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**Results from the Canadian High Seas Research Cruise
to the Eastern North Pacific Ocean,
23 March - 11 April, 1995**

by

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ABSTRACT

The offshore distribution of Pacific salmon (*Oncorhynchus* sp.) was surveyed in the Gulf of Alaska in the spring of 1995 using a mid-water rope trawl modified to fish just below the ocean surface. The survey was conducted from March 23 - April 11, 1995. The objectives of the survey were to collect additional data describing the seasonal variation in the physical and biological factors defining the southern limit to the distribution of Pacific salmon, and to evaluate the capability of the rope trawl to catch salmon in the offshore. This report summarizes the Pacific salmon catches for each fishing station, and the physical characteristics of the Gulf of Alaska at the time of the survey.

CRUISE TRACK AND FISHING STATIONS

The survey described in this report was carried out from March 23 - April 11, 1995 using the *F/V Anita J*, a chartered commercial groundfish trawler of ca. 1,200 HP and 120 feet length over all. Figure 1 shows the cruise track and the surface trawl stations. All trawl sampling was conducted during daylight hours with a mid-water rope trawl modified to fish near the surface. A total of 52 CTD casts and 44 trawl stations were completed, with an oblique plankton tow with a Bongo net and a CTD cast made at ca. 11 p.m. each night, weather permitting. Trawl stations were generally spaced at 30-60 nautical mile intervals (50-100 km) during the day, with greater spatial separation between stations occupied on different days as the vessel could travel for longer periods overnight.

The objectives of the spring survey were to collect additional data describing the seasonal variation in the physical and biological factors defining the southern limit to the distribution of Pacific salmon, and to evaluate the capability of the rope trawl to catch salmon in the offshore. This report summarizes the Pacific salmon catches for each fishing station, and the physical characteristics of the Gulf of Alaska at the time of the survey.

2. FISHING GEAR AND SAMPLING PROTOCOL

All fishing was carried out with a modified mid-water rope trawl using a 3-point bridle attachment to each side wing. The mouth opening was hexagonal, and a horizontal mouth opening of approximately 46 m and vertical opening of approximately 37 m.

Net construction used a variable size hexagonal mesh, with the size of mesh progressively decreasing towards the rear of the net. The use of a hexagonal mesh reduces drag while towing because tension on the net forces the meshes open, increasing

the flow of water through the net relative to the traditional diamond or square mesh, which tends to close under tension.

The net was towed at a speed of roughly 4.5 knots using a pair of 5m Super "V" otter trawl doors with approximately 120 kg weight chains on each side. Initial fishing used 120 m bridles, at which point the reported depth of the net sounder on the head rope was approximately 4m. At approximately the mid-point of the cruise the length of the bridles was reduced to 60 meters and additional flotation was fixed to the head rope in an effort to bring the head rope closer to the surface. The head rope was frequently observed breaking the surface following these modifications, and the net sounder did not report a depth reading except in heavy seas. The length of the main warps payed out varied with sea state, but was always much less than the 700 m maximum length.

Fishing time was recorded from the time the trawl doors deployed in spread position until the net was retrieved and the doors broke the surface. The Anita J proved incapable of fishing the net at speeds exceeding 4.5 knots, a speed which we suspect was marginal for sampling salmon, and we recommend the use of a vessel of greater gross horsepower for future surveys using this gear.

BIOLOGICAL SAMPLING

Sampling information for each trawl station is reported in Table 1. SST readings in Table 1 were based on the engine water intake temperature reported on the bridge console at the time of each tow, and the surface salinity values are based on the initial CTD surface readings after each tow and were not calibrated. Corrected temperature and salinity readings based on the post-cruise calibration of the CTD are reported in a subsequent section.

Because the catch levels tended to be relatively low, the entire catch from later stations was frozen after the number of each species was counted, and the detailed biological sampling was carried out in the laboratory at the Pacific Biological Station in Nanaimo.

Fork length, body weight, gonad weight, liver weight, and weight of stomach contents were measured for a subsample of the salmon catch in early trawl stations. Age determinations were made for those salmon which were not completely descaled by the net—in many cases this meant that the scale sample had to be taken from the small protected area of the lower body protected by the pelvic fin.

Table 1 presents the trawl catches of Pacific salmon at each of the 44 stations. The distribution of salmon catches proved to be sporadic (Fig. 1; the radius of all circles is set proportional to the square root of the catch per trawl-hour). A total of 241 Pacific salmon were caught in the surface trawl; 23% pink salmon, 9% sockeye salmon (*O. nerka*), and 68% chum salmon (Table 2). No coho salmon (*O. kisutch*), steelhead trout (*O. mykiss*)

or chinook salmon (*O. tshawytscha*) were caught. No fin clipped salmon were recorded in the catch. Length frequency distributions for each species are shown in Fig. 2.

PHYSICAL OCEANOGRAPHY

CTD measurements were taken at each fishing station to a maximum depth of 350 meters (shallower depths in poor weather conditions; Table 3). A Seabird Electronics Seacat Profiler (Model 19-03, serial number 1031) was used to measure conductivity, temperature, and pressure. A Seabird dissolved oxygen sensor and a Seatech 25 cm path length transmissometer (serial number 254) were attached to the CTD to measure oxygen concentration and light transmissivity. The CTD was calibrated at the Institute of Ocean Sciences in Sydney, British Columbia before and after the survey, and the initial salinity and oxygen measurements were corrected using the information obtained from either surface bucket samples or deep-water Niskin bottle samples. As noted above, the initial surface and salinity and temperature readings recorded in the bridge log during the survey (Table 1) differed from the final CTD readings after calibration. They have been reported unmodified in Table 1 to give some perspective on the need to conduct calibration tests on the instrumentation.

Surface samples for dissolved oxygen, nutrients (nitrate, phosphate, and silicate), chlorophyll and salinity were taken at each fishing station using a surface sample bucket. Samples for total nitrogen were taken only along the 145°W section. A Niskin bottle was attached to the wire above the CTD in order to collect a deep calibration sample at approximately every fourth station. With the exception of oxygen samples, chemical measurements were carried out at the Inst. Of Ocean Sciences. The latter were analyzed at the Pacific Biological Station.

CTD datasets can be accessed by contacting Robin Brown, Oceanographic Data Management, Institute of Ocean Sciences, P.O. Box 6000, 9860 West Saanich Road, Sidney, B.C., Canada, V8L 4B2. The CTD dataset is identified by the cruise number "9511".

Figs. 3 and 4 show the distribution of salinity and temperature at 10m. The isopleths of salinity and temperature run roughly orthogonal to each other, with salinity decreasing to the northeast, and temperature decreasing to the northwest. Two vertical oceanographic sections along the first two transects (Fig. 5; A: Stns. 2-11 and B: Stns. 12-27, respectively) show that the surface layer was well-mixed to a depth of 80 m or more (Fig. 6) throughout the survey area.

SUMMARY

Salmon were feeding actively during the survey period, with stomachs almost full. Sockeye, pink, and chum salmon were caught together on two tows, but sockeye were not captured at sea temperatures higher than 8°C, and pink salmon were not caught at temperatures greater than 10°C. The patchy distribution of salmon catches is puzzling. It may be the result of not being able to tow the net at speeds greater than 4.5 kts during our because of the limited engine power available. We recommend the use of a vessel sufficiently powerful to tow the net at speeds of 5-5.5 kts, because previous salmon surveys using surface trawl gear towed at these speeds

ACKNOWLEDGEMENTS

We would like to thank the crew of the F/V Anita J and the other scientific crew who participated in our survey: Ms Louise Timmermans (Institute of Ocean Sciences), and Mr Ken Derksen (Archipelago Marine Resources, Victoria), and Dr Peter Rand (University of British Columbia). In addition, we thank Dr Ed Carmack (IOS) for arranging for Ms Timmermans' able assistance and for the loan of the SeaBird CTD equipment.

TABLE 1. Bridge log information and catch summaries at each station for the F.V. "Anita J" cruise to the North Pacific, March 23 - April 11, 1995.

