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**SURVEY OF SALMON IN THE NORTH PACIFIC OCEAN  
AND GULF OF ALASKA--DIXON ENTRANCE TO UNIMAK  
PASS JULY-AUGUST, 1998**

by

H. Richard Carlson, Edward V. Farley, Ellen C. Martinson  
and Christine M. Kondzela

Auke Bay Laboratory  
Alaska Fisheries Science Center  
11305 Glacier Highway  
Juneau, AK 99801-8626 USA

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**Survey of salmon in the North Pacific Ocean  
And Gulf of Alaska--Dixon Entrance to Unimak  
Pass July-August, 1998**

**Abstract**

This report summarizes the preliminary results of a survey of the ocean distribution of young and maturing salmon and their habitat in coastal waters off Alaska during July-August, 1998, by scientists from the Auke Bay Laboratory, Alaska Fisheries Science Center. The work is part of a cooperative international research effort coordinated by the North Pacific Anadromous Fish Commission, to examine growth and survival of salmon during their ocean life. The survey was conducted on the F/V *Great Pacific*, a 38-m stern ramp trawler. Twelve transects, 90-270 nmi apart were sampled by surface trawl, covering coastal waters and nearshore, continental shelf, slope, and oceanic depth zones from Cape Augustine near Dixon Entrance north and west around the Gulf of Alaska off Prince William Sound, Cook Inlet, Kodiak Island and the Alaska Peninsula, to Cape Prominence in the eastern Aleutian Islands. A total of 63 tows, each 2.5 to 5.0 nmi long, was completed, all within the U.S. 200 mile Exclusive Economic Zone. Total catches of salmon included 25,568 juveniles (ocean age-0), 2,175 immatures (ocean age 1 or older), and 835 maturing adults returning to spawn this year. Most juvenile salmon were taken over the shelf zone, and most immature salmon were taken over the slope. Few juvenile salmon were taken west of Mitrofanina Island and few immature salmon were taken east of Cape St. Elias. The juvenile salmon consisted of 18,594 pink, 3,487 chum, 2,296 sockeye, 842 coho, and 349 chinook. Immature salmon included 1,105 chum, 1,019 sockeye, and 51 chinook. Maturing adult salmon included 541 pink, 128 chum, 28 sockeye, 120 coho, and 18 chinook. Sample numbers for all life stages and most species of salmon are sufficient for comparative growth analyses using scales, for food habit comparisons, for estimation of the incidence of otolith marked hatchery salmon, and for genetic tests of stock identity for species, life stages, and comparisons to locations previously sampled. Sea surface temperatures ranged from 12.0 °C near Dixon Entrance to 14.0 °C at Cape St. Elias and 10.0 °C near Unimak Pass.

## Introduction

During July and August, 1998, a survey of salmon (*Oncorhynchus spp.*) distribution in the Gulf of Alaska was conducted by scientists from the Auke Bay Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service. The survey (Fig. 1) began 24 July off Cape Augustine, Dall Island, near Dixon Entrance, and proceeded north and west around the coastline of southeast Alaska, off Prince William Sound, Cape Douglas in Cook Inlet, Kodiak Island, the Alaska Peninsula, and eastern Aleutian Islands, ending on 12 August in Dutch Harbor. Primary objectives of the research were to document ocean distribution of juvenile (age-0) and immature (age-1 and older) salmon and their migration routes in coastal and oceanic waters, relative abundance and size composition of species, ocean growth and stock identity or point of ocean entry. Additional objectives included documenting salmon food habits, occurrence of other fishes, and prevalent oceanographic conditions over selected coastal transects. To obtain comparative findings, the survey repeated previous sampling over transects at Cape Spencer, Ocean Cape, and Gore Point where large catches of juvenile salmon were made in 1996, and off Cape Prominence, Unalaska Island, where large catches of immature salmon were taken in 1997. We also compared surface trawl gear performance with the Canada Dept. Fisheries and Oceans Research Vessel *W.E. Ricker* near Dixon Entrance early in the cruise and this is reported separately. The work is part of an international research effort coordinated through the North Pacific Anadromous Fish Commission to investigate the health and well-being of salmon stocks and the potential for existence of a limited ocean carrying capacity. This was the third year of research by the Auke Bay Laboratory on ocean life of salmon in the North Pacific, and the second of two cruises in 1998. This report summarizes the preliminary results of the survey. Earlier surveys were reported in Carlson, et al. (1996), and Carlson, et al. (1997).

## Methodology

The cruise route (Fig. 1) was designed to repeat sampling effort for comparative purposes over transects off Southeast Alaska and Prince William Sound that were sampled in 1996, and Cape Prominence, near Unimak Pass, sampled in 1997. The cruise itinerary and participating scientists are shown in Table 1. The research gear, methodology, and fishing operations are shown in Table 2. The cruise began July 21 in Seattle, and ran north through Canadian waters to Dixon Entrance, and we began sampling with a surface trawl off Cape Augustine, Dall Island, on July 24, conducting comparative gear trials with Canada Dept. Fisheries and Oceans, Pacific Biological Station, Nanaimo, B.C. and their Research Vessel *W. E. Ricker*. From there, the cruise continued north to Cape Ommaney where we sampled from nearshore over shelf to slope and

seaward over oceanic depths. We followed this pattern of sampling all ocean habitat zones on each transect as the cruise progressed. Cape Ommaney was designated as an oceanographic transect, and we conducted CTD (Conductivity-Temperature-Depth) casts to 300 m or near bottom in shallows, every 2.5 nmi from nearshore out to 62.5 nmi seaward, and made surface trawl tows every 10 nmi, each accompanied by a bongo net oblique plankton tow to 200 m. Other designated oceanographic transects were Cape St. Elias, Cape Chiniak, and Scotch Cap, where the same procedures were followed. We sampled with surface trawl from nearshore to oceanic waters over transects at Cape Spencer, Ocean Cape, Cape St. Elias, Cape Puget, Gore Point, Cape Douglas, Cape Chiniak, Mitrofanina Island, Scotch Cap, and Cape Prominence (Fig. 1).

