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NORTH PACIFIC ALBACORE TUNA EXPLORATION BY THE M/V JOHN N. COBB--1956

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SUMMARY

Albacore tuna were found to be widely distributed off the coasts of Oregon and Washington during the summer of 1956 by the Service's exploratory fishing vessel John N. Cobb. Operations were coordinated closely with the University of Washington's oceanographic vessel Brown Bear. The John N. Cobb explored the waters of the northeastern Pacific Ocean from northern California to southern British Columbia, extending out more than 800 miles offshore, fishing with gill nets and albacore trolling gear.

First albacore were caught in a gill net set on July 20, and subsequent catches indicated that the albacore were scattered over a wide area, but no evidence of offshore schooling was found. Several salmon were taken in the gill nets along 50° N. latitude, but no albacore were taken north of 49° N. latitude.

Following the early albacore catches made by the John N. Cobb and the Brown Bear, several commercial fishing vessels began trolling near the Oregon coast in mid-August and immediately reported good catches of albacore. A fleet of over 100 vessels found good fishing all along the Oregon coast through September, and nearly 4 million pounds of albacore were landed in Oregon ports. This was the first year since 1950 that sizable catches of albacore were made north of California.

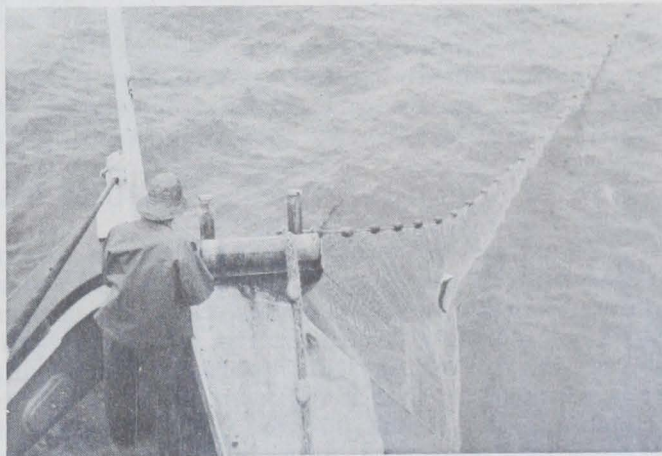


FIG. 1 - THE HIGH-SEAS GILL NETS WERE HAULED OVER THE BOW OF THE JOHN N. COBB. FISH IN THE NET IS A BLUE SHARK.

INTRODUCTION

Exploration to determine distribution and availability of albacore tuna in a section of the northeastern Pacific Ocean from northern California to Southern British Columbia was carried out aboard the U. S. Fish and Wildlife Service's exploratory fishing vessel John N. Cobb during the summer of 1956. Offshore fishing was conducted over a seven-week period, from July 16 to August 30, extending out more than 800 miles off the coasts of Oregon and Washington. At the same time, information on high-seas salmon distribution in the area, particularly data on their apparent southern range at that time of year, was obtained for the Service's salmon research program under the International North Pacific Fisheries Commission.

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The work was coordinated with simultaneous cruises of several other research vessels. The University of Washington's oceanographic vessel Brown Bear, participating with the Oregon Fish Commission, operated closely with the John N. Cobb much of the time (Frolander and Lincoln 1956, and Homberg 1956). High-seas salmon research vessels covered the waters to the north and west of where the two vessels operated, and the John R. Manning from the Pacific Oceanic Fisheries Investigations in Hawaii conducted albacore research west of 145° W. longitude (Anonymous 1956). Oceanographic and biological data collected are currently being analyzed by agencies engaged in albacore and salmon research in this area.