TOW #	DATE	WIND SPEED (knots)	WIND DIR.	START TIME	START POSITION	TOW SPEED (knots)	TOW BEARING	END TIME	END POSITION	SST °C	SSS ‰	PINK #	CHUM #	SOCKEYE #	TOTAL SALMON
1	25-Mar-95	15	SE	11:17	50° 38.9' N 134° 19.1' W	4.4	18°	12:25	50° 42.2' N 134° 17.0' W	6.9	33.0	0	0	0	0
2	25-Mar-95	15	SE	16:13	50° 39.5' N 134° 51.8' W	4.4	281°	17:20	50° 40.2' N 134° 58.9' W	6.7	33.0	0	0	0	0
3	26-Mar-95	5	SE	09:17	50° 24.9' N 138° 23.9' W	4.5	269°	10:22	50° 25.2' N 138° 32.6' W	6.7	33.0	0	0	0	0
4	26-Mar-95	5	SE	14:00	50° 23.8' N 139° 15.7' W	4.5	271°	15:05	50° 24.8' N 139° 24.0' W	6.6	33.0	5	2	14	21
5	26-Mar-95	18	E	19:20	50° 23.9' N 140° 06.6' W	4.5	266°	20:22	50° 24.7' N 140° 11.7' W	6.5	33.1	1	0	0	1
6	27-Mar-95	30	SE	09:10	50° 15.9' N 142° 31.6' W	4.5	270°	10:12	50° 18.1' N 142° 36.9' W	5.8	33.3	0	0	0	0
7	27-Mar-95	25	SE	14:35	50° 16.8' N 143° 07.3' W	4.5	200°	15:50	50° 12.5' N 143° 06.8' W	5.7	33.4	0	0	0	0
8	27-Mar-95	25	SE	18:05	50° 11.8' N 143° 25.7' W	4.5	NA	19:15	50° 09.1' N 143° 35.1' W	5.8	33.4	0	0	0	0
9	28-Mar-95	15	SE	09:55	50° 07.5' N 145° 49.7' W	4.5	175°	10:15	50° 06.3' N 145° 42.7' W	5.4	33.4	0	0	0	0
10	28-Mar-95	15	SE	13:10	50° 00.8' N 145° 13.0' W	4.5	120°	15:40	50° 00.0' N 145° 00.0' W	5.7	33.4	0	0	0	0
11	28-Mar-95	20	SE	18:50	49° 48.1' N 144° 49.5' W	4.5	175°	19:55	49° 43.5' N 144° 59.7' W	5.7	33.4	0	0	0	0
12	29-Mar-95	35	SE	08:30	49° 03.6' N 144° 28.8' W	4.5	NA	09:50	49° 04.5' N 144° 21.4' W	6.3	33.4	0	0	0	0
13	29-Mar-95	20	SE	15:15	48° 38.3' N 144° 18.1' W	4.5	220°	16:28	48° 35.2' N 144° 12.9' W	6.5	33.4	0	0	0	0
14	29-Mar-95	20	SE	17:55	48° 29.4' N 144° 01.6' W	4.5	139°	19:05	48° 26.8' N 143° 55.6' W	6.6	33.4	0	0	0	0
15	30-Mar-95	20	S	08:30	47° 12.1' N 143° 07.2' W	4.5	109°	09:50	47° 11.7' N 143° 09.4' W	7.3	33.5	0	0	0	0
16	30-Mar-95	25	SW	14:15	46° 52.7' N 142° 47.8' W	4.5	76°	15:35	46° 53.9' N 142° 37.9' W	7.8	33.5	0	0	0	0
17	30-Mar-95	25	SSW	19:00	46° 42.2' N 142° 14.7' W	na	168°	19:50	46° 39.3' N 142° 12.7' W	7.4	33.3	10	10	8	28
18	01-Apr-95	25	S	09:15	44° 47.4' N 140° 15.7' W	4.4	160°	10:20	44° 44.2' N 140° 12.1' W	8.9	33.6	1	0	0	1
19	01-Apr-95	27.5	S	13:55	44° 30.7' N 139° 49.6' W	4.4	153°	15:10	44° 27.5' N 139° 43.7' W	9.4	33.6	0	0	0	0
20	01-Apr-95	30	S	18:04	44° 14.5' N 139° 23.4' W	4.4	129°	19:25	44° 11.4' N 139° 16.6' W	9.4	33.6	0	0	0	0
21	02-Apr-95	35	SE	07:55	43° 16.9' N 137° 57.7' W	NA	102°	09:00	43° 17.9' N 137° 50.7' W	9.8	33.5	1	0	0	1
22	02-Apr-95	35	SE	13:15	43° 45.3' N 137° 34.9' W	4.4	110°	14:12	43° 43.5' N 137° 28.8' W	10.4	33.6	0	0	0	0
23	03-Apr-95	25	SSW	09:10	42° 54.4' N 136° 26.9' W	NA	NA	10:05	42° 50.3' N 136° 23.7' W	10.5	33.5	0	0	0	0
24	03-Apr-95	25	SSW	13:20	42° 30.3' N 136° 06.1' W	4.4	156°	14:23	42° 26.7' N 136° 02.4' W	10.5	33.5	0	0	0	0
25	03-Apr-95	10	SW	18:15	41° 59.0' N 135° 46.2' W	NA	164°	19:30	41° 53.9' N 135° 42.3' W	12.8	34.0	0	0	0	0
26	04-Apr-95	5	W	08:15	40° 02.5' N 135° 24.3' W	NA	NA	09:25	39° 58.3' N 135° 23.1' W	NA	NA	0	0	0	0
27	04-Apr-95	5	S	13:14	40° 24.2' N 135° 10.8' W	4.5	18°	14:19	40° 28.7' N 135° 07.9' W	11.6	33.7	0	0	0	0
28	04-Apr-95	15	S	17:25	40° 51.0' N 135° 00.7' W	4.4	1°	18:38	40° 55.6' N 135° 00.2' W	11.5	33.7	0	0	0	0
29	05-Apr-95	20	SW	08:00	42° 44.1' N 134° 46.3' W	NA	345°	09:00	42° 49.9' N 134° 47.5' W	10.1	33.5	3	0	0	3
30	05-Apr-95	20	SW	13:00	43° 16.3' N 134° 44.8' W	4.4	6°	14:05	43° 20.6' N 134° 44.1' W	10.2	33.5	7	0	0	7
31	05-Apr-95	20	SW	17:20	43° 45.1' N 134° 43.9' W	4.5	180°	18:35	43° 50.5' N 134° 44.2' W	10.1	33.5	0	0	0	0
32	06-Apr-95	25	S	08:15	42° 38.0' N 132° 58.5' W	4.5	133°	09:20	42° 38.4' N 132° 52.7' W	11.0	33.5	0	0	0	0
33	06-Apr-95	25	S	13:15	42° 17.7' N 132° 24.8' W	4.5	132°	14:25	42° 14.7' N 132° 19.7' W	11.2	33.5	0	0	0	0
34	06-Apr-95	30	SW	17:45	42° 38.2' N 132° 05.3' W	4.5	24°	19:15	42° 43.7' N 132° 01.5' W	10.4	33.4	0	0	0	0
35	07-Apr-95	35	W	08:20	44° 31.8' N 131° 52.7' W	4.5	NA	09:50	44° 37.6' N 131° 52.5' W	9.8	33.3	0	0	0	0
36	07-Apr-95	35	W	11:55	44° 47.7' N 131° 52.0' W	4.5	358°	12:58	44° 51.6' N 131° 51.2' W	10.0	33.3	0	0	0	0
37	07-Apr-95	35	W	17:30	45° 20.3' N 131° 55.9' W	4.5	355°	18:39	45° 24.8' N 131° 55.8' W	10.0	33.3	0	0	0	0
38	08-Apr-95	20	W	09:10	46° 41.2' N 130° 54.5' W	4.5	292°	10:26	46° 43.3' N 131° 01.6' W	8.9	33.2	10	15	0	25
39	08-Apr-95	20	W	14:15	47° 09.3' N 131° 06.3' W	4.5	352°	15:35	47° 15.3' N 131° 06.5' W	8.2	33.1	3	2	0	5
40	08-Apr-95	20	W	18:00	47° 31.0' N 131° 06.0' W	4.5	6°	19:16	47° 36.4' N 131° 04.3' W	8.1	33.1	13	133	0	146
41	09-Apr-95	5	W	07:45	48° 58.4' N 131° 11.2' W	4.4	4°	09:05	49° 02.5' N 131° 11.1' W	7.9	33.0	1	2	0	3
42	09-Apr-95	5	W	11:12	49° 02.9' N 130° 54.8' W	4.5	90°	12:15	49° 02.1' N 130° 46.0' W	8.2	33.0	0	0	0	0
43	09-Apr-95	10	W	14:55	49° 02.1' N 130° 21.8' W	4.5	95°	15:35	49° 02.9' N 130° 14.7' W	8.9	32.8	0	0	0	0
44	09-Apr-95	35	SE	18:00	49° 03.6' N 130° 00.2' W	4.5	82°	19:07	49° 05.2' N 129° 54.4' W	NA	NA	0	0	0	0
TOTALS												55	164	22	241

