

COMMERCIAL FISHERIES REVIEW

July 1959

Washington 25, D.C.

Vol. 21, No. 7

SHRIMP EXPLORATION IN CENTRAL ALASKAN WATERS BY M/V JOHN N. COBB, JULY- AUGUST 1958

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SUMMARY

The growth of Alaskan shrimping, which began in 1916, was apparently handicapped by the high cost of hand picking of shrimp and by high transportation rates. The introduction in 1956 of peeling machines on the West Coast for processing the small cocktail-size shrimp and the subsequent successful use of those machines, has renewed interest in the possibilities of expanding the existing Alaskan fishery.

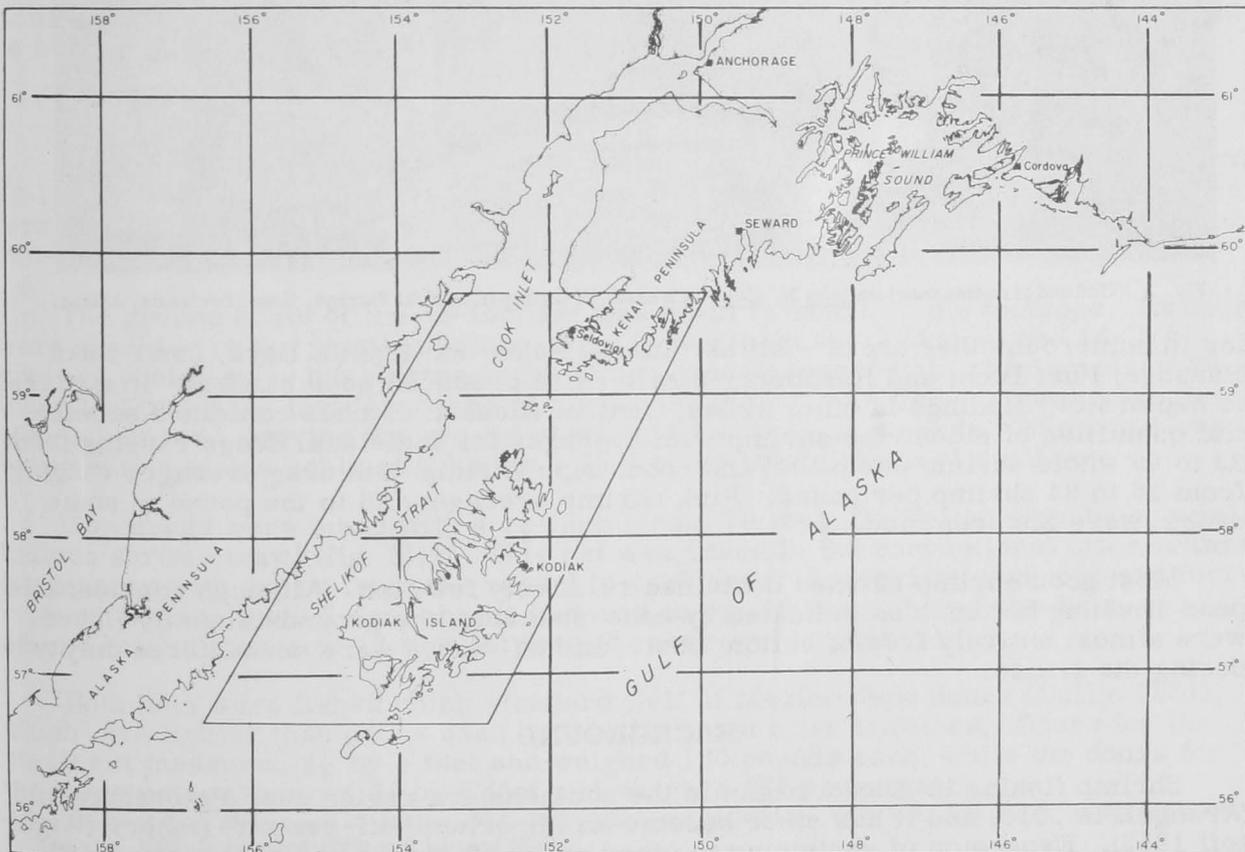


Fig. 1 - Central Alaska. Outline shows areas explored by the John N. Cobb, during shrimp explorations in July and August 1958.

Considerable information regarding the latent shrimp resources of Alaska has been obtained in recent years through explorations conducted by the U. S. Bureau of Commercial Fisheries. To assess the shrimp populations of Lower Cook Inlet and

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Kodiak Island, the Bureau's exploratory fishing vessel, John N. Cobb did exploratory fishing between July 22 and August 26, 1958. During the cruise a total of 109 drags was made using Gulf of Mexico-type shrimp trawls.

