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Observations On Board a Japanese, High-seas, Squid Gillnet Vessel in the North Pacific Ocean July 1-August 14, 1986

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NOTICE

Observations On Board a Japanese, High-seas, Squid Gillnet Vessel in the North Pacific Ocean 1 July - 14 August 1986

by

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ABSTRACT

Under auspices of a U. S. - Japan bilateral agreement, observations on board a commercial Japanese, high-seas, gillnet vessel were conducted during the period 1 July to 14 August, 1986, in the western North Pacific Ocean. Thirty net set and haul operations were observed. In addition to catch and incidental take data, information on the vessel, fishing techniques, gear, and equipment, and overall fishing strategy were noted.

The gear deployed was approximately 24 nm long, comprised of 3 nm length sections which in turn were comprised of the basic unit of gear, 1 tan, 40 m long x 12 m deep. The mesh size of the monofilament gillnet webbing was approximately 118 mm. Gear deployment, requiring up to 3 hours, was completed 1-2 hours prior to sunset. Hauls were completed in 6.5-10.5 hours, beginning 3.5-4.0 hours before sunrise and after a minimum 6.5-hour fishing period. No gear was lost during the period of observation.

Daily catch ranged from 300 to 4,200 squid; in addition, albacore, Pacific pomfret, and blue sharks were the principal components of the catch. One pink salmon was taken. A total of 75 marine mammals of 5 species and 55 seabirds of 6 species were incidentally taken.

Sighting surveys for marine mammals, seabirds, and fishing gear debris were conducted during vessel transits and opportunistically during other periods. A total of 185 groups of

marine mammals comprising 11 species were observed, 65 groups during sighting surveys and 120 groups during fishing operations. Sixty-six transects for seabirds were completed with 16 species identified. Sightings were widely scattered, and group sizes were small. Eleven sightings of fishing gear fragments were recorded, six during surveys and five during fishing operations.

INTRODUCTION

In response to decreasing commercial catches of the Japanese flying squid, Todarodes pacificus, during the early 1950's, Japanese squid fishing vessels began experimental fishing effort on alternate squid resources. During the early to mid-1970's, catches and effort for the neon flying squid, Ommastrephes bartrami, increased to commercial importance as a high-seas drift gillnet fishery for the species in the central North Pacific Ocean (Roper et al, 1984). The fishery has continued to expand, and in 1986 it involved approximately 500 licensed vessels, each fishing up to 30 nm of gear per operation during the current June through November fishing season.

The squid fishing area is self-regulated by time-area restrictions. The Japanese squid regulatory area lies between 170° E to 145° W longitude and 20° to 40-46° N latitude, the latter depending upon the month. In July and August, the latitudinal boundaries were 20-42° N latitude and 20-44° N latitude, respectively (Fig. 1).

The intensive fishing effort may contribute to a significant incidental take of marine mammals, salmon, seabirds, and other marine organisms over a broad expanse of the North Pacific Ocean. In addition, the fishery may generate marine debris, i.e. fishing gear fragments, that can impact marine resources for an indefinite period of time and affect navigational safety. Preliminary evidence suggesting a significant incidental take of certain marine species was presented at the 1984 Workshop on the

Fate and Impact of Marine Debris (Shomura and Yoshida, 1985).

Shipboard observation of the nature and extent of the incidental take and amount of marine debris generated by the commercial Japanese squid gillnet operations has been difficult since the squid fishery area is on the high seas outside the U. S. Exclusive Economic Zone and is not subject to an international treaty to which the U. S. is a signatory. U. S. observers have previously conducted observations of the fishery only twice (Cary and Burgner, 1982; Ignell et al, 1986). To establish a basis for cooperative research, a U. S. - Japan Memorandum of Understanding (MOU) was drafted and signed in June, 1986.

Under the auspices of this MOU and in cooperation with a Japanese government observer, I conducted observations on board the Japanese commercial squid gillnet vessel, Shunyo Maru No. 18 during the period 1 July - 14 August 1986. The vessel departed Hakodate, Japan, on 1 July, entered the North Pacific fishery area (east of longitude 170° E) on 7 July (c.a. 0345 Japan Standard Time (JST)), and after 11 days in transit , arrived at the first gear set position. During the ensuing 34 days, I observed 30 fishing operations before leaving the vessel on 14 August. The following report summarizes observations conducted on board this vessel.