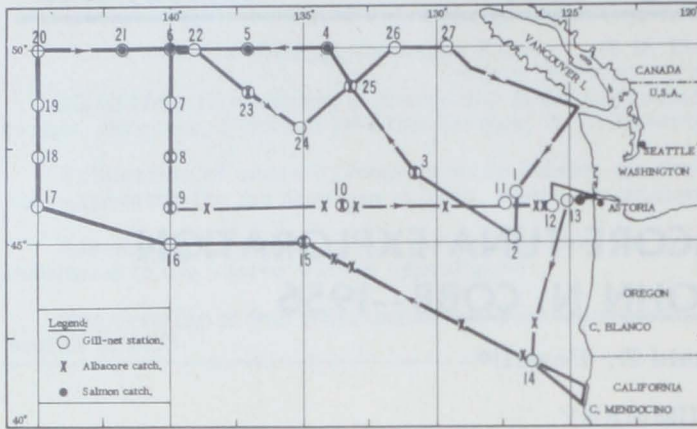


FIG. 2 - TRACK LINE OF THE JOHN N. COBB, SHOWING GILL-NET STATIONS (NUMBERED 1-27) AND ALBACORE AND SALMON CATCHES;

Information obtained by the high-seas salmon research vessels in 1955 indicated that the southern limit of salmon distribution coincided roughly with the northern limit of albacore during the summer months. In the northeastern Pacific this dividing line, with some overlapping, appeared to lie between 45° N. and 50° N. latitude. It was found during those investigations that high-seas gill nets designed to catch salmon were also effective in catching albacore. Accordingly, one of the John N. Cobb's 1956 objectives was to obtain further information on the northern distribution of albacore and the southern distribution of salmon between 40° N. and 50° N. latitude, from the Pacific Coast to 145° W. longitude, fishing with gill nets and albacore trolling gear.

CRUISE PLAN

To assure adequate coverage of the working area in the time scheduled, the cruise plan of the John N. Cobb was laid out with 27 gill-net stations to be occupied in sequence on successive nights, or on alternate nights where distances required two days' running time (see fig. 2). Standard commercial albacore trolling gear was fished during daylight hours while running between stations. Cruise tracks were planned so that the Brown Bear would occupy concurrent all-night oceanographic stations at several of the John N. Cobb's gill-net stations. At other times the vessels took separate courses but arranged to exchange fishing and oceanographic data several times daily by radio. A port call was scheduled in the middle of the cruise for refueling and taking on supplies at Astoria, Ore.

Arrangements were made for the research vessels to keep in radio contact with the trolling fleets of Oregon and Washington to relay information on any significant catches of albacore, especially catches close enough to shore for possible commercial fishing.

A biologist from the Pacific Salmon Investigations staff was assigned to the John N. Cobb to collect data on lengths, weights, stomach contents, etc., of all fish caught and to tag albacore which were landed in good condition. All albacore which were not tagged and released, all salmon, and samples of other species were frozen for future laboratory inspection. The University of Washington furnished oceanographers to make routine observations and collections aboard the John N. Cobb, including sea-water samples, bathythermograph casts, and plankton collections. More comprehensive oceanographic work was done by the Brown Bear, which also fished albacore trolling gear between stations.