FISH #	TOW #	SPECIES	FL (mm)	BODY WT (g)	AGE	SEX	GONAD WT (g)	LIVER WT (g)	STOMACH CONTENT WT (g)	STOMACH CONTENTS, COMMENTS
HS0395-50	17	pink								
HS0395-51	18	pink	342	386.0	0.1	M	0.0	9.2	2.3	
HS0395-52	21	pink	381	621.0	0.1	M	0.0	13.7	2.6	unidentifiable gelatinous material
HS0395-53	29	pink	363	511.5	0.1	F	3.9	12.6	3.1	unidentifiable gelatinous material
HS0395-54	29	pink	382	645.0	0.1	F	2.7	14.9	0.0	
HS0395-55	29	pink	391	656.0	0.1	M	0.0	15.0	4.0	amphipod remains
HS0395-56	30	pink	331	309.0	0.1	F	3.1	6.1	2.8	amphipod remains
HS0395-57	30	pink	338	374.0	0.1	F	2.7	7.8	5.3	small squid, amphipod remains
HS0395-58	30	pink	334	254.5	0.1	F	3.3	5.9	4.9	remains of small squid
HS0395-59	30	pink	328	334.0	0.1	M	0.0	7.9	2.1	unidentifiable gelatinous material, small squid
HS0395-60	30	pink	315	325.5	0.1	F	2.2	7.2	3.0	unidentifiable gelatinous material
HS0395-61	30	pink	325	312.0	0.1	M	0.0	5.7	3.3	unidentifiable gelatinous material, squid remains
HS0395-62	30	pink	320	296.5	0.1	F	2.1	7.8	1.9	unidentifiable gelatinous material, pteropds
HS0395-63	38	pink	306	252.5	0.1	M	0.0	4.5	3.0	four pteropods
HS0395-64	38	pink	338	318.0	0.1	F	3.5	7.7	3.1	unidentifiable gelatinous material
HS0395-65	38	pink	323	275.0	0.1	M	0.0	6.9	3.4	unidentifiable gelatinous material
HS0395-66	38	pink	332	314.0	0.1	F	3.1	7.0	3.6	unidentifiable gelatinous material
HS0395-67	38	pink	338	318.0	0.1	M	0.0	6.9	0.0	
HS0395-68	38	pink	333	364.0	0.1	F	3.1	9.3	3.9	unidentifiable gelatinous material
HS0395-69	38	pink	308	280.0	0.1	F	2.2	5.6	0.3	unidentifiable gelatinous material
HS0395-70	38	chum	305	245.0	0.1	M	0.0	4.0	0.7	unidentifiable gelatinous material
HS0395-71	38	pink	339	308.0	0.1	F	3.4	5.4	1.7	unidentifiable gelatinous material
HS0395-72	38	chum	301	262.5	0.1	F	0.4	5.3	4.9	unidentifiable gelatinous material
HS0395-73	38	chum	279	207.5	0.1	M	0.0	5.5	1.9	unidentifiable gelatinous material
HS0395-74	38	chum	290	244.5	0.1	F	0.4	4.9	2.9	unidentifiable gelatinous material
HS0395-75	38	chum	267	183.5	0.1	F	0.4	3.1	1.5	unidentifiable gelatinous material
HS0395-76	38	chum	296	247.5	0.1	F	0.4	5.2	1.9	unidentifiable gelatinous material
HS0395-77	38	pink	296	235.5	0.1	F	1.6	5.5	4.5	unidentifiable gelatinous material
HS0395-78	38	chum	282	198.0	0.1	F	0.3	3.1	1.9	unidentifiable gelatinous material
HS0395-79	38	pink	326	303.0	0.1	M	0.0	5.9	2.2	unidentifiable gelatinous material
HS0395-80	38	chum	298	259.5	0.1	M	0.0	4.7	2.1	unidentifiable gelatinous material
HS0395-81	38	chum	500	1189.0	0.3	M	0.5	20.0	7.8	unidentifiable gelatinous material
HS0395-82	38	chum	455	930.5	0.2	M	0.0	14.6	14.6	unidentifiable gelatinous material
HS0395-83	38	chum	318	333.0	0.1	M	0.0	5.5	1.6	unidentifiable gelatinous material
HS0395-84	38	chum	285	219.0	0.1	M	0.0	5.9	2.8	unidentifiable gelatinous material
HS0395-85	38	chum	322	327.0	0.1	F	1.0	6.0	4.1	unidentifiable gelatinous material
HS0395-86	38	chum	272	179.5	0.1	F	0.2	3.9	1.6	unidentifiable gelatinous material
HS0395-87	38	chum	284	228.0	0.1	M	0.0	4.9	3.0	unidentifiable gelatinous material
HS0395-88	39	pink								fish lost overboard, went out through scupper
HS0395-89	39	pink	312	297.5	0.1	F	2.1	6.2	5.2	pteropds
HS0395-90	39	pink	312	312.0	0.1	F	2.5	7.6	2.4	pteropds
HS0395-91	39	chum	442	891.5		M	0.0	11.5	8.3	unidentifiable gelatinous material
HS0395-92	39	chum	438	809.0		M	0.0	11.8	5.6	unidentifiable gelatinous material
HS0395-93	40	pink	301	277.5	0.1	F	2.2	6.9	4.8	approximately 50 pteropods
HS0395-94	40	pink	314	290.5	0.1	F	2.5	6.1	7.6	unidentifiable gelatinous material
HS0395-95	40	pink	328	314.5	0.1	M	0.0	6.7	7.1	unidentifiable gelatinous material, approximately 25 pteropods
HS0395-96	40	pink	330	380.5	0.1	M	0.0	8.1	10.1	unidentifiable gelatinous material, approximately 50 pteropods
HS0395-97	40	pink	299	262.0	0.1	F	2.1	5.7	4.0	unidentifiable gelatinous material, approximately 25 pteropods
HS0395-98	40	pink	317	328.5	0.1	F	2.9	6.9	3.8	unidentifiable gelatinous material, amphipod remains