DESCRIPTION OF VESSEL AND CREW

The vessel, Shunyo Maru No. 18, is 47.5 m long with an 8.5 m beam and displaces 344.6 mt. The single diesel engine allows a cruising speed of 11.2 kts and a top speed of 13.0 kts. The

flash freezer capacity is 206.4 m^3, and the three freezer holds have a combined capacity of 432 m^3.

The vessel was originally configured as a longliner when launched in April, 1970, and subsequently converted for gillnetting and jigging operations in 1978. Through 1985, the Shunyo Maru No. 18 was utilized annually for squid gillnet operations in the North Pacific during November-December. During January-April, 1986, the vessel was utilized for initial squid fishing operations near the Falkland Islands. Tentatively, the vessel is scheduled to return from the North Pacific in mid-October to continue this cycle of year-round fishing operations.

Although the vessel is designed to carry a crew of 22, the normal crew complement for squid fishing operations is 16. This includes the Fishing Master who directs fishing operations and assumes primary navigation and ship handling duties; the captain who shares navigation and vessel handling duties and is the ranking deck officer; a Chief of Freezer Operations; radio operator; boatswain's mate; and seven quartermasters (seamen). The engineering crew of four completes the vessel's complement.

Navigation equipment and accessories on board included an NNSS satellite navigation unit with printer, combined gyrocompass and autopilot unit, and two radar units. The NNSS navigation unit served as the sole navigation source; no Loran equipment was observed on board. The NNSS unit was equipped with a remote speed control unit mounted over the gyrocompass-autopilot unit in the pilothouse. Vessel positions were updated by satellite fixes

at less than 2-hour intervals. Between satellite fixes, the accuracy of the indicated vessel positions on the NNSS unit was dependent upon constant manual adjustment of the estimated vessel speed on the remote speed control unit.

Electronic fishing aids included a fathometer with color display (25 m intervals to 300 m depth was the most frequently used scale) and a radio direction finder to home in on radio buoys deployed with the fishing gear. A sea surface temperature readout unit indicating water temperature at 3.5-4.0 m below the water surface was connected to a strip chart recorder to provide a continuous record of sea surface temperatures. The vessel was not equipped with an anemometer.

The main radio gear was located in the radio operator's cabin on the poop deck, one level below the bridge. Several CB, VHF, and SSB radio units for voice communication were located in the pilothouse. A facsimile machine, also located in the radio operator's cabin, provided daily meteorological maps from Japan and the U. S. National Weather Service (San Francisco, CA), 5-day summary isotherm maps, and daily news through Japanese news services.

FISHING GEAR AND TECHNIQES AND CATCH PROCESSING

Fishing Gear:

The general components, design, arrangement, and function of the fishing gear and hauling equipment were similar to those I have observed in the Japanese high-seas, salmon gillnet fishery. The basic unit of gillnet gear, the tan, was approximately 40 m

long with a corkline to leadline (stretch mesh) measurement of 12 m. Approximately 1,400 tans of fishing gear were aboard the vessel, half completely new gear and the remainder reworked gear, i.e. new webbing spliced to previously used corkline and leadline components. The mesh size of the monofilament gillnet webbing was primarily 118 mm (stretch); an unknown amount of 112 mm mesh gear was on board in reserve.

Each tan was connected to adjacent tans by tieing together the corklines and leadlines. Twine was used to lace together every third mesh along the vertical borders of the webbing and then tied off at the corkline and leadline. Approximately 140 tans were connected to form a "section" of gill net 3 nm long. Two sections were frequently tied together to form a "double-length section" 6 nm long. A total of 8 sections, approximately 24 nm of gear, was readied for daily use.

Four types of buoys were deployed, radio, light, spherical, and teardrop. The buoys were deployed singly or in combination with a radio and light buoy at or near the ends of each gear section. Neither radar, nor flag buoys were utilized or observed on board. Twenty-one radio buoys and six light buoys were on board; three of the former and two of the latter were held in reserve. Under poor visibility conditions, the radio buoys provided distant location of the ends of each gear section. At shorter distances, the light buoys functioned as visual cues at the proximal end of each section (the end hauled first) for positioning the vessel on the corkline to begin or resume haul

operations. The spherical buoys, approximately 45 cm in diameter, were normally used at the distal end of each section (the end hauled last) as a visual cue for locating the end, determining the lie of the intervening gear, and positioning the vessel accordingly. They also functioned as floats, providing tension on the corkline and webbing to help prevent snarls at the end of the gear sections. Occasionally, a spherical buoy was used in combination with a radio buoy at the proximal end of a gear section. Under fair-good visibility conditions, the teardrop-shaped buoys, approximately 55 cm in diameter and flourescent pink in color, were used in combination with radio buoys at the proximal end of gear sections to serve as a visual cue for positioning the vessel on the corkline.