The F/V *Great Pacific* is a 38 m long stern ramp trawler built in 1979. The vessel has a main engine of 1450 horsepower and a cruising speed of 10 knots. The fishing gear was a midwater rope trawl, model 400/580<sup>1</sup>, made by Cantrawl Pacific Ltd. of Richmond, B.C. the net is 198 m long, has hexagonal mesh in wings and body, and has a 1.2 cm mesh liner in the codend. The net was fished with three 60-m, 1.9-cm bridles attached at a single point to steel alloy 5-m midwater trawl doors, each weighing 463 kg. The net was towed at 5 kts. at or near surface, with floats on the headrope and 260 m warp line on each door, and was monitored by a Simrad 300 netsounder, which showed a typical spread of 18 m vertically and 52 m horizontally. Most tows lasted 60 minutes and covered about 5.0 nautical miles. Sampling was done mostly during daylight.

Catches were brought aboard, and the codend was routinely emptied onto the sorting table (1000 kg capacity). For catches larger than 1000 kg, the codend contents were emptied into the trawlway forward of the stern ramp, and salmon and other desired specimens sorted out before the remaining catch was returned to the sea. From the catch, salmon and other species were identified to species and counted, and salmon length and weight were recorded, and if available, scales were taken for estimating growth. Juvenile salmon (ocean age-0) and immature salmon (ocean age-1 or older) were identified and sorted to species. Samples of 300 juvenile pink, chum and sockeye were frozen whole at -60° C for genetic analyses and examination for hatchery marked otoliths. Samples of genetic tissues (eye, heart, liver, and muscle) were taken from catches of >300 immature chum and sockeye and frozen for laboratory analyses. Otoliths from immature chum and sockeye were collected to identify hatchery fish with thermal marks. Stomach samples of up to 20 adult and immature salmon of each species were frozen for laboratory analyses of food habits.

Oceanographic observations of conductivity-temperature-depth were made using (Table 2) a Seacat SBE 19-01<sup>1</sup> recorder. After each trawl, surface (bucket) temperatures were taken, using a YSI 30/50<sup>1</sup> salinity temperature probe. Plankton sampling used 60 cm bongo nets with mesh sizes of 505 and 253 mesh, and flow meters were used to estimate water volume sampled by each net. Plankton samples were preserved in 5% formalin for laboratory analyses to estimate relative proportions of major groups and identify most common species.

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<sup>1</sup> Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

## Results and Discussion

### Overview

The 23-day cruise covered more than 3,000 nmi in coastal waters of the Gulf of Alaska, with the research survey beginning near Dixon Entrance and continuing north and west as far as the eastern Aleutian Islands (Fig. 1). A total of 63 surface trawl tows were completed, each from 30 to 60 minutes duration, and covering approximately 2.5 to 5.0 nmi. Catches included all five species of juvenile and maturing adult salmon as well as immature chum, sockeye and chinook salmon (Table 3). A summary of catches by transect for juvenile, immature, and adult salmon is shown in Tables 4-6. Juvenile (age-0) salmon were most numerous in our catches from southeastern Alaska through southcentral Alaska and Kodiak, but were rarely found farther west, with almost none beyond Unimak Pass. Immature salmon were rare off Southeastern Alaska, and began to show in numbers only from Cape Puget west. Juveniles were taken mostly over the continental shelf zone, and immatures mostly over and near the continental slope (200 m) zone. Other fishes taken included dogfish and salmon sharks, Pacific herring, walleye pollock, sablefish, Pacific pomfret, and juvenile rockfish (Table 7). Invertebrates included scyphozoan medusas, salps, doliolids, and squid. Zooplankton samples taken along oceanographic transects contained mostly calanoid copepods, hyperid amphipods, and pteropods. Near surface sea temperatures (Figures 2-5) ranged from 14 °C at Cape St. Elias to 10 °C at Scotch Cap.

### Catch summary

Total catches were 28,578 salmon (Table 3): 25,568 juveniles, 2,175 immatures, and 835 maturing adults. Juvenile salmon included 18,594 pinks, 3,487 chum, 2,296 sockeye, 842 coho, and 349 chinook. Immature salmon included 1,105 chum, 1,019 sockeye, and 51 chinook. Adult salmon included 541 pinks, 128 chum, 28 sockeye, 120 coho, and 18 chinook.

Other fishes (Table 7) included dogfish sharks, salmon sharks, sablefish, walleye pollock, Pacific herring, capelin, pomfret, rockfish, wolf-eels, lumpsuckers, and greenling. Invertebrates were mostly salps, scyphozoan medusas, and squid.

### Biological findings

Scale samples for growth analyses were taken from juvenile, immature and adult salmon and included fish collected from Dixon Entrance to Unimak Pass, with waters off southeast

Alaska, Prince William Sound, and Kodiak well represented in samples, and chum, sockeye, and coho salmon the primary species sampled.

The large samples of genetic tissue collected will allow stock identity comparisons of juvenile chum salmon with those taken in 1996 off Ocean Cape, and immature chum salmon with samples taken near Unimak Pass in 1996 and 1997. Immature sockeye collected from Cape Prominence allow comparative tests with samples taken at nearby Cape Cheerful in the Bering Sea in late April 1998.

Samples for food habit analyses were collected and preserved for later examination in the laboratory, and include all species and juvenile, immature and adult salmon.

## Oceanography

Sea surface temperatures (Figures 2-5) were not unusual, and ranged from 14.0 °C off Cape St. Elias to 10.0° C off Scotch Cap, and 11.0-12.0 °C at Cape Chiniak and Cape Ommaney.

## Significant findings

The cruise repeated transects sampled off southeast Alaska and the north central Gulf of Alaska in 1996. Comparative sampling effort and resultant catches (Table 3) show that juvenile salmon were even more abundant in 1998 at the same primary transects (Table 4) where numbers were highest in 1996; Cape Spencer, Ocean Cape, Cape Puget, and Gore Point. Overall, juvenile pink salmon numbers were over 3 times that of 1996, and chum, and sockeye salmon were present in significantly greater numbers. As in 1996, juveniles were abundant over shelf habitat from Dixon Entrance to Kodiak, and scarce from Shelikof Strait vicinity westward. As before, immature chum and sockeye were sparse between Dixon Entrance and Prince William Sound (Table 5), but from Cape Puget westward they were again abundant over and near slope habitat. An overall distribution pattern which shows juvenile salmon predominate over the shelf from Dixon Entrance as far as Kodiak, and immature salmon predominate over the slope from there west, appears to be a general pattern that has now held true during 1996-1998.