Excellent shrimp catches in Kachemak and Marmot Bays consisted of up to 1,770 and 1,400 pounds of heads-on shrimp per half-hour tow, respectively. Trawl-

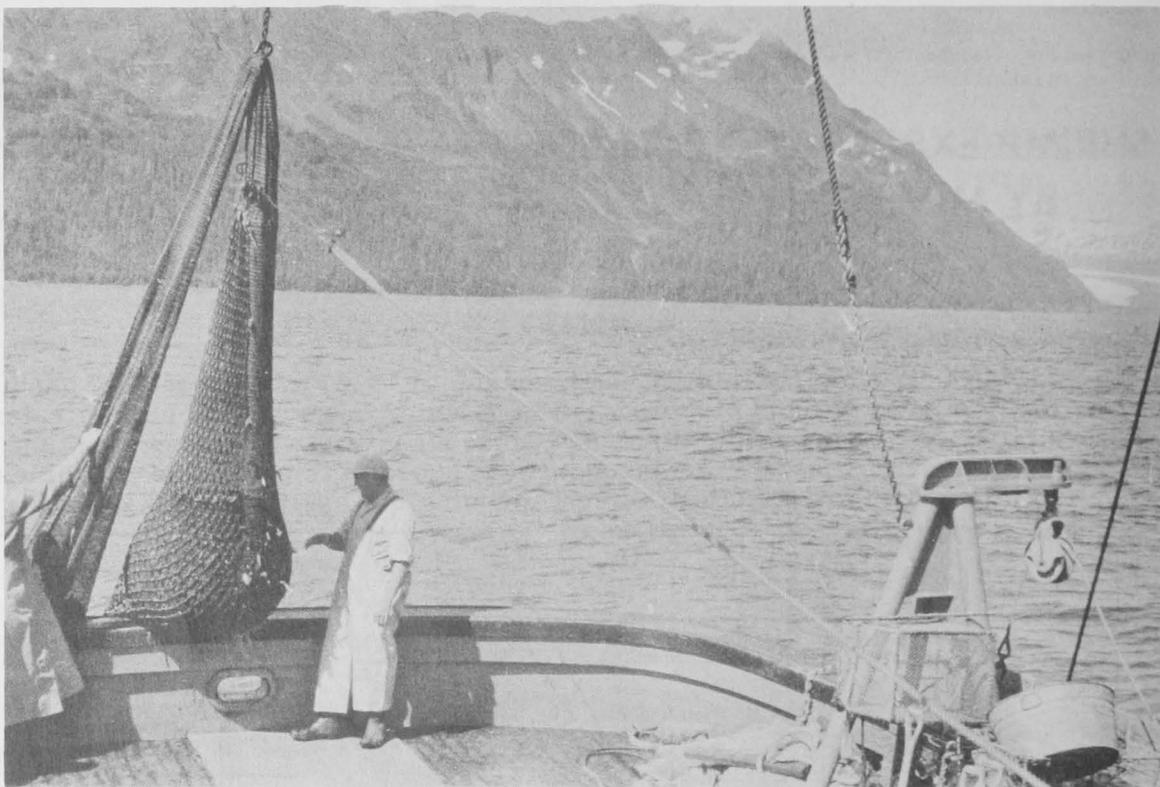


Fig. 2 - Cod end of shrimp trawl on John N. Cobb with catch of shrimp from Nuka Passage, Kenai Peninsula, Alaska.

ing in numerous other areas--Alitak, Kukak, Nuka, and Uganik Bays, Inner Nuka Passage, Port Dick, and Raspberry Strait--also produced good catches. In contrast to exploratory findings in other areas, Central Alaskan catches contained substantial quantities of sidestripe shrimp with averages for individual drags ranging from 23 to 69 whole shrimp per pound and coonstripe shrimp with drag averages ranging from 16 to 84 shrimp per pound. Pink shrimp averaging 56 to the pound in some drags, were also common.

Most good shrimp catches contained relatively few fish. Although considerable poor trawling bottom was indicated by echo-sounding, the grounds actually fished were almost entirely free of bottom obstructions. Snags were encountered only twice during the cruise.

BACKGROUND

Shrimp fishing in Alaska began in the southeastern region near Petersburg and Wrangell in 1916, and it has since become an important "off-season" fishery (Wiguttoff 1953). Expansion of shrimping to other areas of Alaska has been attempted; however, those occasional ventures have been sporadic and on a small scale (Bower 1917-48; and Thompson 1950-56). Apparently the growth of the fishery has been handicapped by the high cost of hand-picking small pink shrimp and high transportation rates. The successful use of mechanical peeling machines, introduced to the West Coast in 1956, has served to renew interest in the expansion of the Alaskan shrimp fishery.

In recent years the Bureau of Commercial Fisheries has acquired considerable information concerning the latent shrimp resources in various waters of Alaska. From 1950 through 1957, nine shrimp explorations were conducted; 5 off Southeastern Alaska, 1 in Yakutat Bay, 2 in Prince William Sound, and 1 extending from near the Shumagin Islands to the Unalaska Island area.^{1/} These explorations revealed numerous areas having commercial potential. The most successful cruise was made in 1957 when catches ranged up to 3,800 pounds in a half-hour drag in the Shumagin Island area. Although results of earlier explorations were not as outstanding, catches might have been larger if fishing had been conducted with a Gulf-type trawl rather than with a small beam trawl.