Buoys were generally attached to each section of gear in the following arrangement beginning at the proximal end of each section: (a) radio buoy and teardrop-shaped buoy combination with a 10-12 m line connecting the radio buoy directly to the end of the corkline and the teardrop-shaped buoy attached to this line approximately 2-3 m from the radio buoy; (b) radio buoy attached by a 10-12 m line to the corkline and located 200-300 m from the distal end of the section; and (c) a spherical buoy connected directly to the distal end of the corkline by a 10-12 m line and a 2-3 kg weight suspended from the distal end of the leadline by a 2-3 m line. On each double-length section of gear, an additional radio buoy was attached by a 10-12 m line to the corkline at or near the point that the two 3 nm sections were

spliced together. To aid location and determine orientation of the gear during early morning hours, the proximal ends of the first 3-4 sections (or double-length sections) hauled daily, bore light buoys in addition to the radio and teardrop buoys. The end hauled first each day was marked with two light buoys connected to each other by a 2 m line, while the remaining sections (or double-length sections) were marked with a single light buoy. Light buoys were attached to adjacent radio buoys with a 2 m line.

Two hydraulically operated net hauling apparatus were located on the port side of the main deck. The leadline hauling apparatus was positioned at the forward area of the main deck, approximately 5.5 m forward of the corkline hauling apparatus. The former consisted of a 3-wheeled system mounted on a pedestal base, the smallest wheel guiding the leadline to the largest, hydraulically driven wheel, and the third wheel providing tension against the drive wheel and leadline to pull the gear on deck. The corkline hauling apparatus, suspended in place by a boom system, consisted of two counter-rotating, pneumatic, rubber spheres. The corkline, pinched between the spheres, was pulled on deck as the spheres revolved.

Two units resembling the corkline hauling apparatus were mounted on a wheeled gantry over the net well, one handling the corkline and the second, the leadline. After the catch was cleared from the gear on the main deck, these units pulled the gear through a 30 cm diameter tube from the main deck, along the

starboard side to the net well. Electric winches moved the gantry forward or aft and raised or lowered the gear hauling units simultaneously as the gear fed into the net well, allowing careful folding and stacking of the gear in preparation for the next set operation.

During the observation period, approximately 20 tans of damaged gear were removed from the main fishing gear due to unrepairable large rips in the webbing or damaged leadline or corkline. The webbing was removed from the leadline and corkline, neatly bundled, and stored in the boatswain's storage locker in the bow. The leadlines and corklines were coiled and stored on deck aft. None of the fishing gear, whole or components, was jettisoned overboard.

Fishing Operations:

Of the thirty observed fishing operations (net sets and hauls) during the period 11-30 July (set/haul numbers 1-17), the set locations varied between 40° 49'-41° 58' N latitude and 158° 50'-169° 56' W longitude, while during the period 1-14 August (set/haul numbers 18-30), operations were shifted northeasterly to a smaller area bounded by 43° 10'-43° 57' N latitude and 155° 46'-158° 49' W longitude (Fig. 2).

Sea surface temperatures recorded during fishing operations ranged from 13.4° to 17.2° C with temperatures of 15° C or less recorded in 22 operations, <14° C in 4 operations and 14.0-15.0° C in 18 operations (Table 1).

The weather and sea conditions were fair throughout the

observation period. Thick fog was almost a daily occurrence, particularly during early morning hours and occasionally persisting for the entire day. None of the scheduled fishing operations were postponed due to weather and sea conditions.

Four sets were postponed to position the vessel in an area of potentially higher squid catch and/or lower incidental catch of non-commercial species. The overall catch of neon flying squid was reported to be worse than in past seasons due in part to unusual oceanographic conditions, i.e. unseasonal and less defined areas of abrupt isothermic boundaries characteristic of favorable fishing areas. Daily radio communications with other squid gillnet vessels were the primary informational source for locating areas of potentially better catch. Secondary sources of information for determining fishing areas included 5-day isotherm summaries, sea floor relief atlas, sea surface temperature profile, and fathometer readings.

