FRI-UW-8307
May 1983

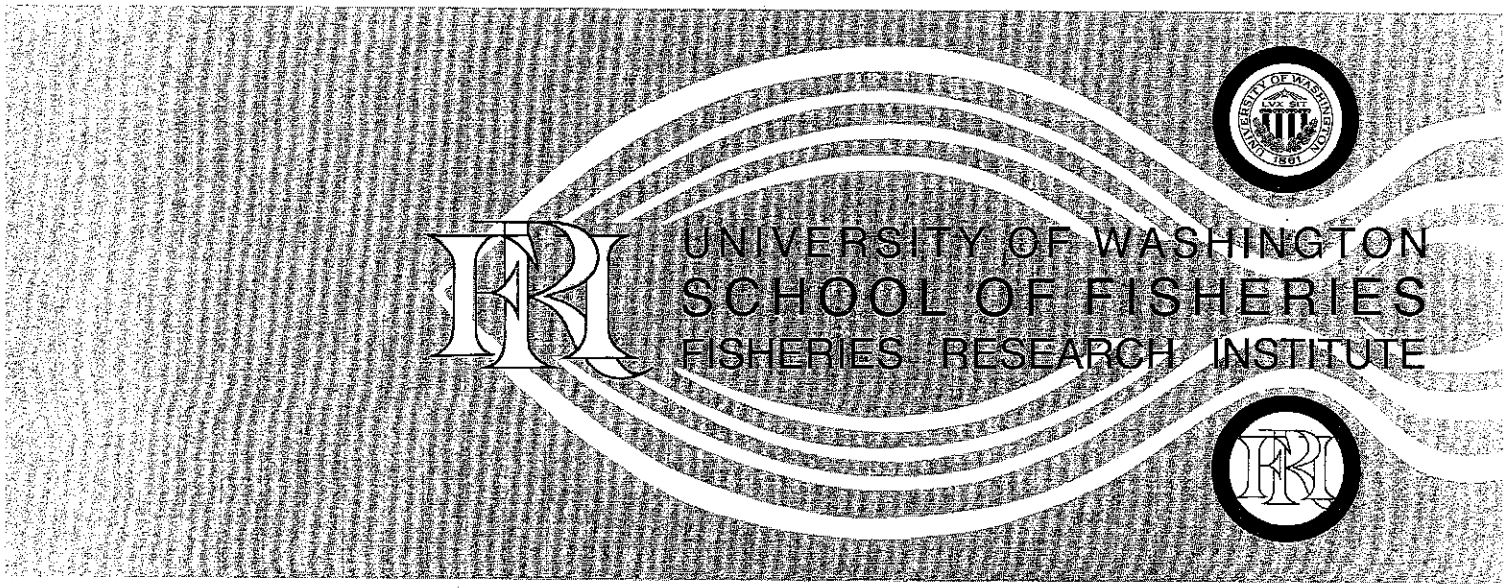
15a

OBSERVATIONS ABOARD A JAPANESE SQUID DRIFTNET FISHING VESSEL IN SEPTEMBER-OCTOBER 1982

by

Frank Cary and Robert L. Burgner

Final Report
to
Pacific Seafood Processors Association



FRI-UW-8307
May 1983

FISHERIES RESEARCH INSTITUTE
School of Fisheries
University of Washington
Seattle, Washington 98195

OBSERVATIONS ABOARD A JAPANESE SQUID DRIFTNET FISHING VESSEL IN SEPTEMBER-OCTOBER 1982

by

Frank Cary and Robert L. Burgner

Final Report to Pacific Seafood Processors Assn.

Approved

Submitted: May 1983

Director

TABLE OF CONTENTS

	Page
LIST OF TABLES	iii
LIST OF FIGURES	iii
INTRODUCTION	1
PROCEDURES	1
TRIP REPORT BY FRANK CARY	2
Arrangements in Japan	2
Observations Conducted Aboard No. 1 HOKUSEN MARU	3
Objectives	3
Description of Vessel and Gear	3
Vessel Specifications	3
Crew	4
Fishing and Net Retrieval Gear	4
Net	4
Buoys	5
Hydraulic Heads	5
Pipe and Aft Areas	5
Other Equipment	8
Method of Catching and Freezing Squid	9
Laying Out of Net	9
Standing By	9
Recovery of Net	9
Packing and Freezing	10
Fishing Locations	10
Catches Observed	12
Sea Temperatures and Weather	12
Photographs	12
Other Comments and Observations	12
Conclusions	17
ACKNOWLEDGMENTS	18
APPENDIX I - Outline of Duties and General Methodology	19

LIST OF TABLES

Number		Page
1.	Squid, albacore, and yellowtail	13
2.	Incidental catches observed (number of individuals), excluding pomfret	13
3.	Surface temperatures during fishing	14
4.	Daily weather	16

LIST OF FIGURES

Number		Page
1.	Corkline hanging	6
2.	Buoy rigging	6
3.	Hydraulic heads	7
4.	Locations fished by No. 1 HOKUSEN MARU in Japanese squid drift gillnet fishery area (shaded) during observer coverage	11

OBSERVATIONS ABOARD A JAPANESE SQUID DRIFTNET FISHING VESSEL IN SEPTEMBER-OCTOBER 1982

INTRODUCTION

In 1978 a Japanese drift gillnet fishery for flying squid (akaika, Ommastrephes bartrami) was initiated in Pacific waters off northern Japan. Beginning in 1979, this fishery was restricted by the Japanese government to North Pacific waters east of 170° E, and in August 1981, licensing and further time-area restrictions were imposed on the new fishery. Boundaries established were longitudes 170° E on the west and 145° W on the east, latitude 20° N to the south, and latitudes 40-46° N to the north, the latter depending on month of the year. The fishery is closed during the months January-May. In 1981, over 500 vessels were approved to operate, utilizing drift gillnets of 115-120 mm mesh, and fishing 27-31.5 km of net per set.

Japan's drift gillnet fishery for squid as now regulated is reportedly fishing in areas where salmon are avoided by seasonally changing the northern limits of operation, which were devised considering such factors as preferred habitat water temperatures for flying squid (15-22° C) and salmon (1-15° C) and their migration patterns. Catching of salmon and trout is prohibited by the new regulations. However, in recent years salmon troll fishermen and buyers in southeastern Alaska have reported an increase in occurrence of apparent net-marked salmon in the coho and chinook salmon catches of the offshore troll fleet. They expressed concern that the drift gillnets of the new Japanese squid fishery may be a source of the scarred fish and consequently may be intercepting large numbers of North American salmon.