In some Central Alaskan waters, commercial fishermen periodically have reported large catches of shrimp. Indications of a potential shrimp resource in Olga Bay, Kodiak Island, were noted during king-crab explorations conducted by the U. S. Fish and Wildlife Service in 1940 (U. S. Fish and Wildlife Service 1942). Pink shrimp were also taken in a midwater trawl between Cape Douglas and Shuyak Island in 1957 (Aron 1958). The Lower Cook Inlet and Kodiak Island areas, however, had not been systematically explored for shrimp prior to 1958.

Between July 22 and August 26, 1958, the shrimp resources in Central Alaskan waters were assessed by the Bureau's North Pacific Fisheries Exploration and Gear Research Station. Fishing was carried out with the exploratory fishing vessel John N. Cobb in waters of Lower Cook Inlet, along the Kenai Peninsula, and adjacent to Kodiak Island (fig. 1). Objectives of the cruise were to: (1) locate and determine species, size, and abundance of shrimp, (2) determine the bottom conditions on prospective shrimp grounds, and (3) collect oceanographic data which could be helpful in understanding shrimp distribution as related to the environment.

GEAR USED

All but two drags during the cruise were made with a 1½-inch mesh,^{2/} standard 43-foot,^{3/} Gulf of Mexico-type, flat shrimp trawl similar to that described by Schaefers and Johnson (1957). The net was attached directly to the back of the doors with two-foot extensions of the headrope and footrope.

The ground chain of the 43-foot net was equal in length to the footrope. Its ends were shackled at the junction points of the breastlines and footrope, and 14-link dropper chains were hung between the footrope and ground chain at intervals of 24 inches. During the last few drags of the cruise the net was fished with the dropper chains removed, leaving the ground chain attached only at its ends. The trawl was towed with a single cable attached to a 25-fathom bridle ahead of the doors.

Two drags were made with a 1½-inch mesh, 70-foot, Gulf of Mexico-type, semi-balloon shrimp trawl (fig. 3).^{4/} This net was towed in the conventional otter-trawling manner with warps from the vessel to each door. Seven-foot headrope and footrope extensions, plus 5-foot chains fastened to the trailing edge of the door, resulted in a total distance of 12 feet between the door and the net.

Both nets were fished using standard Gulf of Mexico-type doors (Bullis 1951), which are lighter than doors used by Pacific coast otter trawlers. Doors for the small net measured 2½ by 5 feet and weighed 160 pounds each, while the doors for the large nets measured 3½ by 8 feet and weighed 385 pounds each.

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

^{2/}All mesh sizes referred to in this report are stretched measure including 1 knot.

^{3/}Net sizes given in this report represent the length of the footrope, excluding the extension straps.

^{4/}Note that the net in figure 3 is drawn in conformance with the net-illustrating method proposed by W. Dickson at the International Fishing Gear Congress, Hamburg, Germany, 1957; i. e., all lengths are true to scale (stretched measure), while all widths are reduced 50 percent.