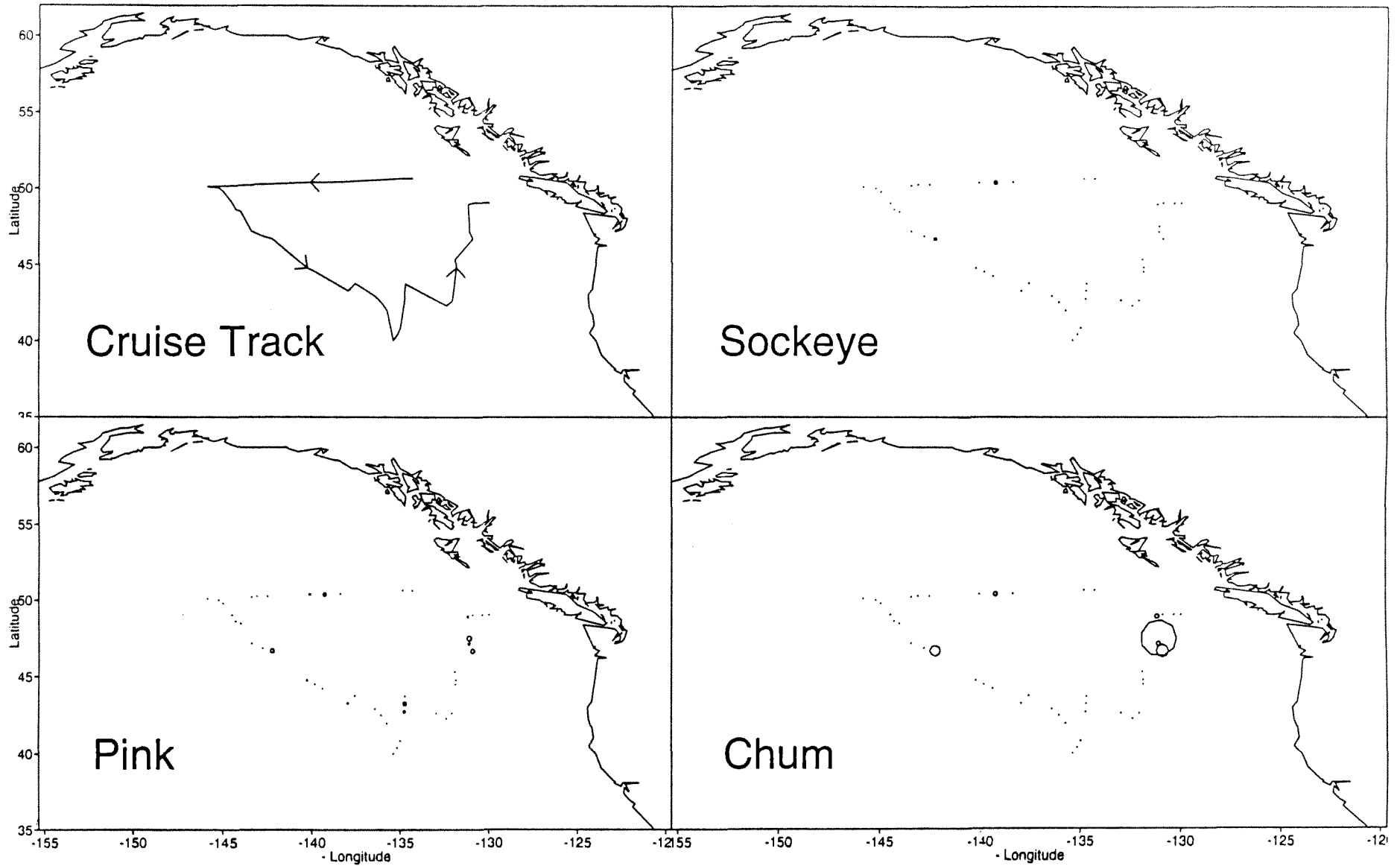
FISH #	TOW #	SPECIES	FL (mm)	BODY WT (g)	AGE	SEX	GONAD WT (g)	LIVER WT (g)	STOMACH CONTENT WT (g)	STOMACH CONTENTS, COMMENTS
HS0395-99	40	pink	313	296.5	0.1	M	0.0	7.0	8.3	unidentifiable gelatinous material, several pteropods
HS0395-100	40	pink	287	235.0	0.1	M	0.0	4.5	3.3	unidentifiable gelatinous material, amphipod remains
HS0395-101	40	pink	337	346.0	0.1	M	0.3	6.9	9.0	pteropods
HS0395-102	40	pink	308	291.0	0.1	M	0.0	6.2	5.4	unidentifiable gelatinous material, approx. 10 pteropods, amphipod remains
HS0395-103	40	pink	322	307.5	0.1	M	0.0	6.5	5.9	unidentifiable gelatinous material, amphipod remains
HS0395-104	40	pink	304	284.5	0.1	M	0.0	7.0	6.6	unidentifiable gelatinous material, amphipod remains, 4 pteropods
HS0395-105	40	pink	322	312.5	0.1	M	0.0	6.2	2.3	unidentifiable gelatinous material, 4 pteropods
HS0395-106	40	chum	288	257.0	0.1	F	0.3	4.7	3.8	unidentifiable gelatinous material
HS0395-107	40	chum	284	256.5	0.1	F	0.4	5.0	11.0	unidentifiable gelatinous material, 4 pteropods
HS0395-108	40	chum	270	204.5	0.1	M	0.0	3.5	4.2	unidentifiable gelatinous material
HS0395-109	40	chum	286	240.5	0.1	F	0.4	4.2	7.7	unidentifiable gelatinous material
HS0395-110	40	chum	302	234.5	0.1	F	0.2	3.4	1.2	unidentifiable gelatinous material
HS0395-111	40	chum	314	310.5	0.1	F	0.7	3.9	2.0	unidentifiable gelatinous material
HS0395-112	40	chum	326	335.0	0.1	F	1.1	1.6	NA	unidentifiable gelatinous material, stomach 50% full
HS0395-113	40	chum	301	274.0	0.1	F	0.0	3.4	NA	unidentifiable gelatinous material, stomach 75% full
HS0395-114	40	chum	298	254.5	0.1	M	0.0	2.7	NA	unidentifiable gelatinous material, stomach 75% full
HS0395-115	40	chum	300	264.5	0.1	F	0.0	4.2	NA	unidentifiable gelatinous material, stomach full
HS0395-116	40	chum	302	266.5	0.1	F	0.4	3.5	NA	unidentifiable gelatinous material, stomach full
HS0395-117	40	chum	300	262.0	0.1	F	0.4	4.1	1.0	unidentifiable gelatinous material
HS0395-118	40	chum	285	216.0	0.1	M	0.0	3.4	NA	unidentifiable gelatinous material, stomach full
HS0395-119	40	chum	269	189.0	0.1	M	0.0	2.1	NA	unidentifiable gelatinous material, stomach full
HS0395-120	40	chum	289	264.0	0.1					
HS0395-121	40	chum	294	263.5	0.1					
HS0395-122	40	chum	284	279.5	0.1					
HS0395-123	40	chum	304	305.5	0.1					
HS0395-124	40	chum	300	297.0	0.1					
HS0395-125	40	chum	290	277.0	0.1					
HS0395-126	40	chum	281	249.5	0.1					
HS0395-127	40	chum	273	252.5	0.1					
HS0395-128	40	chum	311	331.5	0.1					
HS0395-129	40	chum	309	319.5	0.1					
HS0395-130	40	chum	290	251.5	0.1					
HS0395-131	40	chum	287	258.0	0.1					
HS0395-132	40	chum	315	366.5	0.1					
HS0395-133	40	chum	277	225.0	0.1					
HS0395-134	40	chum	284	258.0	0.1					
HS0395-135	40	chum	287	253.0	0.1					
HS0395-136	40	chum	315	324.0	0.1					
HS0395-137	40	chum	266	216.0	0.1					
HS0395-138	40	chum	314	324.0	0.1					
HS0395-139	40	chum	282	243.0	0.1					
HS0395-140	40	chum	269	213.0	0.1					
HS0395-141	40	chum	280	231.0	0.1					
HS0395-142	40	chum	310	335.5	0.1	M	0.0	6.0	6.2	unidentifiable gelatinous material
HS0395-143	40	chum	297	287.0	0.1	M	0.0	4.3	4.4	unidentifiable gelatinous material
HS0395-144	40	chum	298	279.5	0.1	M	0.0	5.2	6.8	unidentifiable gelatinous material
HS0395-145	40	chum	281	240.0	0.1	M	0.0	3.8	5.0	unidentifiable gelatinous material
HS0395-146	40	chum	318	346.0	0.1	M	0.0	5.4	4.5	unidentifiable gelatinous material
HS0395-147	40	chum	271	321.0	0.1	M	0.0	4.0	7.5	unidentifiable gelatinous material