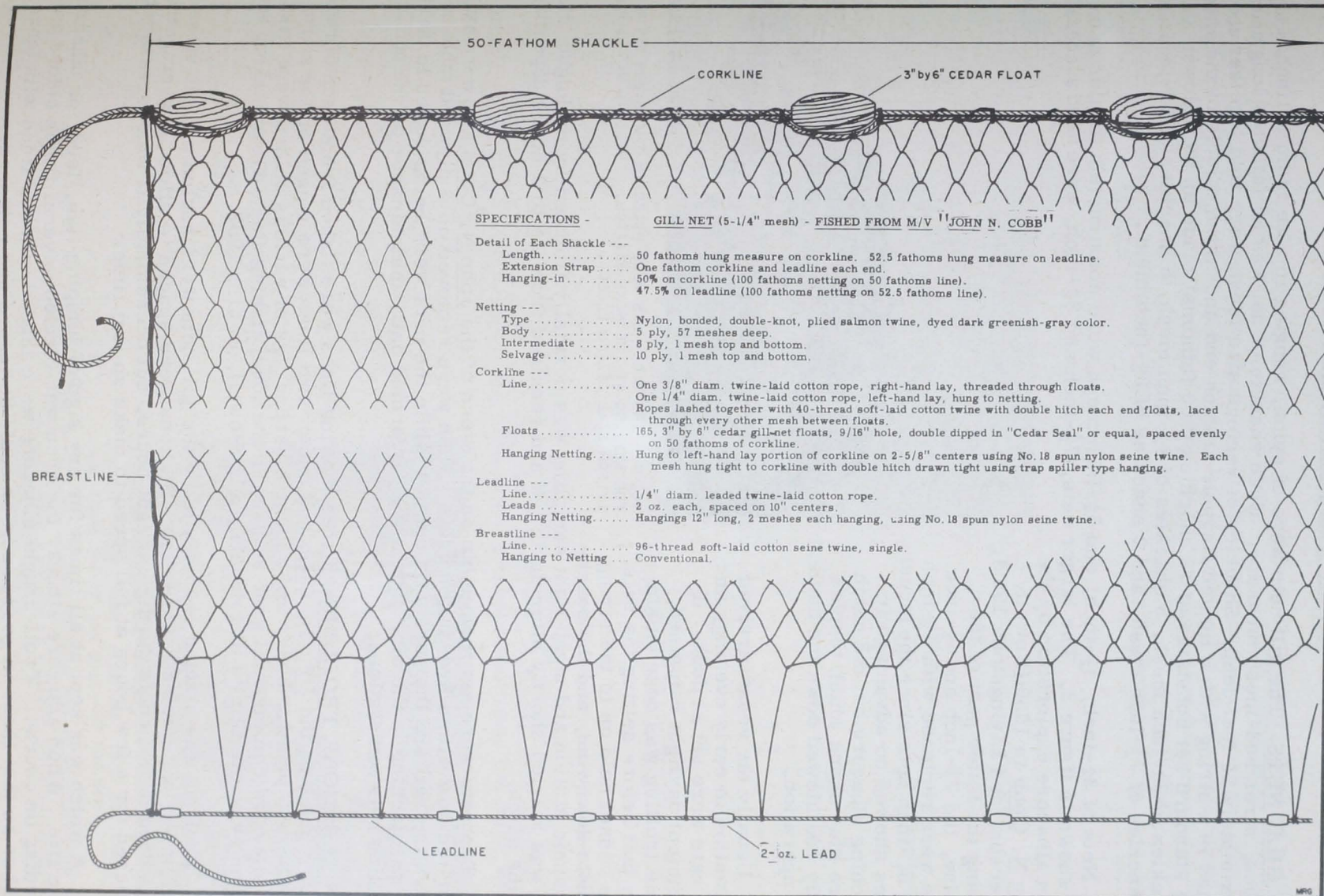


FIG. 3 - DIAGRAM OF GILL NET RIGGED FOR HIGH-SEAS FISHING.

GEAR AND FISHING METHODS

GILL NETS: The gill nets were of nylon, ranging in size from $3\frac{1}{4}$ inches to $8\frac{1}{2}$ inches, stretched-mesh measure. Each shackle of net was 50 fathoms long and approximately 20 feet deep. Shackles of various size mesh were tied together and fished in a string with a lighted flagpole at each end and in the middle of the string. The standard set consisted of 18 shackles (900 fathoms) made up as follows: 3 shackles of $3\frac{1}{4}$ -inch mesh, 5 shackles of $4\frac{1}{2}$ -inch mesh, 6 shackles of $5\frac{1}{4}$ -inch mesh, 2 shackles of $7\frac{1}{2}$ -inch mesh, and 2 shackles of $8\frac{1}{2}$ -inch mesh.

Nets of $3\frac{1}{4}$ -inch, $4\frac{1}{2}$ -inch, and $5\frac{1}{4}$ -inch mesh were constructed similar to the net shown in figure 3. The larger nets, $7\frac{1}{2}$ -inch and $8\frac{1}{2}$ -inch, were used successfully in albacore exploration by the John N. Cobb in 1950 (Powell, Alverson, and Livingstone 1952). During the latter part of the cruise, the $7\frac{1}{2}$ -inch and $8\frac{1}{2}$ -inch nets were replaced with $4\frac{1}{2}$ -inch and $5\frac{1}{4}$ -inch nets since the larger sizes showed no advantage in catching albacore but did catch more blue shark which tangled badly and slowed down the hauling operation.