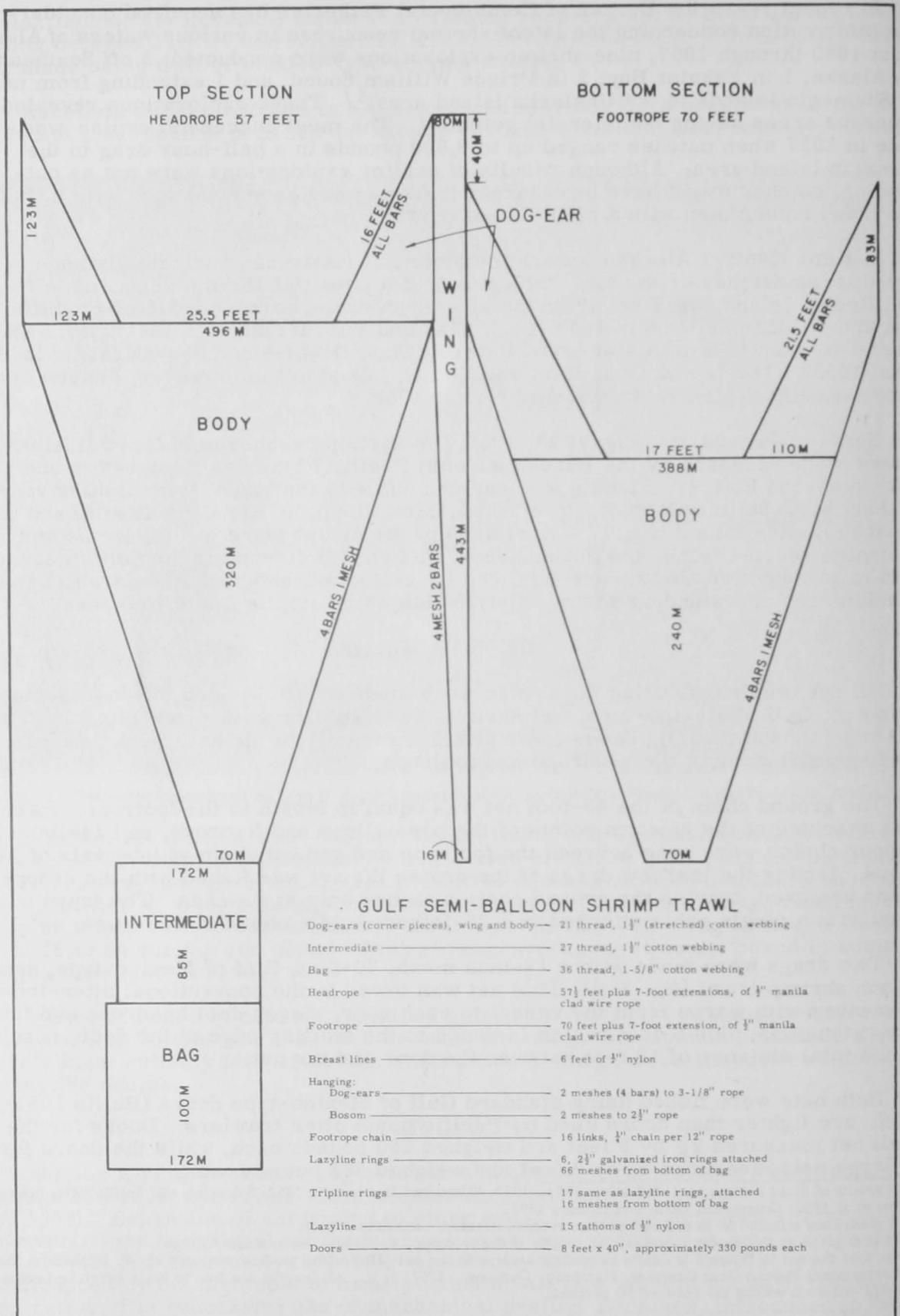


Fig. 3 - Seventy-foot Gulf of Mexico-type semiballoon shrimp trawl used during shrimp explorations in Central Alaska.

A warp-length to water-depth ratio (scope) of approximately 3 to 1 was used, and the nets were towed at speeds between 2.5 and 3.0 knots. Drags were of 30-minute duration, except for five 15-minute drags off Port Dick, where the lack of available grounds precluded longer tows.

FISHING RESULTS

Three species of shrimp were taken in commercial quantities during the cruise. Small cocktail-size pink shrimp (*Pandalus borealis*) were taken throughout the area of operation. A larger species--sidestripe shrimp (*Pandalopsis dispar*) were also found to be widely distributed. Coon-stripe shrimp (*Pandalus hypsinotus*), representatives of another larger species, were caught mostly in the Kenai Peninsula area. Other species which were taken in small quantities included: dock shrimp (*Pandalus danae*), spot shrimp (*Pandalus platyceros*), humpy shrimp (*Pandalus goniurus*), *Eulus suckleyi*, *Eulus macilentus*, and several species of gray shrimp belonging to the family Crangonidae.