Significant numbers of juvenile pink and chum salmon will be examined for otolith marks which identify hatchery fish and allow comparison of the incidence and origin of these fish with 1996 samples. Similarly, samples of juvenile chum salmon will allow genetic tests and comparison with stock origins found off Ocean Cape in 1996. Catches of immature sockeye taken off Cape Prominence in early August are comparable to catches of immature sockeye taken nearby during late April, 1998, off Cape Cheerful, on the Bering Sea side of Unalaska Island. Planned genetic tests hold potential to reveal stock origin of these samples, and provide new information on immature sockeye distribution in the eastern Aleutians. Ongoing laboratory work with the sizeable collections generated from this cruise is expected to provide much more information on ocean migrations of salmon in the North Pacific.

## Acknowledgments

The authors wish to extend thanks to all those who participated in and assisted with the cruise. We are particularly grateful to Captain Charles J. (Jack) Bronson and the crew of the F/V *Great Pacific* for their excellent performance and willingness to make our priorities theirs, and sustained efforts to attain research goals. We also want to recognize and thank David King and his Netloft crew and the RACE Division of the Alaska Fisheries Science Center for their support and assistance since the beginning of the Ocean Carrying Capacity program.

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Table 1. List of participating scientists and cruise itinerary for F/V *Great Pacific* cruise July 21-August 12, 1998, from Southeast to southcentral Alaska and the eastern Aleutian Islands.

Scientific Party:

Leg I: Seattle to Kodiak, July 21- August 6

Richard Carlson, Chief Scientist	NMFS, Auke Bay Laboratory
Edward Farley	“ ” “ ”
Christine Kondzela	“ ” “ ”
Ellen Martinson	TAG DataFlow/Alaska

Leg II: Kodiak to Dutch Harbor, August 6-12

Edward Farley, Chief Scientist	NMFS, Auke Bay Laboratory
James Murphy	“ ” “ ”
John Pohl	TAG DataFlow/Alaska
Saang-Yoon Hyun	Graduate Student, Univ. Washington

Cruise Itinerary:

Leg I:

21 July	Seattle--board scientific party and depart enroute Dixon Entrance
22 July	Underway running north
23 July	Underway running north
24 July	Arrive Cape Augustine, Dall Is, surface trawl tows to 15 nmi off, underway N
25 July	Cape Ommaney, oceanography, fishing to 30 nmi off, drifting overnight
26 July	Cape Ommaney, oceanography, fishing to 62 nmi off, underway N
27 July	Cape Spencer, surface trawl tows to 52 nmi off, underway N
28 July	Ocean Cape, surface trawl tows to 42 nmi off, run, drift overnight
29 July	Ocean Cape, resume surface trawl tows 52 to 115 nmi off, underway NW
30 July	Cape St. Elias, oceanography, fishing to 30 nmi off, drift overnight
31 July	Cape St. Elias, oceanography, fishing to 63 nmi off, underway W
1 August	Cape Puget, surface trawl tows to 63 nmi off, underway W
2 August	Gore Point, surface trawl tows to 32 nmi off, underway W
3 August	Cape Douglas, Cook Inlet, surface trawl tows to 55 nmi off, underway S
4 August	Cape Chiniak, oceanography, fishing
5 August	Cape Chiniak, oceanography, fishing to 63 nmi off, run to Kodiak, exchange sci's



Table 1 (continued)

Leg II:

6 August	Depart Kodiak, run W enroute Mitrofanina Island
7 August	Offshore from Mitrofanina Island, fishing from 82 mi out to 1 nmi off
8 August	Underway West
9 August	Scotch Cap, Unimak Pass, oceanography, fishing to 45 nmi off
10 August	Scotch Cap, resume oceanography, fishing to 62 nmi off , underway W
11 August	Cape Prominence, surface trawl tows to 12 nmi off, underway N
12 August	Arrive Dutch Harbor, disembark scientists and gear, end cruise

Table 2. Description of research gear and fishing operations aboard the F/V *Great Pacific* in July-August, 1998.

Research item/gear	Purpose	Specifications	Deployment	Sample/Data	Comment
<b>A. Hydrographic</b>					
CTD: SEACAT SBE 19-01 Conductivity-Temperature-Depth Recorder (SEA-BIRD Electronics, Inc., Seattle, WA, USA) with DO sensor (SBE 23Ba, Beckman-type polarographic element) and fluorometer. Built: 1988. Calibrated: July, 1995 & Mar 1996	Collect physical & productivity data along transects to gather information related to salmon growth and survival studies; physical environment at salmon sampling stations, productivity, develop ocean current profiles.	Meas. range- Temp.: 5 - 35 C; Conduct.: 0-7 S/m (0 to 70 mmno/cm); Pressure: 50, 100, 150, 200, 300, 500, 1,000, 1500, 3,000, 5,000, or 10,000 psia	Vertical to 300 m (or near bottom at shallower depths), each deployment approx. 2.5 nm apart along standard oceanographic transects and at start or end of fishing stations along other selected transects	Temperature, conductivity, pressure, salinity at 1 m increments	Each deployment of CTD took approx. 20 min. at 300 m depth sta's; data is stored in binary form, conversions to engineering units made with Vers. 4.219 SEASOFT software
Water bucket and hand held salinity-conductivity-temperature probe (YSI 30, Yellow Springs, OH, USA)	To compare surface/air interface water temp's & salin. from near shore, across the shelf, and in open ocean waters, to observe these conditions at salmon collection sta's and correlate with data from the CTD	Resolution: 0.01 C and 0.05 psu	Bucket samples taken at the surface at the end of each fishing station	Sea surface temperature and salinity	Bucket casts were made during mid-water trawl retrieval at end of tow.