Usually the vessel arrived on station in early evening, and the nets were set at dusk. If sufficient daylight remained, some trolling was done on station just before setting the nets. The vessel held on to the string of nets downwind, and the oceanographic station and night-light sampling was normally finished by midnight. Hauling was started shortly after daybreak and required from $1\frac{1}{2}$ to 2 hours depending on the catch.

The nets were set from a bin on the stern of the John N. Cobb and were hauled over the bow with a hydraulic gurdie. Fish were removed on a plywood table between the rail and the gurdie on the bow while the nets were being pulled to the stern for re-stacking in the bin. The crew performed daily maintenance on the nets while trolling between stations.

ALBACORE TROLLING: Three trolling lines were fished from each of two outrigger poles on the John N. Cobb and one or two lines were rigged on the stern. Feathered, plastic, bone, and rubber albacore jigs of various colors were tried, all standard commercial gear as used in the local fishing fleet. Gear makeup and rigging was similar to that described by Powell, et al., 1952.

Trolling was started each day after the gill nets were hauled and the vessel was under way for the next station. Stations were spaced to allow an average trolling speed of 6-7 knots during daylight hours, but occasionally it was necessary to proceed for a few hours at full speed to make up lost time.

A watch was kept at all times for any sign of jumping fish, feed, or other marine life. When albacore struck, the area was circled several times before proceeding on course. Troll-caught albacore were landed in a box lined with foam rubber so that those in good condition could be tagged and released.



FIG. 4 - THE GILL NETS WERE PILED IN THE STERN BIN READY FOR SETTING AT THE NEXT STATION. THE SAIL WAS USED ONLY FOR STABILIZING EFFECT.

CATCH RESULTS

ALBACORE: The first albacore were caught by the John N. Cobb in a gill net set on July 20 near the Cobb seamount which lies about 270 miles west of Grays Harbor, Wash. (see fig. 2 and table 1). From then until August 1, several other gill net catches and trolling catches showed that albacore were widely distributed off

Table 1 - Gill-Net Catch Data--M/V John N. Cobb--Cruise 28--July 16 to August 30, 1956