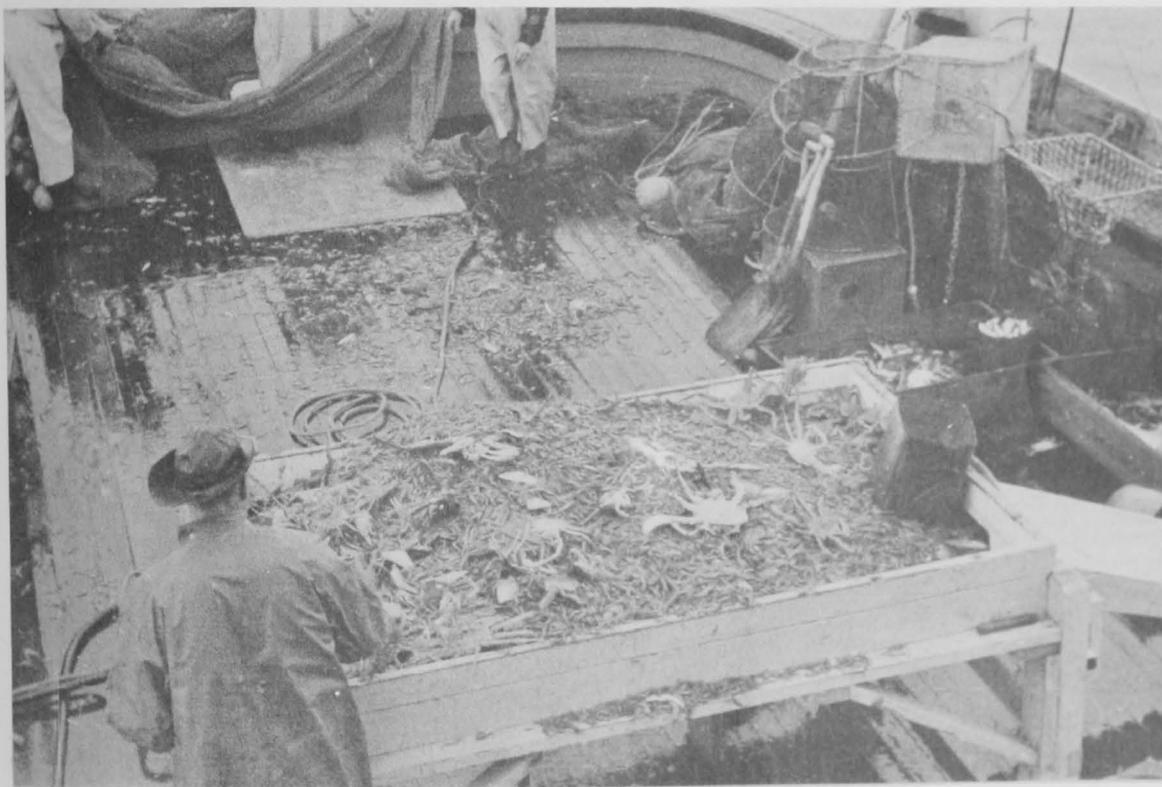


Fig. 4 - Catch of shrimp on sorting table aboard M/V John N. Cobb in Kachemak Bay, Alaska. Note: Sorting table holds 1,000 pounds of shrimp, level-full.

Excellent shrimp catches were made in Kachemak Bay and Marmot Bay near the towns of Homer, Seldovia, and Kodiak. Catches as large as 1,770 pounds of shrimp were taken in Kachemak Bay, and catches up to 1,400 pounds were taken in Marmot Bay. The average catch, for drags made in those two bays, was 655 and 603 pounds, respectively.

Trawling in many smaller bays and inlets, within about 5 to 11 hours running time of Homer, Seldovia and Kodiak, also produced good catches. Drags in Alitak Kukk, Nuka, and Uganik Bays, inner Nuka Passage, Port Dick, Raspberry Strait, and off Cape Douglas yielded shrimp at rates ranging from 265 to 950 pounds per half hour.

In contrast to the results of Bureau explorations conducted off Washington and Oregon, many shrimp catches taken off Alaska contained substantial quantities of



Fig. 5 - The Lower Cook Inlet and Kenai Peninsula areas of Central Alaska showing location of shrimp-trawl drags made by the John N. Cobb during July and August 1958.



Fig. 6 - The Kodiak Island and Shelikof Strait areas of Central Alaska showing location of shrimp-trawl drags made by the John N. Cobb during August of 1958.

sidestripe and coonstripe shrimp. In several bays along the Kenai Peninsula those species were predominant in the catches.

Although the slopes of many of the bays were found to be relatively steep, clear trawling bottom prevailed in most areas fished. Snags were encountered only twice during the cruise, and in both instances net damage was slight. The bottom was composed of mud or a mixture of mud and sand in areas yielding good catches of shrimp.

The location of each of the 109 exploratory drags made during the investigation is diagrammatically presented in figures 5 and 6.

FISHING RESULTS IN LOWER COOK INLET AND KENAI PENINSULA AREAS:
The best catches in the Lower Cook Inlet and Kenai Peninsula areas were made in

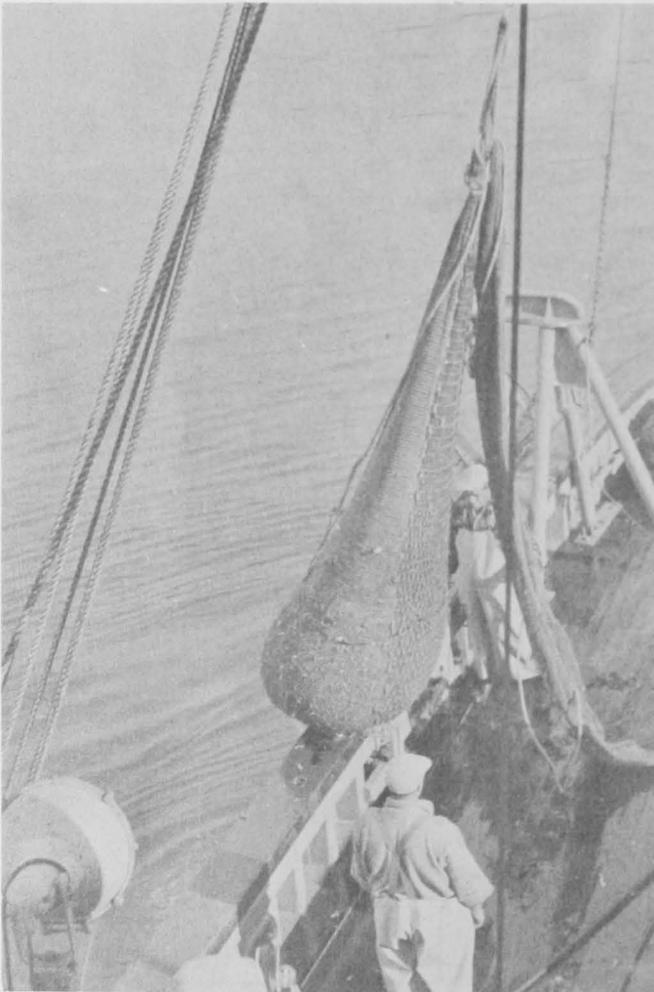


Fig. 7 - Hoisting cod end full of shrimp over rail of John N. Cobb in Kachemak Bay, Alaska.