There was indeed a need for more information on the new squid fishery and the adequacy of the regulations in protecting salmon of North American origin. The 1981 effort data furnished by Japan by 2° latitude x 5° longitude indicated that the squid fleet spent most effort near the monthly northern boundary of the fishery, and 1981 sea surface temperature data indicated that the vessels could often have fished in waters below 15° C within the designated areas.

Because of the concern of the U.S. salmon industry, it was proposed to a representative of Japan Fishery Association that the U.S. industry finance an observer aboard a Japanese squid driftnet vessel in order to gain a better understanding of the squid fishery and to observe incidental catches made.

PROCEDURES

Arrangements were made by Mr. Jim H. Branson, Executive Director, North Pacific Fishery Management Council, through Japan Fisheries Association and the National Common Squid Drift Fishery Association of Japan, to place an industry observer aboard the NO. 1 HOKUSEN MARU,

Hokusen Gyogyo Co., in mid-September 1982. The Fisheries Research Institute, University of Washington, was contracted by the Pacific Seafood Processors Association to train and provide the observer, who was to have a speaking and reading knowledge of the Japanese language. He would embark from Japan aboard the vessel and would return to Japan via the same vessel or another fishing vessel making contact with the observer's vessel at sea. About one month would be spent aboard the vessel during fishing operations. The vessel would be expected to operate in a normal manner with the fleet near the northern border of the monthly fishing area, and preferably toward the northeastern border.

The observer would be provided specific instructions and training as to his duties and these instructions would be shared with the vessel captain. (See Appendix 1, Outline of Duties and General Methodology). The types of observations to be made and the permitted activities aboard the fishing vessel would be agreed on in advance. The observer would be expected to record the daily activities of vessel location, type and amount of gear fished, length of time fished, weather conditions, sea surface temperature, gear losses if any, and catch including incidental catch of each salmonid species by number and size. For this purpose the vessel would be permitted to take salmonids aboard for examination and scale sampling before discarding. Photographing of operations and catches would be permitted.

The observer was to prepare a trip report outline which he would discuss with the vessel captain. A draft trip report would be submitted to the Director, Fisheries Research Institute, for review, and copies of a draft final report would be supplied to the contractor and the President of the National Common Squid Drift Fishery Association for suggestions or comments prior to public release. Dissenting opinions, if any, would be included, if requested, at the end of the report when finalized. Copies of the final report would be provided to interested parties.

Immediately after agreement was reached on the above, Mr. Frank B. Cary was hired by Fisheries Research Institute as the observer, given instructions on observations to be taken, methodology, and fish identification, and provided with camera and necessary gear. Observations were conducted aboard the No. 1 HOKUSEN MARU from boarding on September 10 until October 9, when Mr. Cary became ill. He was subsequently transported north toward Adak for medical aid and transferred to the U.S. Coast Guard cutter RUSH on October 14 (JST). Mr. Cary's trip report follows.

TRIP REPORT BY FRANK CARY

Arrangements in Japan

The trip began with a flight from Seattle which left at 13:50 on September 8, 1982. I was met by Mr. Ozaki of the National Common Squid Drift Fishery Assocation (NCSDFA) at Narita Airport and was accompanied

by him to Mitsui Urban Hotel in central Tokyo. Shortly thereafter, I met the chairman of the association, Mr. Wabuka.

The next morning, Mr. Kando (NCSDFA) accompanied me to Hakodate on a flight which departed from Haneda Airport at 7:40 a.m. We were met at the airport in Hakodate by the president of Hokusen Gyogyo Company, owner of No. 1 HOKUSEN MARU.

At the office of the company, I requested of the president that time be set aside for going over the Outline of Duties for the observer. This was done from 11:00 a.m. in the presence of the Fisheries Director of the vessel. The people of Hokusen Gyogyo Company were very cooperative. It was made clear that they should speak up at this time if there was any difficulty in allowing certain types of data or material to be gathered. The president made it clear that I had permission to gather all information.

The greatest concern expressed was for my safety on board and the fact that the Japanese side might be held somewhat responsible if I should fall into the sea.

Shortly before 15:00 on September 10, I boarded the vessel along with Mr. Inoue of the NCSDFA. Mr. Inoue was to be the "Japanese Observer" to make things go smoothly between the crew and myself.

The departure from Hakodate was at 15:00 JST on September 10, 1982.

Observations Conducted Aboard No. 1 HOKUSEN MARU

Objectives

The purpose of this observation program was primarily to gain information concerning incidental catches of salmonids by the Japanese gillnet flying-squid fishery in the mid-Pacific area by placing an American observer on a squid vessel, No. 1 HOKUSEN MARU, to watch their catch.

Other important aspects of observation were as follows: Water temperature, weather conditions, description of methodology and equipment, position of ship during fishing operations, and timing of deployment and retrieval of net. Number of individuals per species was to be recorded and scale samples were to be taken when any salmon or steelhead trout were encountered (none were encountered). Also to be recorded were other species caught incidentally and their numbers where possible.

Description of Vessel and Gear

Vessel Specifications.

Engine horsepower:	850 x 2 (supercharged at 1250 ps)
Cruising speed:	10-10.5 knots
Maximum speed:	11.5 knots

Age:	15 years (completed in July 1967)	
Gross tonnage:	421.68 metric tons	
Fuel consumption rate:	4 kl/day, cruising; 3 kl/day, fishing	
Vessel dimensions:	Legal length:	48.6 m
	Length at water line:	48.00 m
	Width:	8.5 m
Displacement:	Light:	500.73 t
	Heavy:	789.63 t
	Full load:	881.58 t
Draught:	Light:	2.120 m
	Heavy:	3.01 m
	Full load:	3.29 m
Designed load draught:	3.35 m	
Total freezing capacity:	503.07 m^3	

Crew. Fishing operations aboard the ship were conducted under direction of the Fisheries Director. Other officers included the Captain, Chief Engineer, Chief Radio Officer, First Engineer, Deck Officer, First Oiler, and Chief Freezer. The total crew numbered 16 individuals.

Fishing and Net Retrieval Gear. The fishing gear consisted of net and its accessories, buoys, hydraulic heads for the recovery of leadline and corkline, pipe, aft bin for storage of net, and two hydraulic heads aft, similar to the corkline device, for laying net into aft bin.