FISH #	TOW #	SPECIES	FL (mm)	BODY WT (g)	AGE	SEX	GONAD WT (g)	LIVER WT (g)	STOMACH CONTENT WT (g)	STOMACH CONTENTS, COMMENTS
HS0395-148	40	chum	298	310.0	0.1	M	0.0	5.3	5.6	unidentifiable gelatinous material
HS0395-149	40	chum	287	262.5	0.1	M	0.0	4.4	3.8	unidentifiable gelatinous material
HS0395-150	40	chum	286	266.0	0.1	M	0.0	4.5	6.4	unidentifiable gelatinous material
HS0395-151	40	chum	294	279.0	0.1	F	0.3	4.6	3.4	unidentifiable gelatinous material
HS0395-152	40	chum	285	271.0	0.1	M	0.0	5.5	5.4	unidentifiable gelatinous material
HS0395-153	40	chum	284	258.5	0.1	F	0.5	4.9	4.9	unidentifiable gelatinous material
HS0395-154	40	chum	287	262.5	0.1	M	0.0	3.7	5.0	unidentifiable gelatinous material
HS0395-155	40	chum	293	267.5	0.1	M	0.0	4.3	5.9	unidentifiable gelatinous material
HS0395-156	40	chum	278	263.0	0.1	F	0.1	5.2	5.0	unidentifiable gelatinous material
HS0395-157	40	chum	268	216.0	0.1	F	0.3	4.0	6.5	unidentifiable gelatinous material
HS0395-158	40	chum	306	291.5	0.1	F	0.5	5.1	3.1	unidentifiable gelatinous material
HS0395-159	40	chum	280	242.0	0.1	M	0.0	5.1	5.5	unidentifiable gelatinous material
HS0395-160	40	chum	279	224.5	0.1	F	0.3	3.7	3.7	unidentifiable gelatinous material
HS0395-161	40	chum	294	254.5	0.1	M	0.0	3.8	5.1	unidentifiable gelatinous material
HS0395-162	40	chum	322	281.5	0.1	M	0.0	7.2	7.4	unidentifiable gelatinous material
HS0395-163	40	chum	308	324.5	0.1	F	0.5	5.1	7.2	unidentifiable gelatinous material
HS0395-164	40	chum	280	224.5	0.1	M	0.0	3.6	4.2	unidentifiable gelatinous material
HS0395-165	40	chum	285	251.0	0.1	F	0.3	4.2	5.1	unidentifiable gelatinous material
HS0395-166	40	chum	280	244.5	0.1	F	0.2	5.2	3.4	unidentifiable gelatinous material
HS0395-167	40	chum	288	287.5	0.1	M	0.0	4.8	6.4	unidentifiable gelatinous material
HS0395-168	40	chum	280	239.5	0.1	F	0.3	4.6	5.6	unidentifiable gelatinous material
HS0395-169	40	chum	267	203.5	0.1	F	0.3	3.7	4.2	unidentifiable gelatinous material
HS0395-170	40	chum	287	244.5	0.1	F	0.4	4.6	5.0	unidentifiable gelatinous material
HS0395-171	40	chum	284	257.5	0.1	M	0.0	4.6	2.8	unidentifiable gelatinous material
HS0395-172	40	chum	272	217.0	0.1	M	0.0	4.8	5.2	unidentifiable gelatinous material
HS0395-173	40	chum	278	229.0	0.1	F	0.2	3.7	6.7	unidentifiable gelatinous material
HS0395-174	40	chum	312	321.0	0.1	F	0.5	5.1	3.8	unidentifiable gelatinous material
HS0395-175	40	chum	287	230.5	0.1	M	0.0	5.3	3.8	unidentifiable gelatinous material
HS0395-176	40	chum	277	229.5	0.1	F	0.2	3.8	8.0	unidentifiable gelatinous material
HS0395-177	40	chum	281	237.0	0.1	F	0.4	3.5	4.7	unidentifiable gelatinous material
HS0395-178	40	chum	300	343.0	0.1	F	0.8	6.6	6.6	unidentifiable gelatinous material
HS0395-179	40	chum	298	312.0	0.1	M	0.0	5.6	5.8	unidentifiable gelatinous material
HS0395-180	40	chum	302	321.5	0.1	M	0.0	4.9	5.7	unidentifiable gelatinous material
HS0395-181	40	chum	368	530.0	0.2	F	2.9	6.8	10.0	unidentifiable gelatinous material, fish scales
HS0395-182	40	chum	284	243.0	0.1	F	0.4	3.9	4.6	unidentifiable gelatinous material
HS0395-183	40	chum	302	268.5	0.1	M	0.0	3.8	4.5	unidentifiable gelatinous material
HS0395-184	40	chum	295	309.0	0.1	F	0.7	4.4	7.0	unidentifiable gelatinous material
HS0395-185	40	chum	276	229.0	0.1	M	0.0	2.8	6.0	unidentifiable gelatinous material
HS0395-186	40	chum	294	265.0	0.1	F	0.2	4.6	5.0	unidentifiable gelatinous material
HS0395-187	40	chum	280	243.0	0.1	F	0.2	3.1	4.8	unidentifiable gelatinous material
HS0395-188	40	chum	280	237.5	0.1	F	0.2	3.5	9.2	unidentifiable gelatinous material
HS0395-189	40	chum	310	335.0	0.1	M	0.0	3.7	6.4	unidentifiable gelatinous material
HS0395-190	40	chum	301	285.5	0.1	M	0.0	3.9	4.5	unidentifiable gelatinous material
HS0395-191	40	chum	271	213.0	0.1	M	0.0	2.8	5.5	unidentifiable gelatinous material
HS0395-192	40	chum	288	252.5	0.1	M	0.0	3.4	8.6	unidentifiable gelatinous material
HS0395-193	40	chum	294	229.5	0.1	F	0.0	3.1	3.9	unidentifiable gelatinous material
HS0395-194	40	chum	284	263.5	0.1	F	0.4	4.2	8.2	unidentifiable gelatinous material
HS0395-195	40	chum	290	226.0	0.1	M	0.0	3.2	5.8	unidentifiable gelatinous material
HS0395-196	40	chum	325	373.0	0.1	F	0.3	4.8	5.8	unidentifiable gelatinous material

FISH #	TOW #	SPECIES	FL (mm)	BODY WT (g)	AGE	SEX	GONAD WT (g)	LIVER WT (g)	STOMACH CONTENT WT (g)	STOMACH CONTENTS, COMMENTS
HS0395-197	40	chum	285	254.0	0.1	M	0.0	4.2	7.0	unidentifiable gelatinous material
HS0395-198	40	chum	303	310.0	0.1	F	0.5	4.7	9.2	unidentifiable gelatinous material
HS0395-199	40	chum	285	245.5	0.1	M	0.0	4.2	5.0	unidentifiable gelatinous material
HS0395-200	40	chum	269	217.0	0.1	F	0.0	2.9	4.3	unidentifiable gelatinous material
HS0395-201	40	chum	295	301.5	0.1	M	0.0	5.0	8.5	unidentifiable gelatinous material
HS0395-202	40	chum	280	252.0	0.1	F	0.2	3.6	10.7	unidentifiable gelatinous material
HS0395-203	40	chum	271	213.0	0.1	M	0.0	3.3	3.9	unidentifiable gelatinous material
HS0395-204	40	chum	260	193.0	0.1	F	0.0	2.8	3.9	unidentifiable gelatinous material
HS0395-205	40	chum	281	237.5	0.1	F	0.1	3.3	4.2	unidentifiable gelatinous material
HS0395-206	40	chum	262	207.5	0.1	F	0.1	3.0	6.4	unidentifiable gelatinous material
HS0395-207	40	chum	288	245.5	0.1	M	0.0	3.9	6.3	unidentifiable gelatinous material
HS0395-208	40	chum	293	231.0	0.1	M	0.0	4.0	2.6	unidentifiable gelatinous material
HS0395-209	40	chum	278	224.0	0.1	M	0.0	3.0	3.9	unidentifiable gelatinous material
HS0395-210	40	chum	301	322.0	0.1	M	0.0	4.8	4.5	unidentifiable gelatinous material
HS0395-211	40	chum	283	236.0	0.1	M	0.0	3.4	6.3	unidentifiable gelatinous material
HS0395-212	40	chum	277	252.5	0.1	M	0.0	3.7	6.5	unidentifiable gelatinous material
HS0395-213	40	chum	255	181.0	0.1	M	0.0	2.8	7.1	unidentifiable gelatinous material
HS0395-214	40	chum	279	235.5	0.1	F	0.8	3.2	7.3	unidentifiable gelatinous material
HS0395-215	40	chum	296	276.5	0.1	M	0.0	4.8	4.4	unidentifiable gelatinous material
HS0395-216	40	chum	265	196.0	0.1	F	0.2	2.5	5.4	unidentifiable gelatinous material
HS0395-217	40	chum	283	245.5	0.1	M	0.0	3.0	5.2	unidentifiable gelatinous material
HS0395-218	40	chum	283	217.5	0.1	F	0.1	2.6	4.7	unidentifiable gelatinous material
HS0395-219	40	chum	271	216.5	0.1	M	0.0	2.6	3.3	unidentifiable gelatinous material
HS0395-220	40	chum	296	282.0	0.1	F	0.2	3.4	4.9	unidentifiable gelatinous material
HS0395-221	40	chum	307	303.0	0.1	M	0.0	4.6	4.6	unidentifiable gelatinous material
HS0395-222	40	chum	288	259.0	0.1	F	0.2	3.7	7.1	unidentifiable gelatinous material
HS0395-223	40	chum	302	306.5	0.1	M	0.0	4.4	6.1	unidentifiable gelatinous material
HS0395-224	40	chum	294	279.0	0.1	M	0.0	3.9	6.0	unidentifiable gelatinous material
HS0395-225	40	chum	275	236.5	0.1	M	0.0	3.4	4.5	unidentifiable gelatinous material
HS0395-226	40	chum	266	208.0	0.1	F	0.2	3.7	7.2	unidentifiable gelatinous material
HS0395-227	40	chum	277	236.5	0.1	F	0.3	3.5	5.7	unidentifiable gelatinous material
HS0395-228	40	chum	288	265.0	0.1	M	0.0	3.5	10.2	unidentifiable gelatinous material
HS0395-229	40	chum	296	265.0	0.1	F	0.3	4.3	4.6	unidentifiable gelatinous material
HS0395-230	40	chum	278	234.5	0.1	F	0.3	3.2	5.0	unidentifiable gelatinous material
HS0395-231	40	chum	283	270.5	0.1	M	0.0	4.0	6.1	unidentifiable gelatinous material
HS0395-232	40	chum	295	272.0	0.1	M	0.0	3.5	4.3	unidentifiable gelatinous material
HS0395-233	40	chum	292	274.0	0.1	M	0.0	4.3	5.9	unidentifiable gelatinous material
HS0395-234	40	chum	314	301.5	0.1	M	0.0	3.1	4.2	unidentifiable gelatinous material
HS0395-235	40	chum	273	230.0	0.1	F	0.2	3.0	3.7	unidentifiable gelatinous material
HS0395-236	40	chum	300	289.5	0.1	F	0.4	4.0	6.1	unidentifiable gelatinous material
HS0395-237	40	chum	258	187.0	0.1	M	0.0	2.7	2.6	unidentifiable gelatinous material
HS0395-238	41	pink	334	236.0	0.1	F	3.0	6.2	1.6	unidentifiable gelatinous material
HS0395-239	41	chum	325	330.0	0.1	M	0.0	4.7	4.6	unidentifiable gelatinous material
HS0395-240	41	chum	325	331.0	0.1	M	0.0	3.5	2.2	unidentifiable gelatinous material
HS0395-241	40	chum	278	224.5	0.1	F	0.4	3.1	3.7	unidentifiable gelatinous material