Kachemak Bay, off Cape Douglas, in Port Dick, in Nuka Passage, and off Ragged Island. Most drags made in Cook Inlet and in offshore waters south of Kenai Peninsula yielded little or no shrimp.

Kachemak Bay: The most productive catches in Kachemak Bay were taken from a deep area off Homer Spit and the northern slope of the gully which runs along the southern shoreline between Homer Spit and Seldovia Bay. Five drags made in depths ranging from 53 to 92 fathoms in and near the deep, which is located about 5 miles southwest of the end of Homer Spit, resulted in catches of 360 to 1,020 pounds of shrimp. From 36 to 79 percent of those catches consisted of 26- to 48-count^{5/} sidestripes. On the north slope of the gully near Seldovia Bay, two drags made at depths between 39 and 50 fathoms caught 740 and 1,770 pounds of shrimp, mostly 200-count pinks. One drag made in Tutka Bay, in 41 to 52 fathoms, resulted in 810 pounds of mixed pink and coonstripe shrimp. The coonstripe shrimp, which made up about 39 percent of this catch, averaged 28 shrimp per pound heads on.

Cook Inlet: Catches in Lower Cook Inlet were poor. Twelve

^{5/}All shrimp counts given in this report indicate the average number of heads-on individuals per pound, and were obtained from random samples. Selected shrimp, i.e., those caught with larger mesh nets, or graded shrimp, would be expected to count out much larger than do the random samples. Catch rates are expressed as pounds of heads-on shrimp.

Cape Douglas: Two drags, made 7 to 11 miles off Cape Douglas in 88 to 91 fathoms, resulted in 540 and 600 pounds of mixed pink and sidestripe shrimp. Sidestripes accounted for 15 and 33 percent of those catches, respectively.

Port Dick: The limited area suitable for trawling, and the relatively steep side slopes in Port Dick made it necessary to shorten the trawling time of most drags to 15 minutes. The upper end of West Arm afforded the best trawling bottom despite a large kelp bed which was encountered about 3 miles from the end of the bay. Three drags made in this area at depths between 58 and 101 fathoms yielded 240 and 360 pounds of shrimp in the 15-minute drags and 870 pounds in the half-hour drag. Four drags were made on the steep side slopes of Port Dick. One of those drags, starting in 139 fathoms and ending in 36 fathoms, yielded 540 pounds in 30 minutes. The average catch rate for all drags made in Port Dick was 510 pounds of shrimp per half hour drag.

Catches in Port Dick were composed of mixed pink, sidestripe, and coonstripe shrimp. Although pink shrimp dominated the catches, a considerable quantity of sidestripe and coonstripe shrimp were taken. Pinks ranged in size from 75 to 120 count; sidestripes, from 37 to 69 count; and coonstripes, from 30 to 84 count.

OFFSHORE WATERS SOUTH OF KENAI PENINSULA: Only trace amounts of shrimp were taken in three drags made in offshore waters 6 to 8 miles south of Gore Point. Extensive soundings, within about 10 miles of the peninsula, revealed no other likely offshore shrimp-trawling grounds between Nuka Bay and the eastern entrance to Cook Inlet.

Nuka Passage: Three drags made in the inner part of Nuka Passage, at depths ranging from 49 to 84 fathoms, produced from 390 to 780 pounds of shrimp each. The catches were composed of about half pink shrimp and half mixed sidestripes and coonstripes. The pinks averaged 71 to 96 shrimp to the pound, while the sidestripes ran 44 to 69 per pound. The coonstripes in those catches averaged 23 to 27 shrimp per pound.

Nuka Bay Area: Fishing results in Nuka Bay indicated the presence of a large shrimp population which was widely distributed throughout the bay. The best catches were made in East Arm at depths between 47 to 124 fathoms. Five drags made in this area yielded from 240 to 330 pounds of shrimp each. Those catches consisted of 32 to 62 percent pinks, 33 to 62 percent sidestripes, and 1 to 9 percent coonstripes. The size of pink shrimp taken in that area ranged from 86 to 109 shrimp per pound, while sidestripes ranged from 41 to 58 to the pound. A snag was encountered in East Arm where the net was fished too close to the submarine moraine of McCarty Glacier.



Fig. 8 - Ready to spill catch of shrimp onto sorting table aboard M/V John N. Cobb in Kodiak Island area.

In other portions of Nuka Bay, at depths between 69 and 158 fathoms, six drags resulted in 150 to 280 pounds of shrimp. Those catches consisted of 54 to 71 percent pinks ranging from 67 to 73 shrimp per pound, 25 to 45 percent sidestripes ranging from 27 to 40 shrimp per pound, and up to 12 percent coonstripes which ran 16 to 21 shrimp per pound (heads on).

A single drag made southwest of Ragged Island yielded a catch of relatively large shrimp. In a total catch of 450 pounds, 39 percent of the catch comprised 86-count pinks, 55 percent was composed of 23-count sidestripes, and 6 percent was 18-count coonstripes.

FISHING RESULTS IN THE KODIAK ISLAND AND SHELIKOF STRAIT AREA: Explorations during the last half of the Central Alaskan cruise were conducted principally in Marmot Bay and Shelikof Strait. Excellent catches of shrimp were made in Marmot Bay, but catches in Shelikof Strait were generally poor. Some of the small bays and inlets along Kodiak Island and Shelikof Strait yielded good catches.