Net. The basic unit of length of net is the tan. This unit, however, is not a standardized unit and can be 40 m, 50 m, or 60 m. Most of the nets aboard the No. 1 HOKUSEN MARU were of the 40-m type. The dimensions and specifications of this type of tan are as follows:

Mesh measurement:	110 mm
Mesh per tan (horizontal):	660 meshes
Mesh per tan (vertical):	90 meshes
Length of corkline per tan:	40.20 m
Length of excess corkline per tan:	0.4 m x 2
Length of netted part of corkline per tan:	39.4 m
Weight of corkline per meter:	12.5 g
Length of leadline per tan:	38.25 m
Length of netted part of leadline per tan:	37.90 m
Length of excess leadline per tan:	0.35 m
Weight of leadline per meter:	98 gm/m (new nets)
Number of lead clamps on each tan:	55

Each set of netting consisted of 120 tan of net. Each tan was threaded to the adjacent tan with thin twine. The corkline and the leadline of each tan were tied manually to the corkline and leadline of the adjacent tan. There were seven of these sets which could be used during fishing operations. The corkline consisted of two lines which were tied together with twine at intervals. Plastic "corks" were set between these two lines. These "corks" (200 mm x 59 mm) were grooved so

as to allow the corkline to hold the "corks" more tightly. The manner in which the net was hung from the corkline and the leadline can be best understood by referring to Figure 1.

A sample of the monofilament driftnet web used aboard the vessel was compared with a sample of web collected at sea by the R.V. ALASKA and which had been lost or abandoned by a salmon landbased driftnet vessel. The monofilament web used aboard the squid vessel was of considerably thicker filament diameter and stiffer than the salmon vessel web. The respective diameters were about .69 mm and .51 mm.

The vessel carried 1,350 tans of netting, new and reworked. The nets were worked on en route to the fishing area. During operations, tans were replaced when damaged. Virtually no gear was lost at sea to my knowledge.

Buoys. Three types of buoys were used, radio buoys, plastic spherical buoys, and buoys with light bulbs. The rigging of these buoys onto the end of each set of netting was as shown in Figure 2.

The radio buoys consisted of a somewhat cylindrical metallic buoy about 80 cm tall and about 40 cm in diameter. These had tall antennas about 4 m in height. In the buoys were transmitters designed to transmit signals at a given frequency every three minutes. This would facilitate locating the end of the net, especially in poor visibility. Ten different frequencies were used for the 14 buoys, so that some duplication of transmitting frequency occurred. The buoys bore different letter-number markings (e.g., D 340, C 232). The buoys with light bulbs were very similar to the radio buoys with a 6 V battery and a small light bulb. The third kind of buoy was a simple spherical plastic ball about 50 cm in diameter.

Hydraulic Heads. Two devices were mounted on the port main working deck to assist in net recovery. The forward device was used to tow in the leadline, and the device mounted about 5 m aft of the leadline device was used to tow in the corkline. The main functional part of the leadline device was a grooved wheel into which the operator fed the leadline. The corkline device consisted of two spherical rubber balls which rotated in opposite direction, allowing the corkline to be pulled by the friction and the motion created (Fig. 3).

Pipe and Aft Area. After the net was taken aboard it went into a steel pipe about 39 cm in diameter. This allowed the net to be pulled into the bin in the aft area where it was stored. Two more hydraulic devices of the type described above for the corkline were used to pull the net into this area, allowing the net to be folded in the bin. This pipe became flared as it neared the aft bin so as to allow the corkline and leadline to be separated again.

The aft bin for the net was a large wooden box about 6 m x 6 m x 3 m, open at the top made of wooden boards. Over this bin the hydraulic

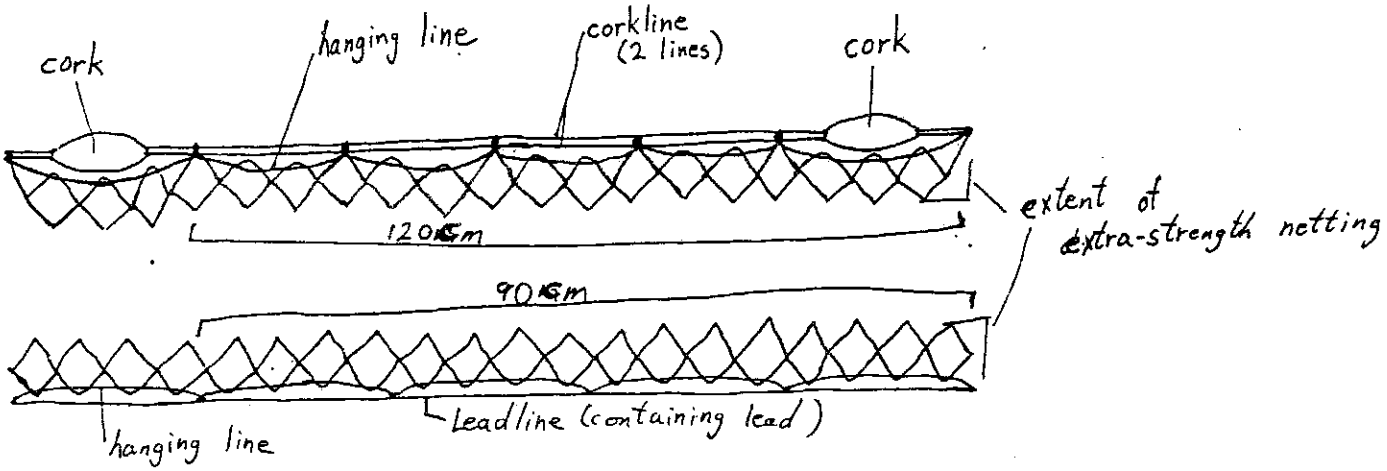


Figure 1. Corkline hanging.