Table 2. (continued)

Research Item/Gear	Purpose	Specifications	Deployment	Sample/Data	Comments
<b>B. Plankton</b>					
Bongo plankton nets two mesh sizes, 253 and 505 $\mu\text{m}$	To identify common plankton species and estimate relative abundance of major groups.	Nets 60 cm diam., mesh sizes 253 and 505 $\mu\text{m}$ , flow meters used to estimate volume sampled. Set at 2 kt, net lowered 1 m/sec. Retrieved at 1 to 1.5 kt, net pulled in at 1m/3 sec.	Oblique tows to 200 m (or to approx. 10 m above the bottom at shallower depths)	Samples preserved in 5-10% formaldehyde	Each deployment takes approximately 15-30 min., depending on depth
<b>C. Salmonids</b>					
Midwater rope trawl model 400/580 (Cantrawl Pacific Ltd., Richmond, B.C., Canada); designed for higher than average towing speeds	To collect biological samples and data for salmonid distribution, growth, survival, and stock identification studies	198 m-long, hexagonal mesh in wings and body, 1.2 cm mesh liner in the codend, fished with three 60-m, 1.9 cm bridles attached at a single point to steel alloy 5.5-m mid-water trawl doors, each weighing 463 kg	Towed at 5 kt for ½ or 1 h, at or near surface with floats on the headrope; 260-m warp line on each door; monitored with Simrad 300 netsounder (spread approx. 52-m wide and 18-m deep)	Each fish assigned a unique control no., fork length (FL), body weight (BW), scale sample, maturity, sex and gonad weight (sub-sample)	Some lengths measured with Limnoterra FMB-IV, electronic fish measuring board; body weights measured with MAREL M 2000 series, electronic platform scale

Table 3 . Numbers and locations of Pacific salmon captured by surface trawl from *F/V Great Pacific* in the Gulf of Alaska, July 24 to August 11 1998.

Haul no.	Date	Location		Pink		Chum		Sockeye		Coho		Chinook	
		Latitude (North)	Longitude (West)	Juv.	Mat.	Juv.	Imm. Mat.	Juv.	Imm. Mat.	Juv.	Mat.	Juv.	Imm. Mat.
66	7/24	54-56.5	133-13.0	17	4	30	5		5	5		1	1
67	7/24	54-58.1	133-19.4	51	1	57	1	7		1			
68	7/24	54-57.8	133-27.1	62	3	55	1	6	2	2	3	1	
69	7/24	54-59.4	133-31.8	2	3	5		1		1	2		
70	7/24	54-58.1	134-07.1	29	4	26	1	2					1
71	7/24	54-58.4	134-21.5	22	1	17		7					
72	7/25	56-09.4	134-42.5	68	70	18	1	3	3		6	296	
73	7/25	56-06.9	134-57.2	146	14	54	1	38			4	10	
74	7/25	56-01.9	135-13.2	64	3	12				2		7	
75	7/25	55-54.6	135-28.2	24	1	14			1		1	2	
76	7/26	55-49.0	135-40.3										
77	7/26	55-42.9	135-55.9						1				
78	7/26	55-38.3	136-11.5				2				1		
79	7/27	58-12.7	136-45.0	346	20	75	27	7	2	40	18	2	
80	7/27	58-03.9	137-15.6	360	21	97	5	45	2	33	3		
81	7/27	57-56.9	137-35.8	1940		411		32		10			
82	7/27	57-48.8	137-57.9	1		2	7			5	1		
83	7/28	59-30.1	139-52.6	2	6	1	14	1	2	257	33	2	2
84	7/28	59-18.2	140-09.5	3170	33	904	3	2	198	2	52	6	1
85	7/28	59-01.7	140-42.4	825	5	72			45		2		1
86	7/29	58-49.6	140-50.4	127	1		7	4	1		1		
87	7/29	58-35.5	141-15.5	1	4		5						

Table 3. (Continued)

88	7/29	58-20.5	141-46.3		1		4	1									
89	7/29	58-06.8	142-05.7		1		4						1				
90	7/30	59-47.5	144-39.9	1	3			1	1			22	13	5		17	
91	7/30	59-39.2	144-47.0	449	5	308	6	1	51			33	1				
92	7/30	59-32.1	144-45.2	19	10	22	15	4	1	1		33	1	5			
93	7/30	59-18.4	144-48.4		7		14					3	2				
94	7/31	59-08.4	144-50.5		2		1	1					1				
95	7/31	58-58.7	144-50.5				1										
96	7/31	58-48.2	144-50.8		2		3										
97	8/01	59-55.2	148-26.8	1050	20	378	22	1	61			7	1				
98	8/01	59-26.5	148-26.3	1224	13	106	7	1	60			51	5	3			
99	8/01	59-07.3	148-25.8	66		22	554	17	14	1		56		1			
100	8/01	58-56.7	147-56.4		8		34	2		1		30					
101	8/02	59-10.1	150-55.7	2903	36	348	118	3	385	1		18	6				
102	8/02	58-49.5	150-19.5	246	6	93	7		44			3	1				
103	8/03	58-51.0	153-11.9	108	19			2	163			125		13			
104	8/03	58-50.4	152-45.0	1427	2	68	11		226	1		15	2				
105	8/03	58-50.1	152-20.4	2079	9	166	3		561	3		7	2				
106	8/03	58-47.4	151-34.7	1257	2	97	17		144			10					
107	8/04	57-36.8	152-05.5	11	18	2		4	3								
108	8/04	57-32.1	151-53.5	338	7	22		7	35			8					
109	8/04	57-25.6	151-39.2	10	29			10	11		1		1				
110	8/04	57-20.1	151-23.8	3	46							1					
111	8/04	57-13.0	151-42.2	2			36	1	1	1		1					
112	8/04	57-08.3	150-54.5	140	3	3	28	2	2		1	1					
113	8/04	56-58.7	150-37.3	1	6		20			2		2	1				
114	8/07	55-02.6	156-46.4		30		48	2		45	1						
115	8/07	55-03.7	157-09.4	1	12		9	1		9		1					1
116	8/07	55-25.9	158-08.8	2	5		2			50							13

Table 3. (Continued)

117	8/07	55-48.2	158-42.4	3	2	3	140	11	1	5	10					
118	8/09	54-22.2	164-45.0	20						2						
119	8/09	54-14.0	164-34.2					2								
120	8/09	54-06.6	164-26.9			1		3								
121	8/09	53-57.7	164-19.2	1				1								
122	8/09	53-46.0	164-10.2	3		64	2	38	2		8					
123	8/10	53-39.6	164-06.1	2		20		15			3					
124	8/10	53-29.6	164-00.9	2		13		35			5					
125	8/11	53-25.0	166-43.8	9		4	3	79			4					
126	8/11	53-21.7	166-39.6	3		2		69	1	1	1					
127	8/11	53-19.1	166-38.3					474								
128	8/11	53-18.1	166-38.3	2		10		177	1		2					
Totals				<u>18,594</u>	<u>541</u>	<u>3487</u>	<u>1105</u>	<u>128</u>	<u>2296</u>	<u>1019</u>	<u>28</u>	<u>842</u>	<u>120</u>	<u>349</u>	<u>51</u>	<u>18</u>
				19,135		4720			3343			962		418		

GT: 28,578

Table 4. Number of juvenile salmon caught from 24 July to 11 August, *F/V GREAT PACIFIC*.