Marmot Bay Area: Although the bottom in Marmot Bay was generally clear, irregular bottom, suitable for short drags only, was found in the gully on the north

side of Spruce Island. Fifteen drags in Marmot Bay yielded an average of 603 pounds of shrimp each.



Fig. 9 - A catch consisting predominantly of fish, taken from Shelikof Strait during exploratory fishing.

In Inner Marmot Bay six drags at depths from 58 to 109 fathoms resulted in 350 to approximately 1,400 pounds of shrimp per drag.^{6/} Those catches were composed of 56 to 83 percent pinks ranging in size from 104 to 127 shrimp per pound. Sidestripe shrimp, which comprised the balance of those catches, ranged from 34 to 51 shrimp to the pound.

Three drags made off Izhut Bay in 93 to 111 fathoms caught 730, 850, and 1,300 pounds of shrimp each. Those catches were composed of 73, 69, and 92 percent pinks with average counts of 135 to 172 per pound. The balance of the catch was sidestripe shrimp averaging from 41 to 51 individuals to the pound.

In Outer Marmot Bay six drags were made at depths between 69 and 110 fathoms. Except for drag No. 103, which produced approximately 700 pounds of pink shrimp averaging 94 shrimp to the pound, catches ranged from 120 to 300 pounds per drag. Those catches were composed of 54 to 89 percent pinks which ran 59 to 77 shrimp per pound. The remaining portions of the catches were 24- to 42-count sidestripes.

Shelikof Strait: Pink and sidestripe shrimp were found distributed throughout Shelikof Strait, but in concentrations considerably less than found in adjacent bays.
^{6/}The size of the largest catch had to be estimated and counts were unobtainable as the whole catch was lost when the cod end parted from the intermediate as the catch was being lifted over the stern rail.

The best catches were made on the bank between Shuyak Island and Cape Douglas in depths of 82 to 88 fathoms. Two drags in this area yielded 200 and 300 pounds of shrimp containing 72 and 90 percent pinks averaging 96 and 70 shrimp per pound, respectively. Sidestripe shrimp, which made up the balance of those catches, ran 45 and 53 shrimp to the pound. A drag off Raspberry Island in 106 to 107 fathoms resulted in 250 pounds of which 63 percent was 44-count sidestripes and 37 percent was 81-count (heads-on) pinks.

The remaining 33 drags made in Shelikof Strait at depths ranging between 68 and 154 fathoms yielded up to 180 pounds of shrimp per drag.

Miscellaneous Bays and Inshore Waters: Although fishing results were generally good in each of the five smaller bodies of water fished in the Kodiak area, insufficient time was available to determine the full extent of trawlable grounds or the distribution of shrimp. Priority was given to exploring offshore waters during the final phase of the cruise; consequently only eight drags were made in those protected waters.

The single drag made in Kukak Bay in 57 to 63 fathoms caught 950 pounds of shrimp; about half pinks and half sidestripes. The pinks averaged 117 shrimp to the pound, while the sidestripes averaged 32 shrimp per pound.

Table 1 - Miscellaneous Fish--Percentage in Drags Catching 150 or More Pounds of Shrimp per Half Hour

		Number of drags (those catching 150 pounds or more shrimp per half hour)	Pounds of heads-on shrimp per half-hour drag		Miscellaneous fish (percentage of total catch weight)		Predominant species of miscellaneous fish
			Range	Avg.	Range	Avg.	
COOK INLET AND KENAI PENINSULA AREA	Nuka Passage	3	390 - 775	612	3 - 15	6	Alaska pollock
	Kachemak Bay	8	150 - 1,770	708	2 - 22	8	halibut, herring, sculpin
	Tutka Bay	1		810		9	flathead and yellowfin "sole"
	Port Dick ^{1/}	7	180 - 870	513	7 - 27	14	Alaska pollock
	Nuka Bay	11	150 - 330	248	8 - 37	16	turbot ^{2/}
	off Cape Douglas	2	540 - 600	570	26 - 28	27	Alaska pollock, turbot
	off Ragged Island	1		450		39	turbot
Cook Inlet	0		---		--	---	
off Gore Point	0		---		--	---	
KODIAK ISLAND AND SHELIKOF STRAIT AREA	Alitak Bay	2	500 - 900	700	2 - 4	4	sculpin
	Kukak Bay	1		950		13	turbot
	off Izhut Bay	3	730 - 1,300	960	13 - 24	16	turbot
	inner Marmot Bay ^{2/}	5	350 - 1,100	610	4 - 32	19	turbot
	Uganik Bay	2	200 - 1,000	600	25 - 49	30	Alaska pollock, yellowfin "sole"
	outer Marmot Bay	5	150 - 700	319	28 - 63	44	flathead "sole", turbot
	Shelikof Strait	6	160 - 300	207	29 - 73	55	Pacific ocean perch, flathead "sole", Alaska pollock, turbot
Raspberry Strait	1		650		59	sablefish, flathead "sole", turbot	
Uyak Bay	2		200		70 - 83	78	flathead "sole", Alaska pollock, turbot

^{1/}Includes five 15-minute drags. Catch analysis adjusted to half-hour rate.

