number 9 in 100 to 104 fathoms produced true cod at a rate of 200 pounds per hour.

Dragging bottom in this area is generally good at depths greater than 80 fathoms and poor in shallower depths.

AIALIK BAY: Three drags, in depths from 94 to 158 fathoms, produced shrimp at rates from 120 to 375 pounds per hour. These shrimp catches were made up of from 63 to 83 percent sidestripe shrimp, which averaged 30 to 63 count in individual drags, and 17 to 37 percent pink shrimp which averaged 104 to 165 count in individual drags. Drag number 13 was comparatively clean (89-percent shrimp), whereas drags 14 and 15 contained only 33 and 37 percent shrimp, respectively. Trawling bottom is good the entire length of the bay in areas deeper than 50 fathoms.

RESURRECTION BAY: Four drags here produced shrimp at rates ranging from 60 to 200 pounds per hour. Two of these drags (numbers 45 and 47) in depths from 120 to 146 fathoms, produced predominantly sidestripe shrimp. The catch of drag number 45 contained 72 percent sidestripe shrimp averaging 68 count and that of drag number 47 contained 87 percent sidestripe shrimp averaging 29 count. The remaining catches produced predominantly pink shrimp. All catches were trashy, and shrimp constituted only 29 to 61 percent of the total weight.

Dragging bottom, in the areas worked, is good except on the shelf south of Bear Glacier in water shallower than 50 fathoms (drags 16 and 17).

DAY HARBOR: Drag number 49, in 68 to 84 fathoms, produced shrimp at the rate of 660 pounds per hour. Of these, 96 percent were pink shrimp averaging 100 count. Drag number 50, in 52 to 56 fathoms, produced shrimp at the rate of 550 pounds per hour. All of these were pink shrimp averaging 110 count. Both drags were relatively clean--shrimp constituted 96 and 86 percent of the totals (fig. 5). Four additional drags, in depths from 54 to 108

2/ All shrimp weights and counts are expressed in terms of whole heads-on shrimp.
3/ Trashy, as used here, indicates a high percentage by weight of noncommercial fish and invertebrates in the total catch.

fathoms, yielded shrimp at rates from 80 to 300 pounds per hour. The shallowest of these drags (drag 54) produced shrimp at the rate of 300 pounds per hour. All of these were pink shrimp averaging 98 count. This catch was also clean, being composed of 88-percent shrimp. The other 3 drags were moderately trashy.

Fig. 5 - A clean catch of 330 pounds of predominantly pink shrimp from a drag made in Day Harbor.

OFFSHORE, SOUTHWEST OF MONTAGUE ISLAND: Drag number 55, outside Whidbey Bay in 55 to 59 fathoms, took pink shrimp (104 count) at a rate of 660 pounds per hour. This was a clean catch composed of 89 percent shrimp. Another drag (drag 26) south of Puget Bay in 106 to 110 fathoms, caught shrimp at a rate of 400 pounds per hour. This catch, however, was trashy, and shrimp constituted only 29 percent of the total weight. The remaining successful drags in this area were made between 59 and 142 fathoms. The shrimp catches ranged from 30 to 220 pounds per hour and were composed primarily of pinks ranging in average size per drag from 62 to 140 count. The balance were sidestripe shrimp ranging in average size per drag from 22 to 64 count. Dragging bottom in this area is good in water deeper than 70 fathoms. Drags outside Puget Bay and southwest of Cape Cleare in depths shallower than 70 fathoms were hindered by a very strong westerly current, and attempts to fish here resulted in failure of the gear to reach bottom, twisted gear, or bogged doors. Off Whidbey Bay, in water shallower than 70 fathoms, the bottom is irregular and composed of rock in some locations; consequently only short drags were possible in a relatively narrow depth range.

MONTAGUE STRAIT AND GREEN ISLAND AREA: Nineteen drags were made here in depths ranging from 20 to 158 fathoms. The best shrimp catch (drag number 34) consisted 130 pounds (260 pounds per hour) of three species: 75 percent 108-count pink shrimp; 21 percent 20-count sidestripe shrimp; and 4 percent 8-count coonstripe shrimp. This catch was trashy, however, being composed of only 56 percent shrimp. The balance of the drags in this area produced very poor shrimp catches which ranged from only a trace to 160 pounds per hour. These catches were also trashy, with shrimp constituting only 7 to 38 percent by weight.

Fig. 6 - The catch from a drag made in Barry Army of Port Wells. One hundred pounds of pink and sidestripe shrimp were taken in this drag.