Station No.	Date ^{1/}	Position of Set		Surface Temperature	Wind Direction, and Force ^{2/}	Fathoms of Net	No. Hours Net ^{3/} Soaked ^{2/}	Number Salmon Caught			Number Albacore Caught	Number Incidental Catch						
		Latitude N.	Longitude W.					Red	Silver	Total		Blue Shark	Jack Mackerel	Pomfret	Squid	Other		
1	7/17 - 7/18	46°17'	126°58'	60.5°F.	WN-4	900	6½	0	0	0	0	2	9	2	1	1 brown ragfish		
2	7/18 - 7/19	45°05'	126°54'	62.1°F.	WN-5-7	900	8	0	0	0	0	3	0	0	0	-		
3	7/20 - 7/21	46°46'	130°47'	59.0°F.	SE-4 - SW-7	900	8½	0	0	0	2	11	17	5	0	-		
4	7/22 - 7/23	50°01'	133°58'	56.0°F.	SE-4	900	9	2	0	2	0	2	0	33	0	1 steelhead trout		
5	7/23 - 7/24	50°00'	137°00'	55.0°F.	EW-3	900	8	2	1	3	0	0	2	41	3	-		
6	7/24 - 7/25	50°00'	140°00'	54.0°F.	W-4	900	8½	1	0	1	0	0	3	206	2	-		
7	7/25 - 7/26	48°40'	140°00'	54.0°F.	W-5	900	8½	0	0	0	0	1	5	27	0	-		
8	7/26 - 7/27	47°20'	140°00'	55.5°F.	WN-4	900	9½	0	0	0	7	3	2	13	2	-		
9	7/27 - 7/28	46°00'	140°00'	58.0°F.	NE-2	900	8	0	0	0	2	6	0	0	97	-		
10	7/29 - 7/30	46°00'	133°30'	58.0°F.	WN-4	900	8½	0	0	0	9	8	8	44	10	-		
11	7/31 - 8/1	46°00'	127°28'	61.0°F.	WN-4-5	900	8	0	0	0	0	9	0	1	0	-		
12	8/1 - 8/2	45°58'	125°40'	61.0°F.	WN-5	900	7½	0	0	0	0	11	1	0	0	-		
13	8/6 - 8/7	46°12'	125°13'	62.5°F.	WN-4	900	8½	0	0	0	0	14	2	0	0	1 smokereel shark, 2 sablesfish		
14	8/8 - 8/9	44°50'	126°24'	61.0°F.	NEW-6-7	400	8½	0	0	0	0	4	0	0	0	-		
15	8/14 - 8/15	45°00'	135°00'	63.0°F.	NEE-4	900	10½	0	0	0	3	8	98	47	4	-		
16	8/16 - 8/17	45°00'	140°00'	62.2°F.	SEW-4-7	900	10½	0	0	0	0	19	0	7	7	-		
17	8/18 - 8/19	46°00'	145°00'	59.0°F.	SW-8	400	12½	0	0	0	0	7	0	0	0	-		
18	8/19 - 8/20	47°20'	145°00'	57.3°F.	SW-6	900	10½	0	0	0	0	31	0	1	5	-		
19	8/20 - 8/21	48°40'	145°00'	56.5°F.	SEW-6	900	11½	0	0	0	0	27	5	9	1	-		
20	8/21 - 8/22	50°00'	145°00'	56.5°F.	SSW-4	900	10½	0	0	0	0	3	0	59	0	-		
21	8/22 - 8/23	46°59'	141°48'	58.2°F.	WN-3	900	10	0	1	1	0	4	52	58	13	1 giant skiffish, 1 smokereel shark		
22	8/23 - 8/24	46°58'	139°00'	58.3°F.	W-5	900	11½	0	0	0	0	3	76	68	43	1 giant skiffish		
23	8/24 - 8/25	46°00'	137°07'	59.0°F.	SE-4	900	9½	0	0	0	1	9	38	5	5	-		
24	8/25 - 8/26	46°06'	135°10'	61.5°F.	ESW-5	900	9½	0	0	0	0	15	148	22	6	-		
25	8/26 - 8/27	46°06'	133°11'	61.0°F.	WSW-5	900	10½	0	0	0	1	12	31	25	0	-		
26	8/27 - 8/28	50°01'	131°31'	61.7°F.	BSW-3	900	10½	0	0	0	0	11	0	0	0	-		
27	8/28 - 8/29	50°00'	129°30'	61.5°F.	WSW-5 - WNW-6	900	10½	0	0	0	0	2	0	0	0	-		
TOTALS							23,300	253	5	2	7	25	225	497	667	199		

^{1/} All gill-net sets were made at night
^{2/} Wind force is according to Beaufort scale
^{3/} Does not include setting and hauling time

Washington and Oregon out to 140° W. longitude, over 600 miles offshore. During August albacore were also taken as far south as 42° N. latitude near station 14 off northern California and at several of the more offshore stations, but none were caught north of 49° N. latitude.

Although the fishing revealed a wide distribution of albacore, individual catches were small during the entire cruise. A total of 38 albacore were taken on trolling gear and 25 in the gill nets. In addition, 13 observed albacore were lost after striking the trolling gear, and several were seen to fall out of the small-mesh nets during hauling.

Best catches of albacore were made on July 29 when 9 were taken on trolling gear near 46° N., 134°10' W., and nine were caught that night in a gill-net set some 20 miles eastward. Seven more albacore were taken trolling the next morning along the same track line. On August 1, three albacore were caught approximately 80 to 100 miles off the Columbia River on the trolling gear.

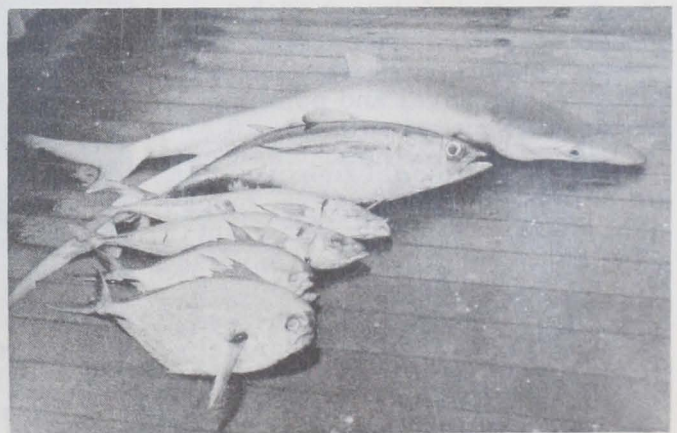


FIG. 5 - BLUE SHARK, ALBACORE, JACK MACKEREL, AND POMFRET FROM ONE OF THE GILL-NET CATCHES.