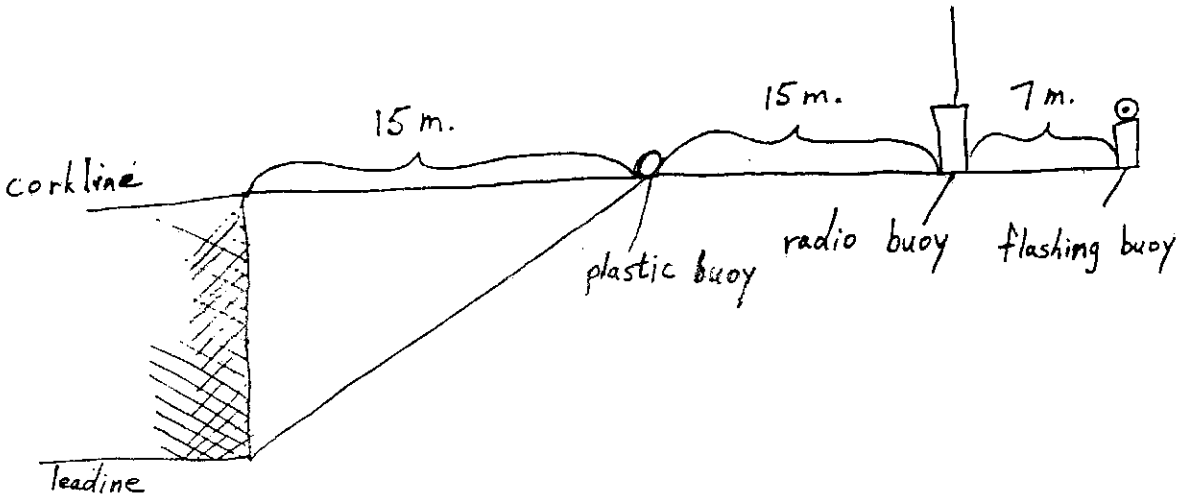


Figure 2. Buoy rigging.

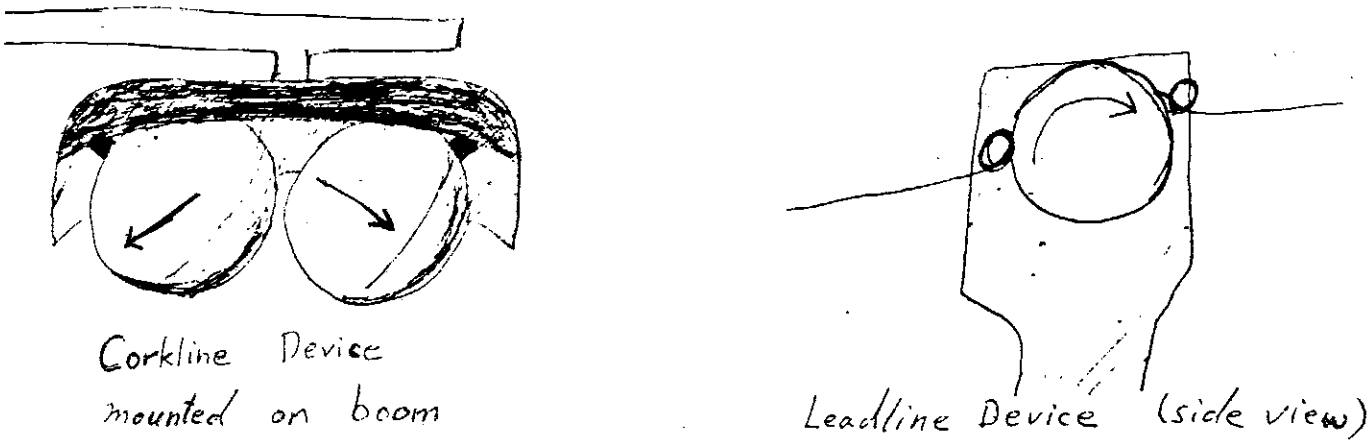


Figure 3. Hydraulic heads.

devices mentioned above were set into tracks so they could travel forward and aft, allowing the net to be distributed and folded into the bin in an even manner.

Other Equipment. Other equipment aboard No. 1 HOKUSEN MARU included the following: Radio equipment, navigational equipment, freezing equipment, water temperature thermometer, hydroacoustic sounder, and facsimile receiver.

Radio equipment included the following: A primary signal instrument, a secondary signal instrument (both produced by JRC), short-wave receiver, two radar sets, one produced by Kobe Kogyo and the other by Furuno Electric, and a directional receiver to receive signals from the radio buoys.

Navigation was done entirely by satellite navigational system (Furuno NNSS) in conjunction with a gyro-compass. Although the ship had a Loran system, it did not have Loran C. Therefore, Loran was not used. The accuracy of the satellite system depended on several factors. The system was most accurate when only a short time had elapsed from the time when the position was last plotted from the satellites. This elapsed time was indicated on the screen and was seldom more than two or three hours. If the vessel was cruising to a fixed course, at a fixed speed, this system was much more accurate than at other times (e.g., when vessel was fishing). This is the probable explanation of the fact that the co-ordinates for commencement of fishing operations may not agree with the co-ordinates at termination.

The freezing equipment was produced by Mitsubishi Electric and included three units. The freezing areas included a small quick-freezing compartment as well as the entire hold of the ship. The temperature used was -35° C to -40° C.

A water temperature recording thermometer took the temperature of sea water at a depth of about 3 m, at some point on the underside of the ship. I made four checks by measuring a bucket of sea water with a mercury thermometer. The two thermometers never differed by over 0.1° C. Therefore, it appears that the recording thermometer was an extremely accurate device. Temperature was continuously recorded on graph paper with a stylus, producing a temperature-time graph.

There were two types of hydroacoustic systems, one with a color television type display, and the other which displayed its data on paper. The latter was seldom used.

The facsimile receiver was important because the weather map arrived through it twice a day as well as the average sea temperature isotherm map compiled weekly. A daily newspaper was also received by this means.

Method of Catching and Freezing Squid

The fishing operation can be divided into the following: a) laying out of net, b) standing by while net is in water, c) recovery of net, and dislodging of squid and other product from net, d) packing and freezing.

Laying Out of Net. First, buoys were attached to the end of the net according to the rigging diagrammed in Figure 2. These were floated from the rear of the ship, and net was fed out by two men who kept the corkline and leadline apart. It took about 25 minutes for one set to be placed into the water. This, of course, varied with the speed of the ship which was about 5-8 knots during this operation, depending on the weather. As each set was completed, a bell signaled the skipper to reduce speed to very slow in order to allow the proper buoys to be attached. Then speed was increased and a 2-5 minute gap was placed between adjacent sets of nets. Normally, seven sets were deployed during each operation which was about 34 km of net. These nets were deployed in an east-west direction. At times rough seas or currents caused the nets to deviate from the straight-line pattern, but this was unintentional, as it made recovery difficult.

Standing By. After the laying of the net, the ship steamed to a position, usually set its parachute drogue, and waited. This position was either at the original starting point of the operation or at the finishing point. The downwind side was always chosen, as it was much easier to recover the net against the wind. The usual pattern was to steam back to the original position, and recover the net with the vessel going in the same direction as when it was set out.