Transect	No. of juvenile salmon in catch					
	Total	Pink	Chum	Sockeye	Coho	Chinook
Cape Augustine	407	183	190	23	9	2
Cape Ommaney	758	302	98	41	2	315
Cape Spencer	3406	2647	585	84	88	2
Ocean Cape	5661	4125	977	245	311	3
Cape St. Elias	953	469	330	53	91	10
Cape Puget	3129	2340	506	135	144	4
Gore Point	4040	3149	441	429	21	0
Cape Douglas	6466	4871	331	1094	157	13
Cape Chiniak	597	505	27	52	13	0
Mitrofanina Island	151	3	2	140	6	0
Scotch Cap	0	0	0	0	0	0
Cape Prominence	0	0	0	0	0	0
<b>Total Catch</b>	<b>25,568</b>	<b>18,594</b>	<b>3487</b>	<b>2296</b>	<b>842</b>	<b>349</b>

Table 5. Number of immature salmon caught from 24 July to 11 August, *F/V GREAT PACIFIC*.

Transect	No. of immature salmon in catch			
	Total	Chum	Sockeye	Chinook
Cape Augustine	1	0	0	1
Cape Ommaney	0	0	0	0
Cape Spencer	0	9	0	0
Ocean Cape	26	23	0	3
Cape St. Elias	51	40	1	0
Cape Puget	623	617	2	0
Gore Point	126	125	1	0
Cape Douglas	48	31	4	0
Cape Chiniak	87	84	3	0
Mitrofanina Island	200	62	115	24
Scotch Cap	268	98	94	16
Cape Prominence	822	16	799	7
Total Catch	2175	1105	1019	51



Table 6. Number of maturing salmon caught from 24 July to 11 August, *F/V GREAT PACIFIC*.

Transect	No. of maturing salmon in catch					
	Total	Pink	Chum	Sockeye	Coho	Chinook
Cape Augustine	37	16	8	7	5	1
Cape Ommaney	106	88	2	5	11	0
Cape Spencer	100	41	32	4	23	0
Ocean Cape	117	51	21	4	41	0
Cape St. Elias	71	29	7	0	18	17
Cape Puget	68	41	21	0	6	0
Gore Point	52	42	3	0	7	0
Cape Douglas	38	32	2	0	4	0
Cape Chiniak	137	109	24	2	2	0
Mitrofanias Island	77	70	3	2	2	0
Scotch Cap	12	8	2	2	0	0
Cape Prominence	20	14	3	2	1	0
<b>Total Catch</b>	<b>835</b>	<b>541</b>	<b>128</b>	<b>28</b>	<b>120</b>	<b>18</b>

Table 7. Catch records for non-salmonids captures on the F/V *Great Pacific* cruise July and August 1998, in the North Pacific Ocean and Southern Bering Sea.

Transects	Spiny dogfish	Salmon shark	Blue shark	Pacific herring	Capelin	Pacific sand lance	Pacific cod	Walleye pollock (J)	Walleye pollock (A)	Sablefish
Cape Augustine				2						
Cape Ommaney						10				6
Cape Spencer		2		5						1
Ocean Cape	55	1	1		20,000					82
Cape St. Elias	782	1		2						40
Cape Puget	4	1							1	
Gore Point	3					4			2	8
Cape Douglas						6		1	8	11
Cape Chiniak	294	1		38	4			1	122	29
Mitrofanina Island						1000			166	5
Scotch Cap				5				201	140	
Cape Prominence	2						1	307	22	12
Total Catch	1140	6	1	52	20,004	1020	1	517	461	194

Table 7 (Continued).

Transects	Rockfish	Dagger-tooth	Pacific pomfret	Prowfish	Wolf-eel	Spiny lumpsucker	Smooth lumpsucker	Atka mackerel	Greenling
Cape Augustine	1			1	1				
Cape Ommaney	1503	1	15	3	14		2		
Cape Spencer	172			4	127				
Ocean Cape	2832		16	5	82				
Cape St. Elias	1155		2		54				39
Cape Puget			7	1	24				
Gore Point				1	8				
Cape Douglas				4	4				1
Cape Chiniak	40			1	1	1	50		
Mitrofanian Island		1			2	1	1		55
Scotch Cap				1					
Cape Prominence					1			2	455
Total Catch	5703	2	40	21	318	2	53	2	550

Table 7 (Continued).

Transects	Stickleback	King of salmon	Sturgeon poacher	Sandfish	Dall Porpoise
Cape Augustine		5			
Cape Ommaney			1		
Cape Spencer					
Ocean Cape					
Cape St. Elias					2
Cape Puget	20				
Gore Point					
Cape Douglas				6	
Cape Chiniak					
Mitrofanian Island					
Scotch Cap				1	
Cape Prominence					
Total Catch	20	5	1	7	2