The consistently small catches indicated that the albacore were widely scattered and not in large schools in the offshore waters. This was supported by the fact that no sizable schools were sighted at any time during the cruise. Only occasional jumpers, from one to a few fish, were seen.

Date	Position		Time of Day	Surface Temperature	Wind Direction and Force ^{1/}	Number Albacore Caught	Strikes, Fish Lost
	Latitude N.	Longitude W.					
7/27	47°13'	140°00'	0900	56° F.	NW-3	1	
"	46°00'	140°00'	2030	58° F.	NE-2	2	2
7/28	46°04'	138°40'	1615	58.5° F.	NNE-4	1	1
7/29	46°00'	134°10'	1630-1830	58° F.	WSW-4	9	
7/30	46°00'	133°00'	1030-1210	58° F.	NW-4	7	1
7/31	46°04'	129°40'	0825	60° F.	NW-4	1	
8/1	45°57'	126°25'	1340	61° F.	WNW-5	1	1
"	45°58'	125°48'	1730	61° F.	WNW-5	2	
8/8	42°55'	126°25'	1054	60.5° F.	NW-7	1	
"	42°00'	126°36'	2000	60.5° F.	NW-7	4	
8/12	42°14'	126°26'	1630-1740	59° F.	SSW-4	-	4
8/13	42°54'	128°58'	0610	62° F.	S-4	2	2
8/14	44°20'	133°06'	0610	63° F.	SSE-3	2	
"	44°36'	133°48'	1050	63° F.	SSE-3	3	
8/15	44°58'	135°32'	1150	62.5° F.	SW-10	1	2
8/26	48°29'	134°27'	1300	61° F.	WSW-5	1	
Total						38	13

^{1/} WIND FORCE IS ACCORDING TO BEAUFORT SCALE.

consisting of 5 red salmon and 2 silver salmon. One steelhead trout was taken along with two red salmon in the gill nets on July 22 at 50°01' N., 133°58' W.

No salmon were taken south of 50° N. latitude except for one silver salmon which struck the albacore trolling gear 20 miles off the Columbia River on August 6.

INCIDENTAL GILL-NET CATCH: Several species of pelagic fish far outnumbered the catch of albacore in the gill nets (see table 1). A total of 667 pomfret, 497 jack mackerel, and 225 blue shark were landed. In addition, 199 large squid (2-3 feet in length) were also taken in the nets. All these species were found widely distributed over the fishing area, blue shark being present in all but two of the gill-net catches.

Up to 206 pomfret, 148 jack mackerel, 97 squid, and 31 blue shark were taken in individual gill-net catches. Blue shark were in every catch containing albacore, and jack mackerel and pomfret were in all but one.

Other incidental fish caught in the nets were brown ragfish, mackerel shark, sablefish, and giant skilfish. One of the giant skilfish was kept alive aboard the John N. Cobb for eight days until the end of the trip, when it was transferred to the University of Washington School of Fisheries aquarium where it is still alive and growing.

NIGHT-LIGHT FISHING: After the gill nets were set each evening and the oceanographic station completed, night-light fishing with small-mesh dip nets was carried on for an hour or two usually between 9 p. m. and midnight. A 1,000-watt underwater diving light was suspended just beneath the surface to attract the small feed. On several occasions in choppy seas the 500-watt boom light suspended about six feet above the water was also used. Samples of specimens caught were preserved, and each station was classified as "poor," "fair," or "rich," depending on



FIG. 6 - PORTION OF A GILL-NET CATCH INCLUDING MACKEREL SHARK, BLUE SHARK, POMFRET, JACK MACKEREL, AND SQUID.

the relative numbers of fish and squid observed. No effective night-lighting was done at four gill-net stations because of poor weather conditions.