Recovery of Net. If it was difficult to find the flashing-light buoy by direct visual means, the direction of the radio buoy could be ascertained. There was no way of knowing the distance to the buoy using the radio device, however. When the fishing buoy was seen, the port side was brought near the buoy. At this point a man stood in the bow and hurled a heavy four-pronged hook with a rope attached. This hook landed just beyond the buoys and was allowed to sink slightly. The line was pulled and hooked on the corkline or a line connecting the buoys. The line attached to the hook was drawn using the leadline hydraulic device described above. All the buoys and the end of the net were brought aboard in this manner. The ends of the leadline and corkline were tied to the line protruding from the net pipe (usually the end rigging of the previous net set). This process was repeated at the beginning of recovery of every set.

There were usually ten men in the forward work area, five along the leadline side of the net and five along the corkline side. One of these men operated the leadline recovery device where most of the tension was, and another operated the corkline recovery device located on a boom about five meters toward the stern (port side).

The rest of the men (eight men) worked on dislodging the fish and squid from the net and keeping the net from becoming tangled. Usually the fin of the squid was caught in the net. The squid would be dislodged by pushing the squid a little farther through, then by swinging it, forcing the rest of the squid out. Fish were dislodged from the net in a similar manner. Flying squid, albacore, and yellowtail were left on the deck and collected. Pomfret and all other species were thrown overboard. Recovery of seven sets of nets usually took about eight hours. Sunrise occurred about halfway through this process or shortly thereafter. It was difficult to observe the drop-out rate as the catch came aboard, but it was probably well under 10% for all species.

The typical pattern for a 24-hour period on days in which fishing took place was as follows:

10:00 JST	Begin setting out of net
12:30	Finish setting out of net
14:00	Dinner
14:30-21:00	Sleep or rest
22:00-05:00	Retrieval of net (breakfast at about 01:00)
06:30	Lunch
07:00-10:00	Sleep or rest

Time referred to in this report is Japan Standard Time, which is about four hours earlier than local standard time on the fishing grounds.

Packing and Freezing. Squid were gathered from the deck surface and packed in pans which measured 56.5 x 32.5 x 12.5 cm. The number of squid packed into each pan varied from about 12 to 18 depending on the size of the squid. Each pan held about 20 kg of squid. These pans were stacked and later placed in the temporary quick-freeze located just under the bridge. After about 6-8 hours in this room, they were transferred to the hold. While being transferred, the squid were removed from the pans. Thus, frozen blocks of squid were placed into the hold without any packaging. Albacore and yellowtail, the only fish kept, were frozen whole.

Fishing Locations

Locations fished during the time of my observations (September 10 - October 3) are shown in Figure 4. During September fishing is permitted north to 46° N. After a trial set on September 20 the vessel fished for five days between 45 and 46° N and 150 and 153° W. Then operations were moved southwest to begin October fishing south of the 44° N October boundary. Five sets were made between 43 and 44° N and 165 and 168° W, beginning October 1. No sets were made on October 6-8 because of heavy seas.

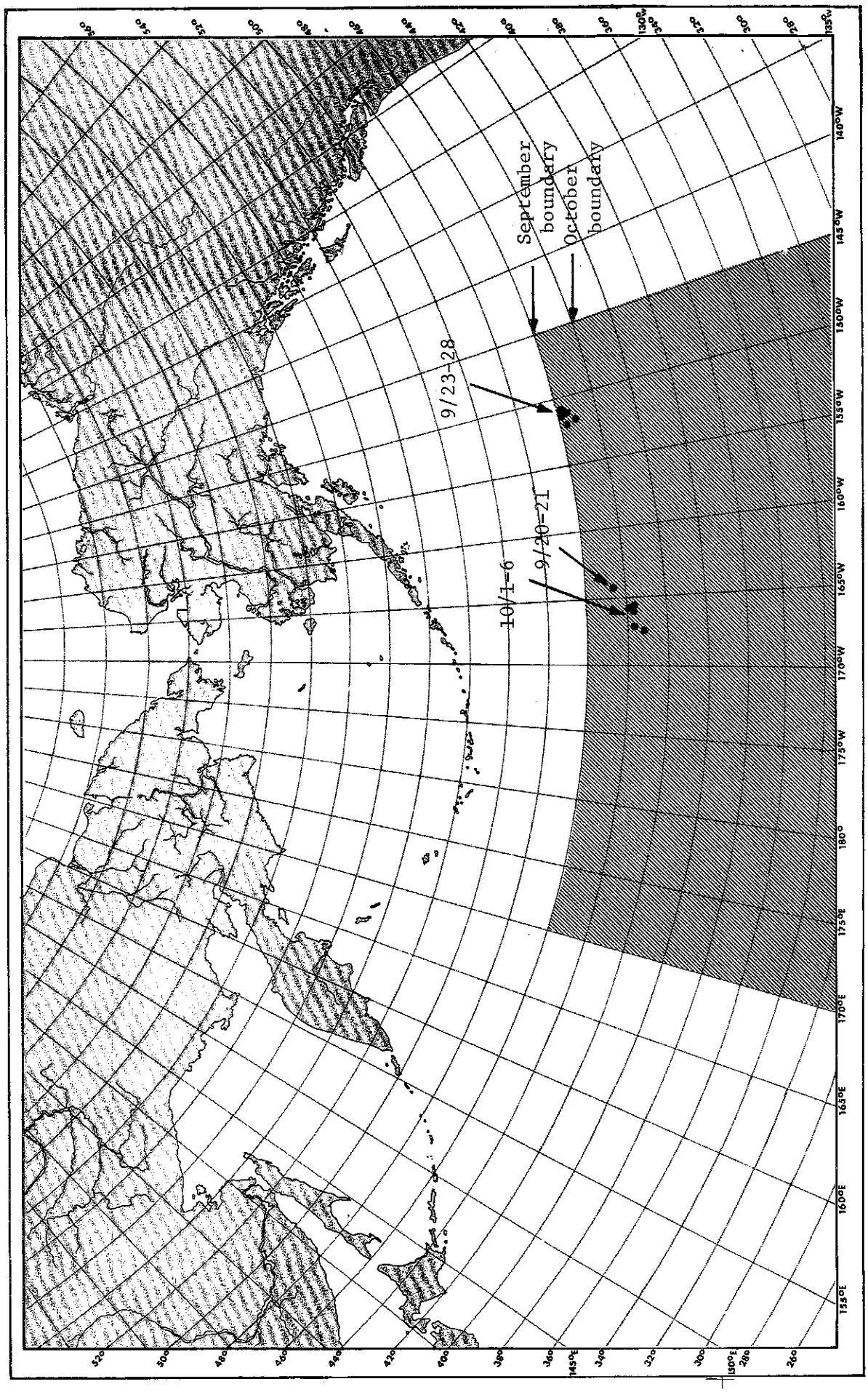


Fig. 4. Locations fished by NO. 1 HOKUSEN MARU in Japanese squid drift gillnet fishery area (shaded) during observer coverage.