EASTERN PRINCE WILLIAM SOUND AREA: Twenty-three drags were made in this area in depths ranging from 32 to 233 fathoms. Shrimp catches were very poor. The largest catch was made in Simpson Bay in 32 to 45 fathoms where shrimp were taken at the rate of 540 pounds per hour (drag 75). The shrimp catch was composed of 78 percent pink shrimp averaging 112 count, 13 percent sidestripe shrimp averaging 39 count, and 9 percent coonstripe shrimp averaging 54 count. The catch, however, was trashy, and shrimp constituted only 53 percent of the total weight. The remainder of the drags in this area produced shrimp at rates ranging from 2 to 80 pounds per hour, and the catches were very trashy.

PORT WELLS AREA: One of three drags in this area (drag number 100) produced shrimp at an hourly rate of 200 pounds. The catch was composed of 37 percent pink shrimp (156 count), 51 percent sidestripe shrimp (25 count), and 12 percent coonstripe shrimp (18 count). The shrimp in this drag constituted only 44 percent of the total catch. In addition to the marine life, two large boulders weighing approximately 75 and 150 pounds were taken, indicating unsuitable bottom for extended drags (fig. 6). The drag in College Fiord (number 100) resulted in a severely damaged net and loss of the catch.

FISH CATCH

Catches of food fish obtained during the cruise ranged from 0 to 740 pounds per half-hour drag. The 740-pound catch was taken between Pye Islands and Seal Rocks (drag number 2) in 90 to 102 fathoms. In addition, 175 pounds of Pacific ocean perch were taken in each of two drags outside Whidbey Bay (drags number 24 and 26). Also, approximately 100 pounds of marketable-size rock sole (Lepidopsetta bilineata) were taken in drags near Green Island (drag 69) and in Orca Bay (drag number 77).

The majority of the catches, however, consisted predominantly of industrial species including: walleye pollock (Theragra chalcogrammus); turbot or arrowtooth flounder (Atheresthes stomias); yellowfin sole (Limanda aspera); flathead sole (Hippoglossoides elassodon); smelt (Osmeridae); sculpin (Cottidae); sea poacher (Agonidae); blenny (Xiphisteridae); eel pouts (Zoarcidae); herring (Clupea pallasi); skates (Raja sp.); and dogfish (Squalus acanthias).

MISCELLANEOUS OBSERVATIONS

Weather and oceanographic observations were recorded at each fishing station. Surface water temperatures were obtained at each station. They ranged from 37.7° F. to 49.7° F. and averaged 46.5° F. Bottom water temperatures were obtained at 44 stations. The range was 41.5° F. to 52° F. and averaged 44.7° F.

Bottom samples were obtained from all but two stations. In all but 5 instances the bottom consisted wholly or partially of gray mud. The color was a very light gray in contrast to the darker gray and greenish mud bottom found in the Cook Inlet-Kodiak Island area in 1958 (Greenwood 1959). On the other five drags the bottom types were gravel, rock, coral (or various combinations of these), and mud.

APPENDIX

A supplemental oceanographic observations table for Cruise 44 is available at the Seattle office of the Branch of Exploratory Fishing.

LITERATURE CITED

ELLSON, J. G., and LIVINGSTONE, ROBERT, Jr.
1952. The John N. Cobb's Shellfish Explorations in Certain Southeastern Alaskan Waters, Spring 1951. Commercial Fisheries Review, vol. 14, no. 4 (April), pp. 1-20. (Also Separate No. 311.)

GREENWOOD, MELVIN R.
1958. Bottom Trawling Explorations off Southeastern Alaska, 1956-1957. Commercial Fisheries Review, vol. 20, no. 12 (December), pp. 9-21. (Also Separate No. 553.)

1959. Shrimp Explorations in Central Alaskan Waters by M/V John N. Cobb, July-August 1958. Commercial Fisheries Review, vol. 21, no. 7 (July), pp. 1-13. (Also Separate No. 553.)

JOHNSON, HAROLD C.
1959. King Crab, Shrimp, and Bottom Fish Explorations Conducted in Certain Waters from the Shumagin Islands to Unalaska, Alaska, by the M/V Tordenskjold--Summer and Fall, 1957. Commercial Fisheries Review, vol. 21, no. 3 (March), pp. 7-19. (Also Separate No. 543.)

SCHAEFERS, EDWARD A.
1951. The John N. Cobb's Shellfish Explorations in Certain Southeastern Alaskan Waters, Spring and Fall of 1950 (A Preliminary Report). Commercial Fisheries Review, vol. 13, no. 4 (April), pp. 9-19. (Also Separate No. 278.)

1953. Shellfish Explorations in Certain Southeastern Alaskan Waters by the John N. Cobb, Spring of 1952. Commercial Fisheries Review, vol. 15, no. 3 (March), pp. 1-18. (Also Separate No. 343.)