Saury, from 1½ inches to 12 inches in length, were the most abundant feed species observed. Squid and lanternfish were also quite common. The plankton hauls were preserved for later analysis at the University of Washington Department of Oceanography.

Saury were present at 22 of the 23 stations, squid at 15, and lanternfish at 10. Squid were the most difficult to catch in the dip nets, but it was usually possible to capture enough for a sample. At one station several large squid were speared. Saury and lanternfish were caught quite easily, especially at the richer stations. Seven stations were classified as "poor," eight as "fair," and eight as "rich."

Analysis of the night-light fishing results showed a correlation with the catch of albacore in the gill nets. At 7 stations rated as "poor" for night-light fishing only one albacore was taken, at 8 stations rated as "fair" only two albacore were taken, and at 8 stations rated as "rich" 19 albacore were taken.

In addition to the plankton samples taken at each oceanographic station, other floating organisms were observed and collected. Vellella (purple-sail jellyfish) were seen in vast numbers over large areas, sometimes for several days running. Floating goose barnacles were also abundant at times, as were salps and round white jellyfish.

SIZE OF ALBACORE

Albacore caught by the John N. Cobb ranged in size from 50 cm. (19.7 inches) to 78 cm. (30.7 inches), and from 5.5 pounds to 20.5 pounds. The gill-net caught fish averaged 67 cm. (26.4 inches) and 14.5 pounds as compared to 64.5 cm. (25.4 inches) and 12.2 pounds for the troll-caught fish. The over-all average was 65.5 cm. (25.8 inches) and 13.4 pounds. These figures include lengths for 62 albacore and weights for 43 albacore.

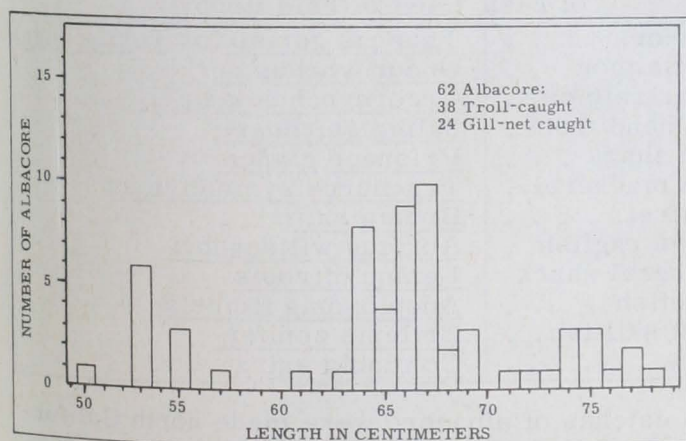


FIG. 8 - LENGTH-FREQUENCIES FOR 62 ALBACORE CAUGHT BY THE JOHN N. COBB.

group. It is possible that the size groups represent three age classes, but the total number of measurements is probably too small for any such conclusions to be drawn.

WATER TEMPERATURE IN RELATION TO CATCH

Table 3 shows that catch of albacore and salmon in relation to surface water temperature. Salmon were caught in water from 54° F. to 58° F. Albacore were taken at temperatures ranging from 55.5° F. to 63° F. The area of overlapping

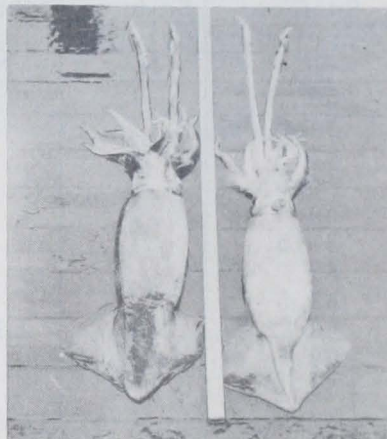


FIG. 7 - TWO OF THE LARGE SQUID, APPROXIMATELY THREE FEET IN LENGTH, WHICH WERE TAKEN IN SEVERAL GILL-NET CATCHES.

catches was from 55.5° to 58° F., but in general salmon were caught in waters colder than 57° F. and albacore were caught in waters warmer than 57° F.