Catches Observed

No salmonids were observed. The crew made a concerted effort to inform the observer of any unusual fish even at times when the observer was not at the bridge. Most of the time (about 80% or more) the observer was watching the net being landed, so it is highly unlikely that any salmonids were taken aboard.

Species in addition to flying squid were provisionally identified as follows: Albacore (Thunnus alalunga), yellowtail (Seriola aureovittata), Pacific pomfret (Brama japonica), mako, or bonito, shark (Isurus oxyrinchus), common dolphin (Delphinus delphis),[1] northern right whale dolphin (Lissodelphis borealis), ocean sunfish (Mola mola), mackerel, or salmon, shark (Lamna ditropis), pelagic armorhead (Pentaceros richardsoni), and an unidentified species resembling the genus Centrolophus. The last four species listed were very rarely seen. An additional shark species, blue shark (Prionace glauca), was later identified from photographs taken. There was always too large a number of Pacific pomfret to count. Table 1 lists the catch of squid, albacore, and yellowtail.

Table 2 lists the number of fish and dolphins not kept by the vessel, counted by the observer on days on which fishing took place.

Sea Temperatures and Weather

The shipboard sea temperature thermometer was a very accurate device which could be read to the nearest 0.1° C with some care. This device always agreed to within 0.1° C of the temperature taken by measuring a bucket of water taken from the surface. Table 3 gives sea temperatures during fishing operations.

Table 4 lists weather conditions taken about noon JST.

Photographs

Six rolls of color transparency slides were taken of the gear, fishing operations, and catches of the No. 1 HOKUSEN MARU. These slides are on file at Fisheries Research Institute, University of Washington.

Other Comments and Observations

There were several factors which influenced the selection of the areas to fish. The most important was water temperature. A fairly

---

[1] Identification in doubt. Because of latitude of catch, more likely North Pacific white sided dolphin (Lagenorhynchus obliguidens).

Table 1. Squid, albacore and yellowtail catch.

Date	Squid Catch Estimate			
	Weight (Kg)	Number	Number albacore	Number yellowtail
Sept. 21	400	360	17	—
24	2000	1300	80	50
25	1940	1160	39	8
26	1980	1200	85	23
27	3440	2200	54	105
28	2680	1750	205	4
Oct. 2	3320	1700	50	0
3	4840	2500	38	30
4	1080	800	73	0
5	2380	1500	24	48
6	1200	800	90	13

Table 2. Incidental catches observed (number of individuals), excluding pomfret.

Date of set	Sharks	Common dolphin[1]	Northern right whale dolphin	Ocean sunfish	Pelagic armorhead
Sep 20-21	1	--	--	--	--
23-24	51	5	2	--	--
24-25	27	--	--	--	--
25-26	94	1	1	2	--
26-27	60	--	--	1	--
27-28	22	--	--	--	--
Oct 1-2	5	4	--	1	--
2-3	9	1	3	--	--
3-4	4	--	--	--	4
4-5	2	--	1	--	1
5-6	9	--	--	--	--

[1]See footnote, previous page.

Table 3. Surface temperatures during fishing.

Date	Time (JST)	Position		Surface Water Temperature (°C)	Setting Net (S) or Retrieval (R)
Sept. 20	11:10	44°38'N	164°54'W	13.4	S
	12:32			13.0	S
	13:15	44°38'N	164°36'W	12.6	S
	18:35	44°38'N	164°54'W	13.6	R
	19:46			13.3	R
	21:15			13.0	R
Sept. 23	09:45	45°45'N	151°43'W	14.6	S
	11:23			14.5	S
	12:12	45°45'N	152°05'W	14.4	S
	21:30			14.4	R
	23:40			14.5	R
Sept. 24	03:31	45°45'N	152°05'W	14.4	R
	09:51	45°32'N	150°57'W	14.8	S
	11:55			14.6	S
	20:55	45°32'N	150°57'W	14.7	R
Sept. 25	01:33			14.6	R
	09:25	45°11'N	151°42'W	14.8	S
	10:28			14.7	S
	11:55	45°07'N	152°13'W	14.6	S
	20:45	45°11'N	151°42'W	14.8	R
	22:43			14.7	R
	23:40			14.6	R
Sept. 26	05:30	45°07'N	152°13'W	14.6	R
	10:40	45°51'N	151°25'W	14.4	S
	13:30	45°56'N	150°54'W	14.4	S
	21:40	45°56'N	150°54'W	14.4	R
Sept. 27	02:36			14.5	R
	06:00	45°51'N	151°25'W	14.4	R
	09:50	45°58'N	151°25'W	14.2	S
	10:33			14.3	S
	12:22	45°58'N	150°56'W	14.4	S
Sept. 28	01:40			14.4	R
	03:50	45°58'N	151°25'W	14.3	R
Oct. 1	11:30	43°58'N	166°01'W	13.0	S
	12:33			12.9	S
	13:34			12.8	S

Table 3, cont'd

Date	Time (JST)	Position		Surface Water Temperature (C)	Setting Net (S) or Retrieval (R)
Oct. 1	13:53	43°59'N	165°33'W	12.7	S
	22:00	43°58'N	166°01'W	12.6	R
Oct. 2	0:10			12.5	R
	04:30			12.4	R
	05:35	43°59'N	165°33'W	12.6	R
Oct.3	11:10	43°49'N	166°22'W	13.0	S
	11:49			12.8	S
	12:31			12.9	S
	12:53			13.0	S
	13:34	43°49'N	165°50'W	13.2	S
	23:10			13.2	R
	01:30			13.1	R
	03:51			12.9	R
	05:07			12.8	R
	06:13	43°49'N	165°50'W	13.0	R
Oct. 4	11:20	43°52'N	166°12'W	12.9	S
	11:39			12.7	S
	11:58			12.9	S
	13:06			13.0	S
	13:25			12.9	S
	13:45	43°53'N	165°43'W	12.7	S
	0:35			13.0	R
	04:53			12.7	R
	05:51			12.6	R
Oct. 5	12:00	43°47'N	167°07'W	12.7	S
	14:40	43°45'N	167°27'W	12.8	S
	01:08			12.8	R
	05:23	43°45'N	167°27'W	12.9	R
Oct. 6	11:20	43°17'N	167°52'W	13.2	S
	12:39			13.3	S
	13:00			13.4	S
	13:18	43°17'N	167°29'W	13.6	S
	19:50	43°17'N	167°29'W	13.6	R
	22:53			13.4	R
	01:36	43°17'N	167°52'W	13.2	R

(Note: Each day's fishing operation is separated by horizontal line)

Table 4. Daily weather.