CTD cast #	Latitude	Longitude	Max. Depth	Surface T	Surface S
2	-134.84	50.658	337	6.6496	32.4712
3	-138.37	50.41	342	6.6835	32.5534
4	-139.205	50.393	369	6.6287	32.534
5	-140.039	50.388	336	6.4887	32.5752
6	-141.08	50.388	171	5.84	32.6808
7	-142.465	50.267	309	6.186	32.7099
8	-143.02	50.303	327	5.7472	32.7224
9	-143.581	50.159	334	5.773	32.7402
10	-144.228	50.119	344	5.9675	32.7535
11	-145.828	50.148	367	5.4476	32.7322
12	-144.977	50.003	320	5.6666	32.7427
13	-144.998	49.723	292	5.7329	32.7496
14	-144.5	49.137	137	6.2805	32.7701
15	-144.325	48.682	346	6.481	32.7698
16	-143.902	48.448	317	6.6084	32.7777
17	-143.85	48.064	218	6.4542	32.7278
18	-143.489	47.23	313	7.3085	32.8146
19	-142.815	46.876	297	7.5907	32.8334
20	-142.255	46.729	229	7.4259	32.7266
21	-141.029	45.24	314	8.2057	32.831
22	-140.162	44.736	197	8.9154	32.8865
23	-139.706	44.457	271	9.3635	32.9475
24	-139.265	44.199	324	9.389	32.9328
25	-138.928	43.977	295	9.1478	32.8988
26	-137.846	43.308	106	9.8006	32.8278
27	-136.376	42.833	313	10.4368	32.9227
28	-136.018	42.439	311	10.5358	32.8837
29	-135.689	41.89	356	10.4549	32.8475
30	-135.631	41.441	371	10.6835	32.8173
31	-135.375	39.965	207	12.8378	33.2741
32	-135.116	40.493	331	11.604	33.0184
33	-134.995	40.94	360	11.4923	33.0187
34	-134.79	42.838	310	10.1475	32.8334
35	-134.723	43.354	320	10.2006	32.8545
36	-134.718	43.858	272	10.135	32.8557
37	-134.236	43.52	281	9.8324	32.8196
38	-132.873	42.611	228	10.9859	32.8616
39	-132.307	42.244	317	11.1838	32.8639
40	-132.008	42.743	220	10.4048	32.8012
41	-131.866	43.079	245	10.3274	32.8144
42	-131.859	44.633	134	9.7899	32.7023
43	-131.838	44.87	309	9.9912	32.7088
44	-131.919	45.415	308	9.3903	32.707
45	-131.758	45.722	294	9.1466	32.728
46	-131.037	46.723	352	8.9583	32.6437
47	-131.098	47.268	320	8.2209	32.5633
48	-131.045	47.609	304	8.221	32.5839
49	-131.056	47.872	308	7.7615	32.4966
50	-131.173	49.049	352	7.8799	32.4882
51	-130.751	49.041	325	8.2166	32.514
52	-130.227	49.063	257	8.868	32.4026
53	-129.897	49.1	95	8.8548	32.3817

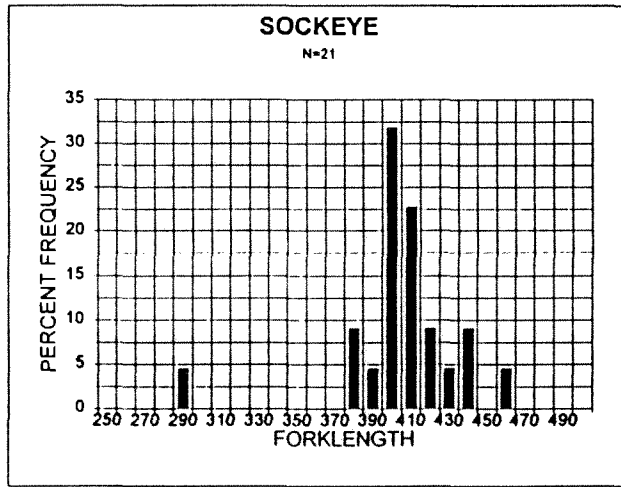
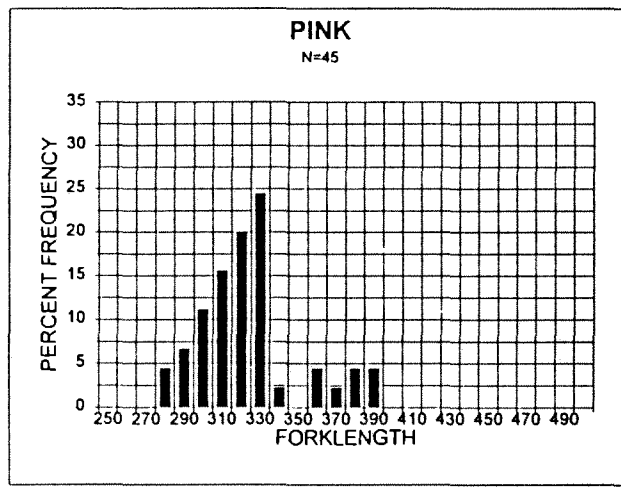
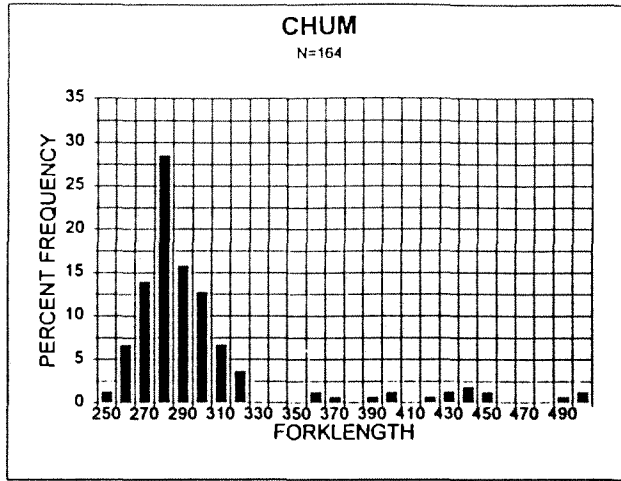
F/V Anita J, 23 March - 11 April, 1995