_____, and SMITH, KEITH A.
1954. Shellfish Explorations in the Yakutat Bay Area, Alaska, by John N. Cobb, Spring 1953. Commercial Fisheries Review, vol. 16, no. 4 (April), pp. 1-12. (Also Separate No. 398.)

LITERATURE CITED (Contd.)

_____; SMITH, K. A.; and GREENWOOD, M. R.
1955. Bottomfish and Shellfish Explorations in the Prince William Sound Area, Alaska, 1954. Commercial Fisheries Review, vol. 17, no. 4 (April), pp. 6-28. (Also Separate No. 398.)

_____, and JOHNSON, H. C.
1957. Shrimp Explorations off the Washington Coast, Fall 1955 and Spring 1956. Commercial Fisheries Review, vol. 19, no. 1 (January), pp. 9-25. (Also Separate No. 465.)

CONSERVATION OF YOUNG EEL MIGRATION ROUTES INTO INLAND WATER SYSTEM OF THE NETHERLANDS

Due to the steady demands to keep the inland waters of the low-lying parts of the Netherlands as fresh as possible, more and more dams, locks, and sluices are built as a separation between the sea and the inland water system. Hence elvers or young eels encounter steadily-increasing difficulties in their efforts to reach the inland waters from the sea and at some places it is even virtually impossible for them to cross these barriers.

With the idea to preserve the most important migration routes, it was decided to investigate the possibility to facilitate the inward elver migration, especially at the Afsluitdijk, which bars the IJsselmeer from the sea. In this respect it may be stated that the most obvious solution of this problem--viz. construction of so-called elver ladders--is practically impossible, because such ladders would be too readily destroyed by heavy waves pounding on the dam during spells of bad weather.

In the first years following 1932--the year during which the Zuyder Sea was dammed off from the North Sea and was renamed IJsselmeer--it was decided to open the sluices in the Afsluitdijk in the elver season at the time the sea level was at the same height as that of the IJsselmeer. By this procedure elvers got sufficient opportunity to pass the sluices and subsequently to migrate into the lake. The great drawback was that considerable quantities of sea water entered the lake besides the elvers. For even when fresh water passed the sluices on the way to the sea, saline water crept into the Ijsselmeer along the bottom.

According as the salinity of the lake decreased, which was of considerable advantage to the agricultural areas around the IJsselmeer, this inward flow of sea water could no longer be allowed. Therefore a new procedure of elver passing was introduced in the year 1938, based on the results of several years of studying elver behavior.

The method adopted consisted of the alternate opening and closing of the two hatches of the sluices. First the seaward hatches were lifted, so that elvers were able to enter the sluices, to congregate there near the inner hatches. This worked especially well during the periods when fresh water leaked in along the sides of the inner hatches. Next the seaward hatches were closed and the inner ones opened. The elvers thereby got the opportunity to enter the fresh lake. After some time the inner hatches were closed again and the outer ones opened, and so on. In fact, the elvers were handled like a ship in a lock. This whole sequence was repeated six times per night in the entire elver seasons and up to 1957 inclusive it met with considerable success. The great drawback was, however, again that appreciable quantities of sea water flowed into the IJsselmeer: per season some 10,000,000 square meters.

In an effort to eliminate this drawback a renewed study on elver behavior was started. This revealed that elvers are quite willing to migrate against a fresh-water flow along the sea bottom, and do not do so exclusively in the surface layers as was hitherto presumed. Based upon this knowledge, a new procedure has been put in operation from 1958 onwards: during low tide in sea the hatches of the sluices will be raised a few centimeters only, so that continuous flow of fresh water will pass the hatches on its way to the sea along the bottom of the sluices.

Extensive and large-scale aquarium experiments did reveal that in such a situation elvers will be attracted by the fresh water and assemble themselves in front of the hatches. As soon as the velocity of the fresh-water flow diminished sufficiently--owing to a rising of the sea level at flood tide--all elvers will make for the fresh water of the IJsselmeer. As soon as the sea level is equal with that of the lake the hatches will be closed, thus preventing the salt water from flowing into the lake. By this procedure the elvers will easily reach the lake without a simultaneous entrance of noteworthy quantities of sea water.

Aquarium tests have also revealed that elvers are not the only fish species to react in this way on a flow of fresh water. Flounder and smelt, which latter forms a very important staple food for eel, pike and perch--and perch abound in the IJsselmeer--show the same type of behavior. It has been proved that adoption of the new procedure described above offers those species a chance to enter the lake, which chance they lacked before.

--C. L. Deelder,
National Institute for Fishery Research,
IJmuiden, Netherlands.