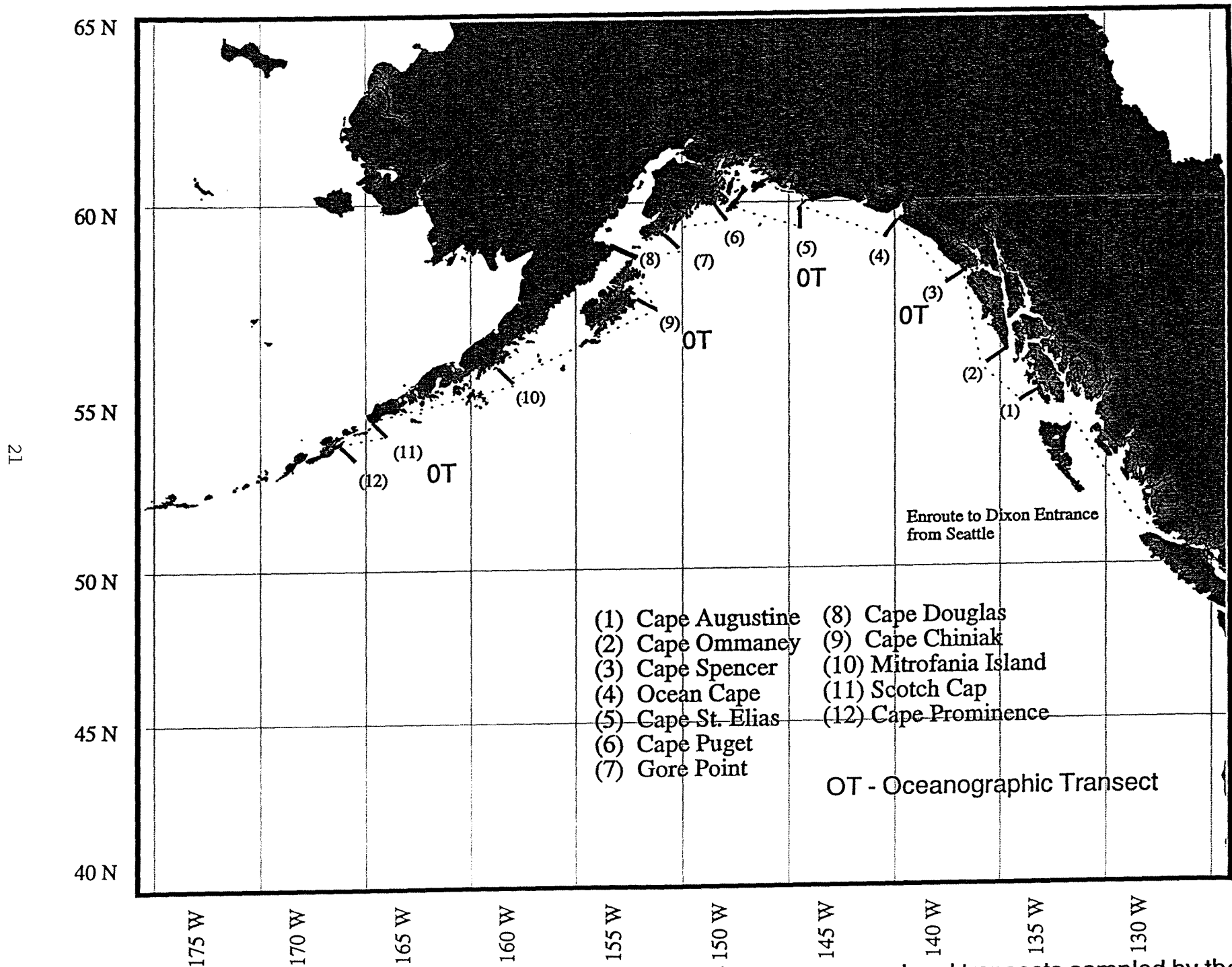


Figure 1. Overview map of the North Pacific Ocean showing area covered and transects sampled by the FV GREAT PACIFIC during July and August 1999

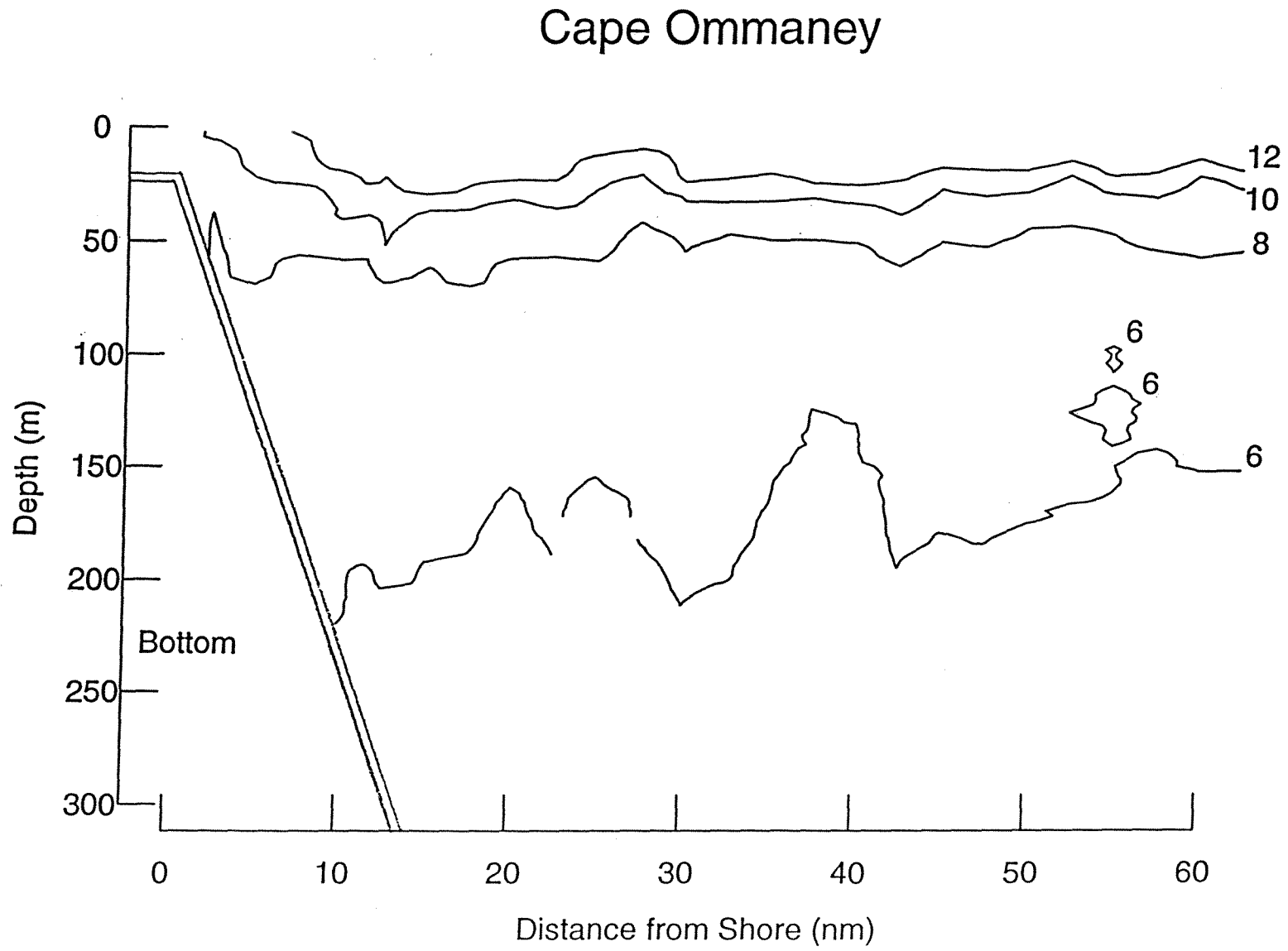


Figure 2. Temperature profile ( $^{\circ}\text{C}$ ) off Cape Ommaney from nearshore to 60 nautical miles taken aboard the *F/V Great Pacific* on July 25 and 26, 1998.