. species not caught in set

o species caught in set

rs²



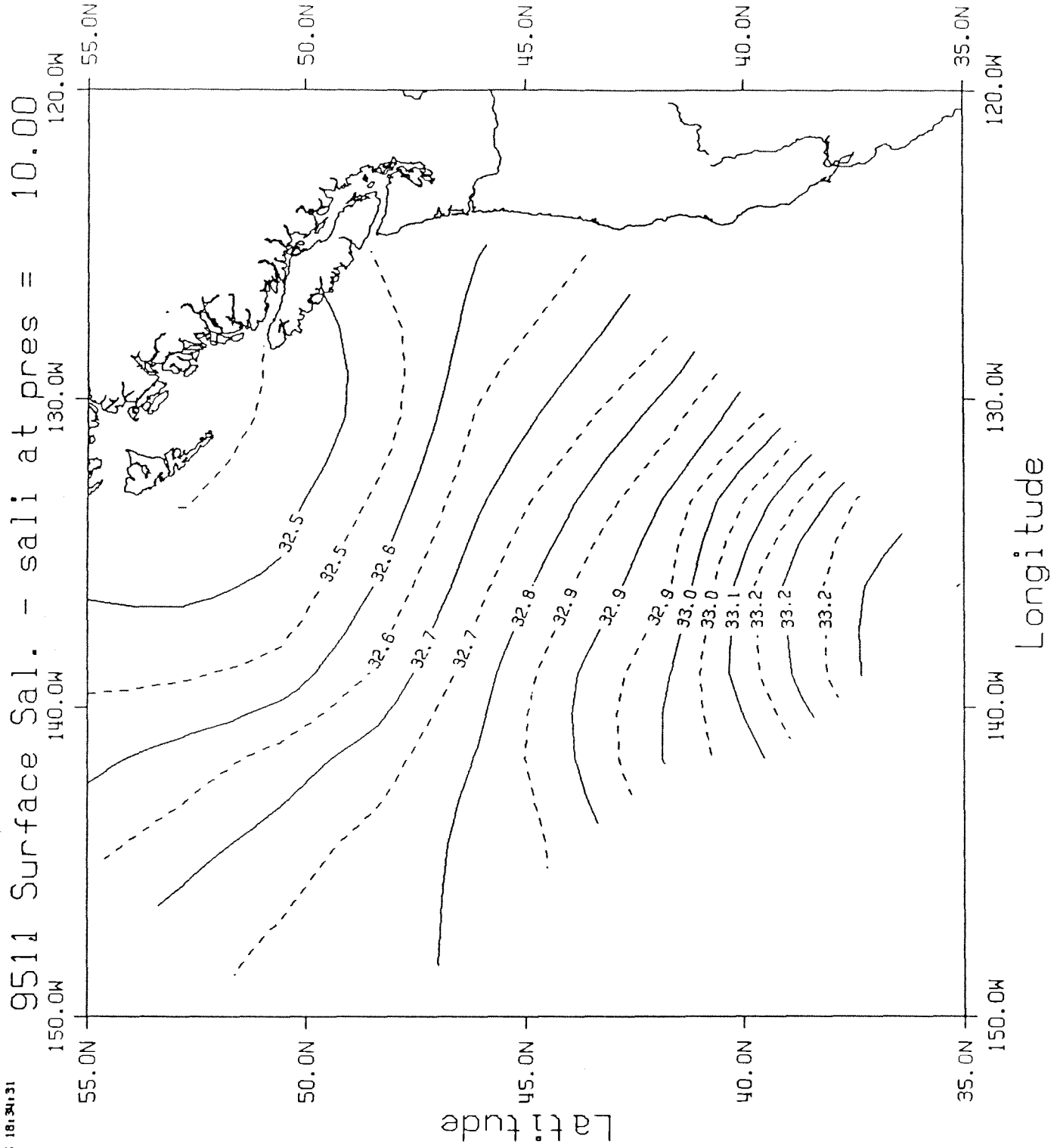


Fig 4

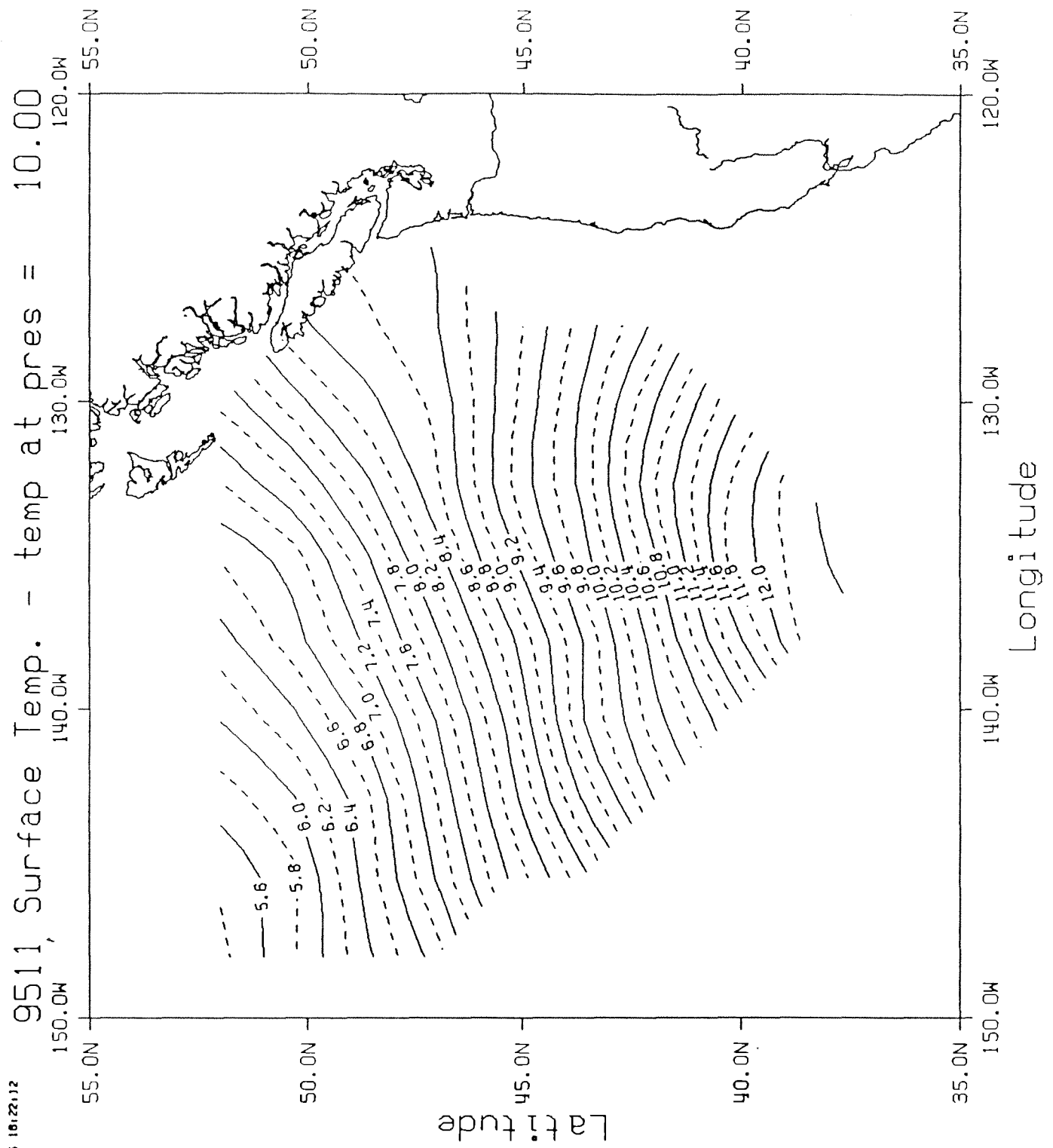
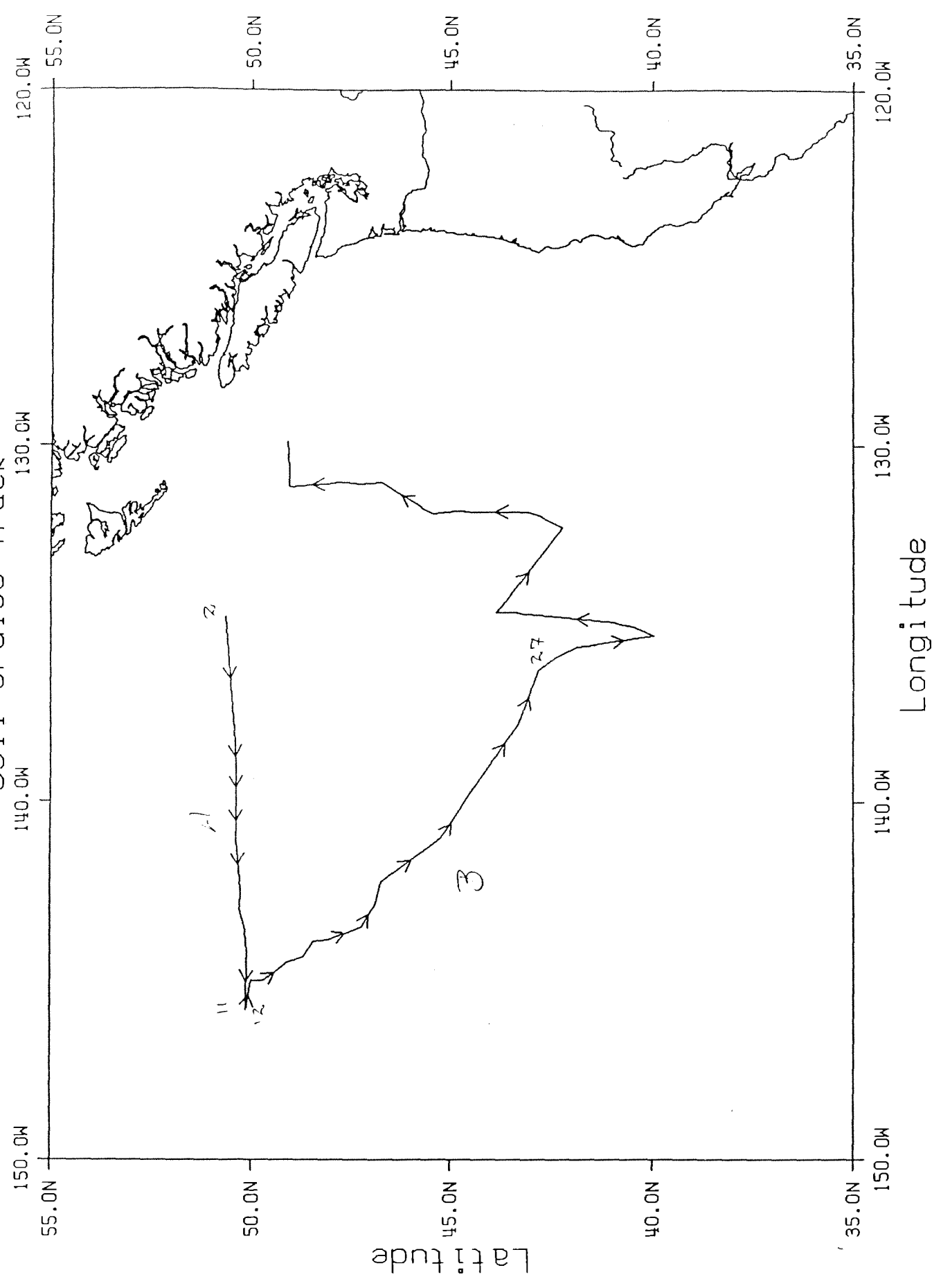