Date	Time	Position	Water temp. (°C)	Weather	Wind speed (Beaufort) and direction	Vessel direction	Cloud cover	Barometer mg Hg	Air Temp. (°C)
Sept. 11	12:00	41°51'N 145°28'E	19.6	Cloudy	4 W		100%	756.5	22.5
12	12:00	42°22'N 151°17'E	15.0	Cloudy	3 E	90°	100%	760.5	16
13	12:00	42°35'N 157°05'E	15.6	Fog	3 ESE	89°	100%	762.0	17
14	12:00	43°04'N 163°00'E	15.7	Cloudy	5 SSW	80°	100%	760	17
15	12:00	43°43'N 169°03'E	13.7	Cloudy	4 WSW	84°	80%	754	15
16	12:00	43°30'N 175°06'E	14.9	Fair	7 NNW	105°	40 %	757	15
17	12:00	44°09'N 178°27'E	12.8	Cloudy	4 NW	90°	100%	764	12
18	12:00	44°02'N 175°25'W	13.0	Cloudy	3 WNW	90°	100%	764	12
19	12:00	44°02'N 169°12'W	12.4	Cloudy	4 SSW	90°	100%	760	12
20	11:10	44°38'N 164°54'W	13.4	Cloudy	5 SW	90°	100%	755	13
21	12:00	44°35'N 162°28'W	13.3	Cloudy	4 NNW	85°	100%	758.5	12
22	12:00	45°35'N 156°58'W	14.2	Cloudy	4 NNW	84°	100%	762	15.5
23	12:12	45°55'N 152°05'W	14.4	Cloudy	5 NNW	—	50%	768	11.5
24	11:55	45°31'N 150°57'W	14.6	Cloudy	5 NW	180°	100%	772	11
25	11:55	45°07'N 152°13'W	14.6	Cloudy	3 WSW	179°	100%	767	13
26	12:00	45°55'N 151°25'W	14.4	Cloudy	5 SW	70°	100%	762.5	15.5
27	12:00	45°58'N 150°60'W	14.4	Cloudy	3 SW	90°	100%	768	15
28	12:00	45°47'N 151°36'W	14.5	Clear	4 SSW	229°	0	768	16
29	12:00	44°17'N 155°27'W	14.9	Rain	3 W	245°	100%	758.5	14
30	12:00	43°57'N 160°32'W	14.9	Clear	3 NW	266°	10%	765	12
Oct. 1	11:30	43°58'N 166°01'W	13	Fair	2 SE	90°	20%	772	15
2	11:10	43°49'N 166°22'W	13.	Cloudy	3 SSW	87°	95%	768	14
3	11:20	43°52'N 166°12'W	12.9	Cloudy	1 N	89°	100%	765	15
4	12:00	43°47'N 167°07'W	12.7	Cloudy	6 W	269°	100%	758	12
5	11:20	43°17'N 167°52'W	13.2	Cloudy	1 W	90°	100%	765	12
6	12:00	42 05'N 167 43'W	15.2	Cloudy	6 SW	178	100%	755	16
7	12:00	41 46'N 170 26'W	14.8	Clear	7 WSW	240	60%	753	15
8	12:00	41 30'N 171 30'W	15.2	Clear	7 NW	291	30%	755	12

sudden drop in water temperature was said to indicate an area where fishing could begin. Sonar was also used to determine the fishing area. Also used were sea temperature maps which arrived from Japan by facsimile. These were maps which averaged a week's temperature as observed by fishing vessels and cargo vessels. Also referred to were seafloor charts printed by Scripps Institutions of Oceanography.

During the entire period one of two other fishing vessels observed was No. 2 HOKUSEN MARU which belonged to the same company as No. 1 HOKUSEN MARU. No. 2 had come to get some fuel from No. 1. The other vessel was in operation but too distant to identify by name. Only two other vessels were observed, both cargo vessels. One of the these cargo vessels cruised through the net, causing it to break.

No. 1 HOKUSEN MARU was built as a tuna-fishing vessel. Some minor changes were made a few years age to accommodate it for squid gillnet fishing. The vessel is used for albacore fishing in the off season, January-May, using a larger mesh-size net in waters farther south. The operation is basically similar.

This year was reported not to be a good year for squid fishing. Summer was a much better season than fall. The No. 1 HOKUSEN MARU was reported to have sailed on her first trip on June 5, returning on September 5 about 70% filled. Only two days of fishing were lost due to weather.

According to Mr. Inoue of NCSDFA, there were about 300 Japanese high-seas squid vessels east of 170° E on September 1, 1982. All squid vessels must radio Japan Fishery Agency in Japan as they enter the fishery area east of 170° E. He indicated there was an estimated 140 non-Japanese squid gillnet vessels fishing on September 1, 1982, i.e., about 80-100 Taiwanese vessels and about 40 Korean (mostly S. Korean). They reportedly are not constrained by their governments as to fishing area as is the Japanese fleet.

Conclusions

In spite of the fact that fishing took place in waters well below 15° C (12.4-14.8° C), no salmonids were observed. Fishing also took place often at the most northerly latitude permitted for that month (sometimes within one minute latitude of the northern boundary of the permitted area). Thus, it is possible that the contention of the Japanese side that no salmonids are encountered by squid vessels in these areas is essentially correct. Further observations, including other seasons of the year, would be necessary to ascertain whether salmon are ever encountered in the area permitted for squid gillnet fishing.