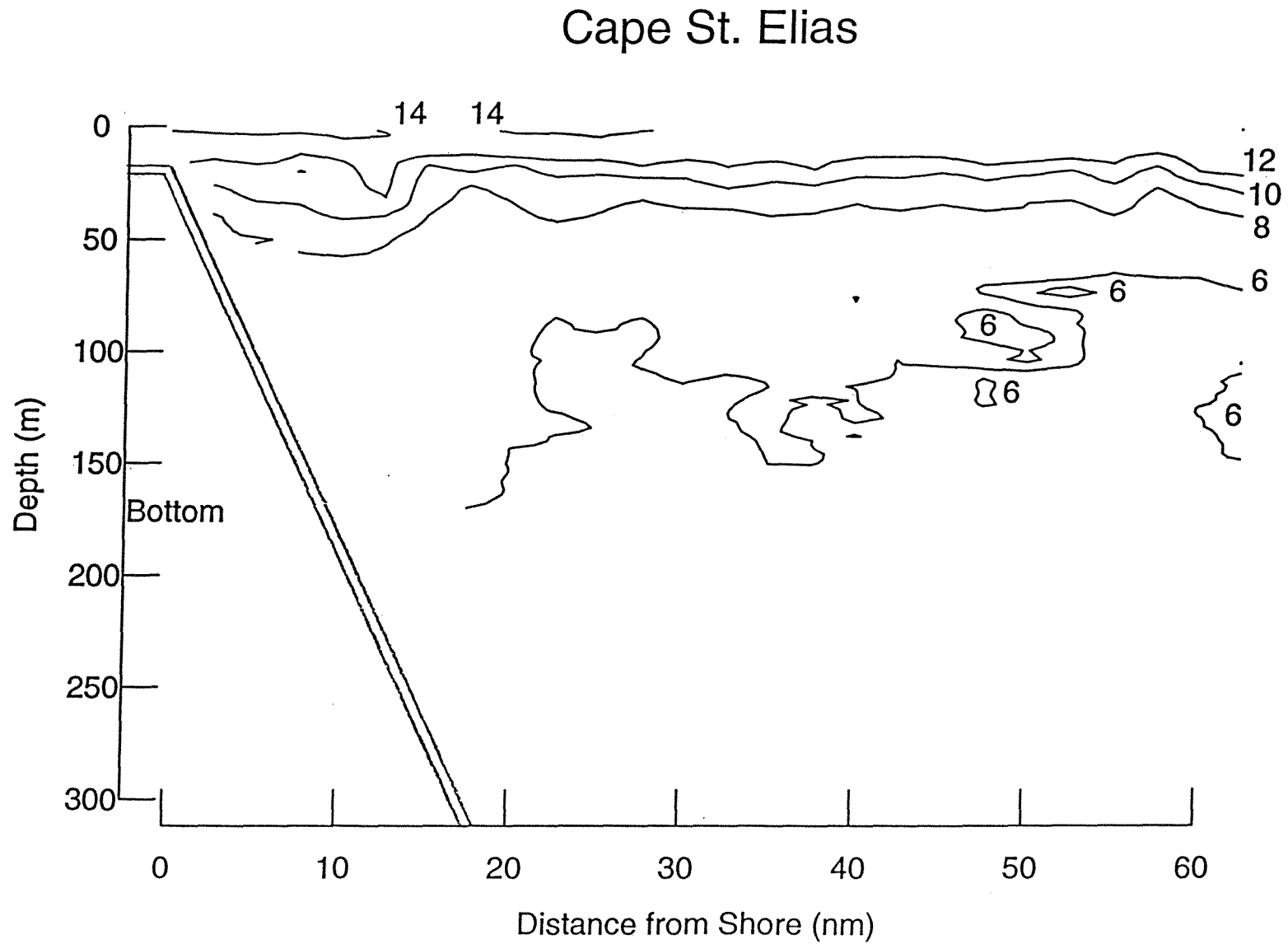


Figure 3. Temperature profile ( $^{\circ}\text{C}$ ) off Cape St. Elias from nearshore to 60 nautical miles taken aboard the *F/V Great Pacific* on July 30 and 31, 1998.