^{2/}Does not include Drag No. 98 as catch breakdown was not obtained.

^{3/}Arrow-toothed flounder.

One drag made in Uganik Bay (South Arm) in 35 to 41 fathoms caught 1,000 pounds of shrimp. That catch was 87 percent pink and dock shrimp and 13 percent coonstripes. Counts for those species were 117, 129, and 81 heads-on individuals to the pound, respectively. The other drag in Uganik Bay was made in 88 to 94 fathoms and caught 200 pounds of shrimp.

Two drags made in Uyak Bay each caught 200 pounds of shrimp of which more than half was sidestripes.

Two drags in Alitak Bay caught 500 and 900 pounds of shrimp consisting of approximately 80 percent pink and dock shrimp and 20 percent sidestripes and coonstripes. Pinks ranged from 108 to 133 shrimp per pound; dock shrimp averaged 115; sidestripes averaged 40; and coonstripes averaged 65 shrimp per pound.

The single drag made in Raspberry Strait caught 650 pounds of 115-count pink shrimp.

MISCELLANEOUS FISH CATCH: In catches containing 150 pounds of shrimp or more, the weight of incidentally-caught fish varied between 2 and 83 percent of the total catch (table 1). Areas producing the least amount of miscellaneous fish included: Alitak Bay, Kachemak Bay, Nuka Passage, and Tutka Bay. Areas producing a considerable amount of miscellaneous fish included: Outer Marmot Bay, Raspberry Strait, Shelikof Strait, and Uyak Bay. The latter areas generally yielded mediocre or poor catches of shrimp.

The most commonly caught miscellaneous fish were Alaska pollock (*Theragra chalcogramma*) and turbot (arrow-toothed flounder, *Atheresthes stomias*). Flat-head "sole" (*Hippoglossoides elassodon*) were caught in considerable numbers in several areas. Other food fish noted in the catches included: halibut (*Hippoglossus stenolepis*), herring (*Clupea pallasii*), Pacific ocean perch (*Sebastes alutus*), sablefish, *Anoplopoma fimbria*, and the yellowfin "sole" (*Limanda aspera*).

King crab (*Paralithodes camtschatica*) were caught in small numbers. Only 35 of the 109 drags caught king crab and only 7 of those caught more than 5 crabs.

MISCELLANEOUS OBSERVATIONS

Weather and oceanographic observations were recorded at each fish position.^{7/} Air temperatures averaged about 51° F., surface water temperatures averaged about 49° F., and bottom water temperatures averaged about 42.5° F. during the explorations in Central Alaska (table 2).

Table 2 - Summary of Temperature Observations Made During Shrimp Explorations in Central Alaska

	Cook Inlet - Kenai Peninsula Area		Kodiak Island - Shelikof Strait Area	
	Range	Avg.	Range	Avg.
	° F.	° F.	° F.	° F.
Air temperatures	49 -56	51.7	48 -56	51.1
Surface temperatures	46 -53.5	49.6	45 -51	49.0
Bottom temperatures	41 -47	43.4	38 -44.5	41.9
Difference between surface and bottom temperatures	1.0-12.5	6.2	2.0-11.5	7.2

Although rain occurred on approximately half the days spent in Central Alaska, and fog was occasionally encountered, at no time were fishing operations curtailed because of weather conditions. When wind and sea conditions made fishing in open waters undesirable explorations were carried out in sheltered areas.

APPENDIX

A detailed fishing log showing the fishing positions, time on bottom, catch particulars, and other pertinent data for each drag is available as an appendix to the

^{7/}Supplemental oceanographic information is available at the Seattle office of the Branch of Exploratory Fishing and Gear Research.

reprint of this article. Write for Separate 553, which contains Table 3 - Fishing Log--Shrimp Trawl Drags Made in Lower Cook Inlet and Kodiak Island Area-- July 22 to August 26, 1958--U. S. Fish and Wildlife Service Exploratory Fishing Vessel John N. Cobb.

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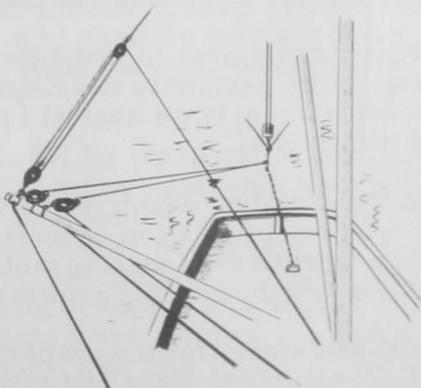
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Note: The shrimp explorations in Central Alaskan Waters were planned and carried out in cooperation with the Alaska Region, Bureau of Commercial Fisheries, and the Alaska Department of Fisheries. Members of the fishing industry were also consulted for views and ideas concerning the project. Representatives from all three groups accompanied the John N. Cobb at various times during fishing activities.



STERN RIG FOR TOWING THE TRAWL