Surface Temperature °F.	Salmon Gill Net No.	Albacore Gill Net No.	Albacore Troll No.
54	1		
54.5			
55	3		
55.5		7	
56	2		1
56.5			
57			
57.5			
58	1	11	21
58.5			2
59		3	4
59.5			
60			1
60.5			5
61		1	5
61.5			
62			4
62.5			3
63		3	5
Total	7	25	1/51

1/ INCLUDES 13 TROLLING STRIKES WHERE THE ALBACORE WERE LOST BEFORE LANDING.

Best albacore catches were made in 58° F. water with trolling gear. Only one troll-caught albacore was taken in colder water. Again the total catch was too small for any significant analysis of catch-temperature relationship.

COMMERCIAL FISHERY DEVELOPMENT

Following the early reports of offshore albacore catches made in late July and early August by the John N. Cobb and the Brown Bear, several commercial fishing vessels rigged with albacore trolling gear began fishing along the Oregon coast in mid-August. First commercial catches were reported by the Kiska, Betty, and Nel on August 18 fishing 70 to 100 miles off the central Oregon coast. Other vessels entered the fishery immediately and by August 24 it was reported that 150 vessels were moving into the albacore fishing area.

fishing all along the Oregon coast through September, with daily catches up to 700 and 800 fish reported by the more successful vessels. Price disputes slowed fishing somewhat during late September, and by early October the fleet had mostly dispersed with the regular albacore trollers heading for still-productive grounds off California.

Total landings of albacore by the fleet in Oregon ports amounted to nearly four million pounds and these probably would have been larger but for the price disputes. This was the first year since 1950 that sizable catches of albacore were made north California. Whether it signifies a return to the Pacific Northwest coast of the unpredictable white-meat tuna after several years of absence is a matter of conjecture. Surely there is not sufficient scientific evidence available at this time on which to base any prediction.

The fleet found continued good

Albacore	<u>Thunnus germon</u> (or <u>T. alalunga</u>)
Red salmon . .	<u>Oncorhynchus nerka</u>
Silver salmon .	<u>Oncorhynchus kisutch</u>
Steelhead trout .	<u>Salmo gairdnerii</u>
Blue shark . . .	<u>Prionace glauca</u>
Jack mackerel .	<u>Trachurus symmetricus</u>
Pomfret	<u>Brama rai</u>
Brown ragfish .	<u>Acrotus willoughbyi</u>
Mackerel shark	<u>Lamna ditropis</u>
Sablefish	<u>Anoplopoma fimbria</u>
Giant skilfish .	<u>Erilepis zonifer</u>
Saury	<u>Cololabis saira</u>

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CREAM OF CRAB SOUP FOR A SUMMER LUNCHEON

Cream of crab soup is a "natural" in the summer since crab meat is plentiful at that time. It is nutritious and delicious and an easy-to-prepare hot meal for our cooler summer days. Crab soup has been a favorite of Marylanders for years.



Crab soup can be prepared by using cooked crab meat from hard shell crabs packed in cans and marketed fresh, frozen, or canned. The four principal species that supply the crab meat are the blue, Dungeness king, and rock crabs. The meat from these crabs can be used interchangeably in most recipes.

The home economists of the United States Fish and Wildlife Service suggest that you serve "Cream of Crab Soup" with crunchy crackers and a crisp vegetable salad.

CREAM OF CRAB SOUP

1 POUND CRAB MEAT	$\frac{1}{4}$ TEASPOON CELERY SALT
1 CHICKEN BOUILLON CUBE	1 TEASPOON SALT
1 CUP BOILING WATER	DASH PEPPER
$\frac{1}{4}$ CUP CHOPPED ONION	1 QUART MILK
$\frac{1}{4}$ CUP BUTTER OR OTHER FAT, MELTED	CHOPPED PARSLEY
3 TABLESPOONS FLOUR.	

Remove any shell or cartilage from crab meat. Dissolve bouillon cube in water. Cook onion in butter until tender. Blend in flour and seasonings. Add milk and bouillon gradually; cook until thick, stirring constantly. Add crab meat; heat. Garnish with parsley sprinkled over the top. Serves 6.