During July, the Shunyo Maru No. 18 operated semi-independently for a majority of the fishing operations and in August, operated primarily within a multi-vessel array. Within the array, the Fishing Masters cooperatively coordinated fishing operations aided by constant radio communications. Set positions were assigned to maintain a minimum 2 nm inter-vessel distance along the north-south axis. Set operations were scheduled to begin simultaneously with all vessels bearing in the same direction from a common position of longitude. The coordination of a multi-vessel array also involved determination of starting

and ending set positions for vessels which set their gear end-to-end with the main, multi-vessel array. All fishing operations were oriented in an approximately east-west direction, a standard procedure among Japanese squid gillnet vessels (Table 1).

The typical pattern of activity for a 24-hour period of fishing operations (noted in JST) was generally as follows:

1000-1215	Begin set operations
1300-1530	Complete the set
1330-1600	Meal (scheduling highly variable, depending upon when the set operation is completed)
1400-2100	Crew rests after meal
2115-2200	Begin haul operations
0100	Meal (scheduling variable; crew has 15-minute meal break after the third gear section is hauled)
0445-0800	Complete the haul
0500-0830	Meal (scheduling highly variable, depending upon when the haul and processing operations are completed)
0530-1000	Most crewmembers rest after the meal, while a few mend net, maintain bridge watch, or attend to other duties before retiring.

Set Operations:

The maximum length of gear deployed was eight sections, approximately 24 nm. Although additional gear could have been utilized, the eight section length was considered optimum for

maintaining crew efficiency and work schedules over a long period at sea. Seven sections and six sections were deployed on two occasions each. Weather and sea conditions were the primary considerations for deploying less than the maximum eight sections of gear, except during Set #01 when only seven sections were deployed under good weather and sea conditions and Set #12 when only six of the eight sections scheduled were eventually deployed due to concerns over numerous sperm whales that were swimming toward the gear that had already been set. Sets were initiated between 1000 and 1215 hrs JST and completed approximately 1-3 hours before sunset, approximately 1630 hrs JST. About three hours were required to deploy eight sections of gear at a vessel speed of 9.6-10.6 kts.

Each gear section was set separately or under favorable weather and sea conditions, often tied together to form up to three double-length sections. Each adjacent section and double-length section was separated by a 100-200 m interval during the set operation.

Set operations were begun by dropping the initial spherical buoy over the side. The attached gear, stacked in the net well, was propelled over a motorized roller to follow the buoy. One crewman stationed on either end of the roller cleared any minor snarls in the gear. The roller, positioned transversely across the fantail, was designed with a larger circumference in the central portion to maintain the separation between the corkline and leadline. This separation was maintained as the gear dropped

towards the water surface by seawater sprayed under high pressure through a set of nozzles located across the fantail under the roller. The seawater spray also reduced the amount of gear web flutter from air turbulence, thus reducing the number of small snarls between the webbing and corkline and/or leadline.

Set operations were observed from locations on top of the poop deck superstructure, aft of the bridge, and forward of the stack. These locations, approximately 9.0-10.0 m eyelevel above the water surface, allowed a 340° view from the vessel to the horizon and a relatively unobstructed view aft along the netline to as close as 10 m astern. A view of the sector 10° on either side of the bow was obstructed by the pilothouse superstructure.

Haul Operations:

Haul operations commenced between 2115 and 2200 hrs JST, allowing a minimum 6.5 hour fishing period following completion of set operations. Sunrise occurred at approximately 0030-0100 hrs JST. Vessel haul speed ranged from 2.9-3.6 kts. Transits between the ends of adjacent net sections were effected at higher speeds in 8-12 minutes. Depending upon the amount of catch in the gear and prevailing sea/wind conditions, each 40 m tan unit was hauled aboard in 15-40 seconds. The haul operations were completed in 6.5-10.5 hours.

Usually, 12 crewmen were stationed on the main deck during haul operations, 4 each along the corkline and leadline and 2 each at the forward and aft processing stations. As time permitted, 1-2 members of the hauling teams assisted the

processing teams and vice versa. The emphasis was on a coordinated effort to maintain a constant haul rate by quickly removing the catch from the gear and efficiently transferring the cleared gear from the main deck to the net well astern.

Squid, fish, and sharks up to 2 m long were hauled on deck with the use of the corkline and leadline hauling apparatus and the concerted effort of up eight crewmen pulling simultaneously on the webbing. Large sharks, billfish, and porpoise were gaffed and manually hauled aboard. Infrequently, large billfish and porpoise were hauled on deck by dropping a rope loop around the tail stock and then utilizing the forecastle boom and electric winch.