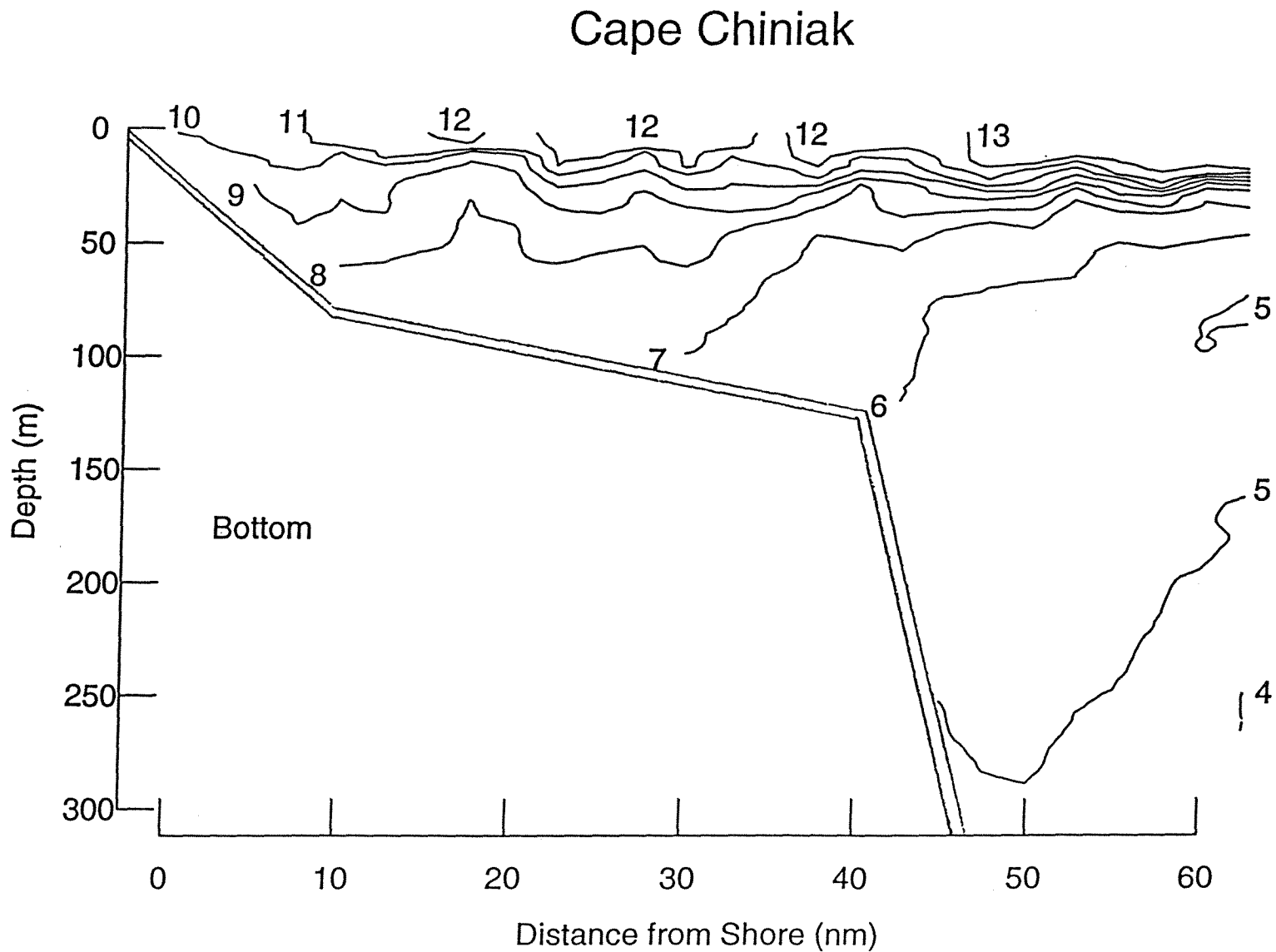


Figure 4. Temperature profile ( $^{\circ}\text{C}$ ) off Cape Chiniak from nearshore to 60 nautical miles taken aboard the *F/V Great Pacific* on August 4, 1998.



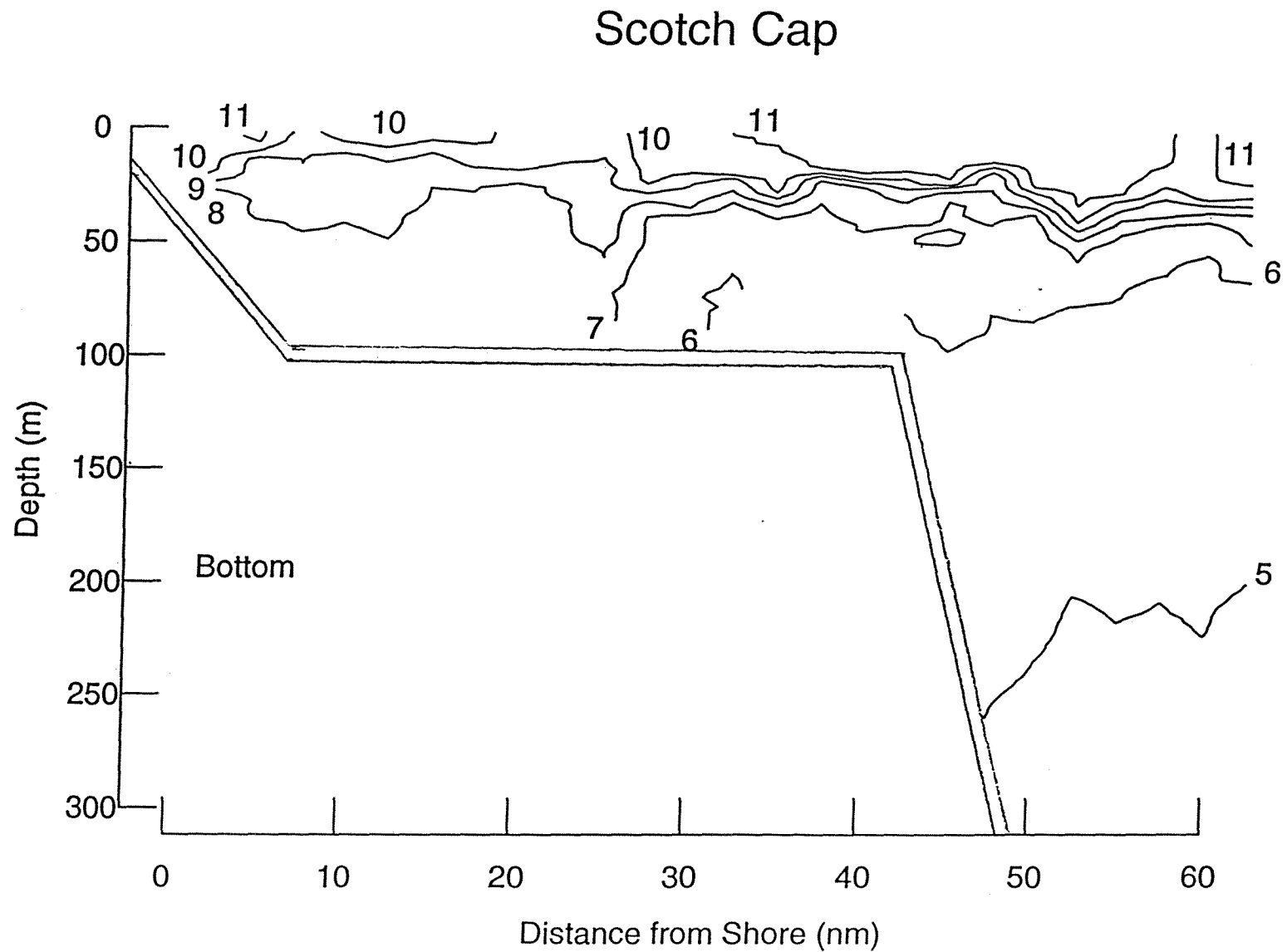


Figure 5. Temperature profile ( $^{\circ}\text{C}$ ) off Scotch Cap from nearshore to 60 nautical miles taken aboard the *F/V Great Pacific* on August 9 and 10, 1998.