ACKNOWLEDGMENTS

We wish to acknowledge the hospitality and full cooperation provided to Mr. Cary by Mr. Shichiro Wabuka, President, and other officials of the National Common Squid Drift Fishery Association, by Mr. Inoue of the Association who accompanied Mr. Cary aboard the vessel, and in particular, by the owners, officers, and crew of the No. 1 HOKUSEN MARU.

Funding for this program through the Pacific Seafood Processors Association was provided by the following organizations:

Alaska Fisheries Development Foundation
Cordova District Fisheries Union
North Pacific Fishery Management Council (NPFMC)
Pacific Seafood Processors Association
Peninsula Marketing Association
Seafood ~~Processors~~ Producers Cooperative
State of Alaska
United Southeast Alaska Gillnetters
Western Alaska Cooperative Marketing Association

Mr. Jim Branson, Executive Director, NPFMC, was instrumental in arranging the observer program with the Japanese industry and in obtaining necessary funding.

APPENDIX I

APPENDIX I

Fisheries Research Institute
University of Washington
Seattle, Washington 98195

SQUID FISHERY OBSERVER

Outline of Duties and General Methodology

I. General observations of fishing operations and gear.

The observer will take notes supplemented by photographic documentation insofar as possible on various aspects of vessel configuration, navigational methods, crew composition and division of labor, gear and accessories, and methods of gear deployment and retrieval, catch processing and storage, methods and detail of logging target and incidental catches, etc. These notes will be taken throughout the assignment. In particular, we are interested in:

A. Vessel configuration: basic dimensions (length, breadth, draft, displacement), general layout, engine horsepower, cruising and maximum speed, fuel consumption rate, freezer or catch storage characteristics (temperature, volume, etc.), age, ownership, affiliation with rest of fleet, involvement in other fisheries, etc..
B. Vessel navigational aids, radio equipment, other electronics.
C. Crew characteristics: Number of crew, positions, division of labor.

D. Gear

1. Characteristics of basic gillnet gear, including length of a unit-of-effort (tan?), number or range of numbers of tans per operation, depth of net, hanging configuration and ratio, characteristics of various components such as corks, corkline, leadline, hanging twine (if any), mesh, buoys and/or radio markers, vessel identification marks on gear, etc.
2. Spare gear - how much is on board?
3. Accessories - describe hydraulic power blocks used for retrieval, and any other accessories.

E. Methods of gear setting and retrieval.

1. Time of set each day; variability.
2. Soak time; variability.
3. Total effort, variability.

4. Setting gear - describe in detail, including how position is decided upon, how direction is decided, speed during set, placement of buoys or markers, occupation of vessel during soak, duration of setting, etc.
5. Retrieval - describe in detail the methods, duration, speed, etc.
6. Amount of gear loss or damage, replacement procedures.

F. Characteristics and disposition of catch.

1. Picking from gear; usual pattern of occurrence in gillnet.
2. Sorting, weighting.
3. Processing procedures - scheduling, location, cleaning, freezing, re-weighing if any, packaging if any, storage.
4. Logging - requirements, procedures used, reporting requirements.
5. General method of dealing with incidental salmonid and non-salmonid catches.

II. Daily observations and data record.

These data should be recorded on a daily basis, or more often as appropriate.

A. Vessel location - position at beginning of each gillnet operation, or at some (noted) time of day if no operation is conducted.

B. Weather and sea conditions (recorded at some point during a fishing operation, or at some convenient time during the day if fishing is not conducted).

1. Sea surface temperature - try to record each time vessel location is recorded, and at a few points (if possible) during set of gear.
2. Temperature at 5m, 10m, 15m, 20m, 25m, at some point during each fishing operation, as possible.

3. General weather conditions - record at some point during an operation, or at some (recorded) time of day if no operation is conducted.

   a. Sea state - swell and wind wave height.
   b. Wind speed (if anomometer present).
   c. % cloud cover and fog/haze conditions.
   d. Air temperature.
   e. Barometric pressure (mb, mm Hg, etc.).

C. Fishing effort and directed catch, in each gillnet operation.

1. Amount of gillnet set and soak time.
2. Total squid catch in weight.
3. Total squid catch in numbers, estimated from counts per weighing basket, etc., insofar as possible. If catch is sorted by size immediately, attempt to stratify estimate of catch in numbers if possible.
4. Try to note drop-out rate.

D. Incidental catches.

1. Non-salmonid fish - attempt to count by (major) species insofar as possible.
2. Salmonid fish.
   a. Direct accurate count by species.
   b. Attempt to note generally where salmonids occur in the net in vertical dimension and degree of patchiness along length of net.
   c. Note drop-outs.

III. Procedures for examining incidental salmonid catches.

A. Length, weight, scale samples. To the extent possible, take a scale sample and a length (tip-of-snout to fork-of-tail) measurement from every salmonid caught. If catch must be subsampled, stratify according to species, and randomize according to size as much as possible. Take weight data only if time permits.

B. Method of collecting scale samples:

1. Take one scale/fish from chum and pink salmon, take two scales/fish (from both sides of body) from sockeye, coho, and chinook salmon and from steelhead.

2. Take scales only from "preferred area" of fish's body, i.e., halfway between posterior of dorsal fin and adipose fin and 1-4 rows above (preferably) or below lateral line. Do not take a lateral line scale, a loose scale (which may be from a different fish), or an obviously deformed scale. If a "preferred" scale is not possible, take one from as close to the preferred zone as possible, indicating where on the data table.

3. Clean scale(s) of epithelium, dirt and mucus as much as possible with a damp cloth, moisten and affix to gummed card on or near appropriate fish number. Make sure the up-side of the scale on the fish is also the up-side on the card.

4. Label the card and data page so they can be matched and cross-referenced.

5. It is important that fish number on the length/weight data page corresponds to the numbers on the scale card.

6. Never put scales from different operations on the same scale card; always switch to a new card even if only one or two fish were sampled from the previous operation.

C. Method of collecting tag recovery information (if any).

1. External disc tags - retain tag or at least record tag serial number. Record all pertinent circumstances of capture (location, date), and biological data from the fish (species, length, weight, scale sample, sex if possible, etc.).

2. Coded-wire-snout tag (indicated by absence of adipose fin). Examine fish for biological data, decapitate behind eyes, and retain head in plastic bag provided, labeled with recovery location and date, and pertinent biological data (length, weight, etc.). Add plenty of salt to bag, or freeze to be salted later. Before returning samples to Seattle, drain liquid and re-salt, and seal bag as well as possible.

D. Photographic record of net marks. Try to compile a collection of photographs of net marks on salmon caught in the gillnets.