Figure 5

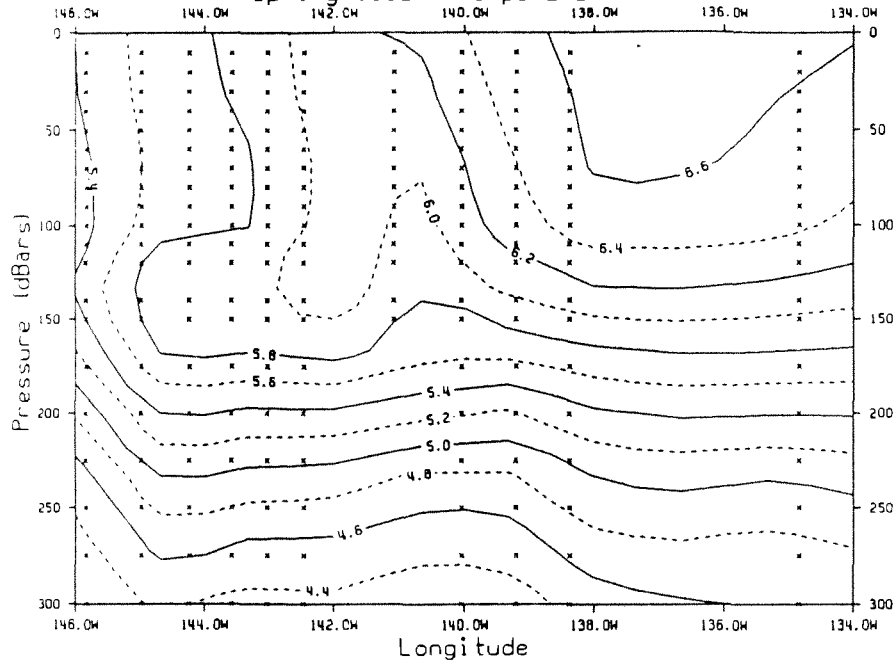
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9511 Cruise Track



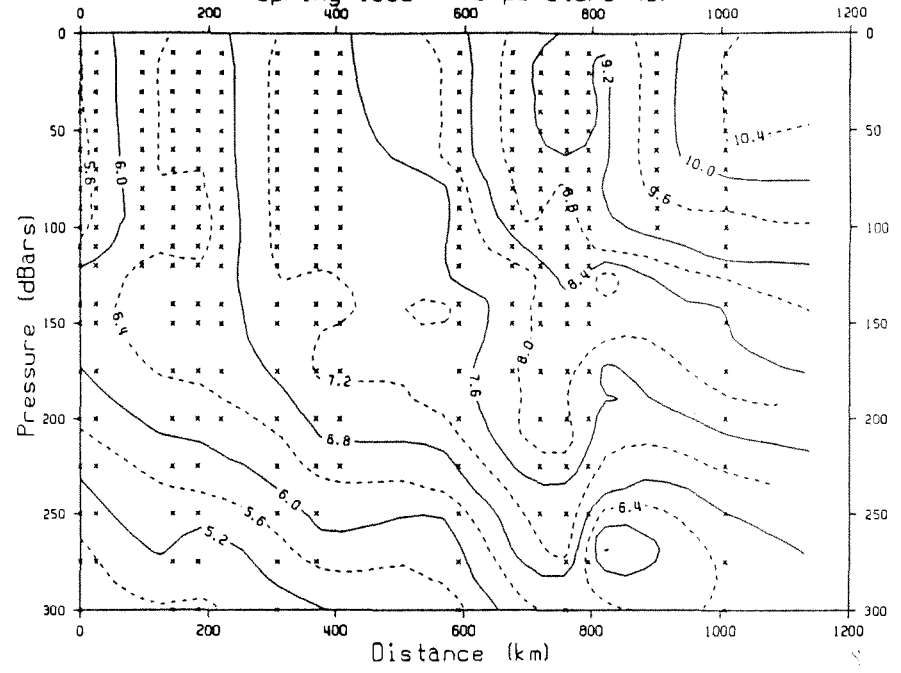
A

Spring 1995 - Temperature (C)

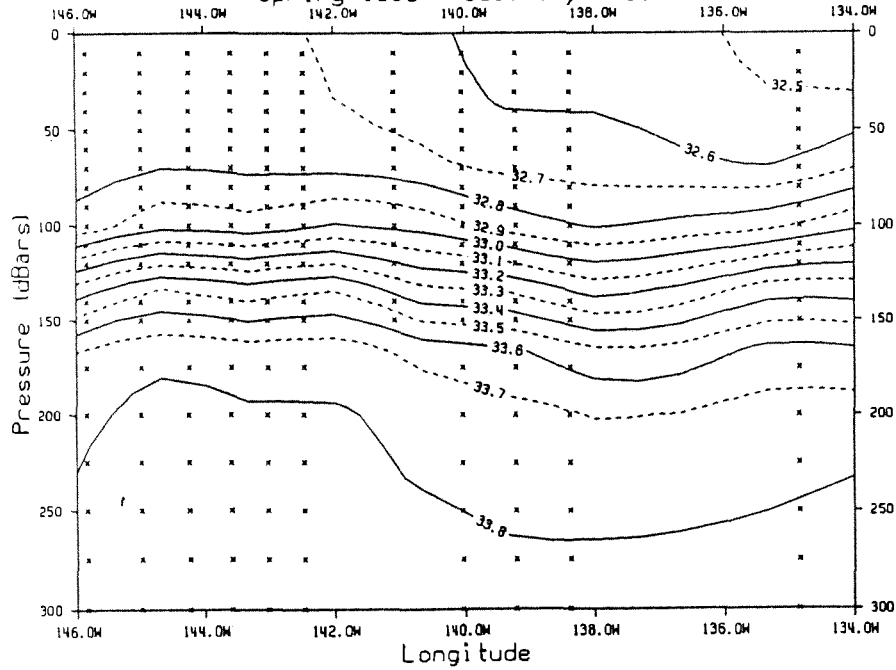


B

Spring 1995 - Temperature (C)



Spring 1995 - Salinity (PSU)



Spring 1995 - Salinity (PSU)