Haul operations were observed from the port side bridge wing with eyelevel approximately 6.5-7.0 m above the water surface. Within a step or two, this location allowed (a) a panoramic view of the entire main deck, (b) a clear view forward along the netline, and (c) a relatively acute, downward viewing angle to observe entangled animals and detect dropouts.

Catch composition:

Between 300 to 4,200 neon flying squid were caught per fishing operation. The dropout rate alongside the vessel during a haul was approximately 8-10%. Since non-commercial species caught in the gear, e.g. Pacific pomfret and sharks, were shaken out before arriving on deck, their dropout rates were considerably higher.

Aside from the neon flying squid, the following species were

identified in the catch: albacore (Thunnus alalunga), Pacific pomfret (Brama japonica), yellowtail (Seriola aureovittata), swordfish (Xiphias gladius), marlin (Makaira or Tetrapturus sp.), ocean sunfish (Mola mola), lancetfish (Alepisaurus ferox), opah (Lampris regius), and Pacific saury (Cololabis saira). One pink salmon (Oncorhynchus gorbuscha) was observed. In addition, the following species were tentatively identified: Luvarus sp., viperfish (Chauliodus sp.), Pacific bonito (Sarda chiliensis), pelagic armorhead (Pentaceros richardsonii), chub mackerel (Scomber japonicus), boreopacific gonate squid (Gonatopsis borealis) or makko gonate squid (G. makko), and boreal clubhook squid (Onychoteuthis borealijaponica). Among the sharks, the blue shark (Prionace glauca) was the principal component of the catch; an occasional salmon shark (Lamna ditropis), one thresher shark (Alopias vulpinus), and one tentatively identified mako shark (Isurus oxyrinchus) were also caught.

Neon flying squid, albacore, yellowtail, billfish, and large salmon sharks were the principal species kept for processing. A limited number of large Pacific pomfret and an occasional ocean sunfish were also retained. The remainder of the catch was discarded.

Marine Mammal, Seabird, and Marine Turtle Incidental Take:

A total of 75 marine mammals, representing five species, were incidentally taken, including 43 northern right whale dolphin (Lissodelphis borealis), 8 Pacific white-sided dolphin (Lagenorhynchus obliquidens), 7 Dall's porpoise (Phocoenoides

dalli), 1 striped dolphin (Stenella coeruleoalba), and 16 northern fur seal (Callorhinus ursinus). Five of the incidentally taken animals, i.e. 1 Dall's porpoise, 2 northern right whale dolphins, and 2 northern fur seals, were freed from the gear and released alive in seemingly good condition. During haul operations, an additional 5 northern fur seals swimming freely between the corkline and leadline just ahead of the shallowing bight of webbing were entangled when they failed in eventual attempts to "porpoise" over the corkline and swim clear. These seals incurred few minor injuries, if any, as they were quickly hauled on deck, deftly disentangled, and immediately returned to the sea.

A total of 55 seabirds were observed incidentally taken in the gear, including 40 dark shearwaters; 8 blackfooted albatross (Diomedea nigripes); 6 Laysan albatross (Diomedea immutabilis); and 1 Buller's shearwater (Puffinus bulleri). Among the 40 dark shearwaters, 2 were identified as sooty shearwaters (Puffinus griseus), and 1 as a short-tailed shearwater (Puffinus tenuirostris); 2 were tentatively identified as flesh-footed shearwaters (Puffinus carneipes). The balance was predominantly sooty and short-tailed shearwaters.

One leatherback turtle (Dermochelys coriacea) was incidentally taken in the fishing gear. The animal was released alive in the water and swam away strongly.

Processing the Catch:

After removal from the gear, the neon flying squid were slit

along the silvery stripe along the ventral midline from the mantle opening to the fin insertion. The head with tentacles attached and viscera were removed intact from the mantle. The fins were then removed from the mantle and placed in separate piles. If the outer tissue layer of the mantle was broken, it was removed completely. After the viscera was resected and discarded, the eyes were removed from the heads as time allowed and the remainder of the head with tentacles attached was set aside for further processing. After a thorough seawater rinse, the mantles, "skinned" mantles, fins, and heads with tentacles attached were packed in separate plastic freezer pans measuring 45.5 cm x 31.0 cm x 10.0 cm. When fully packed, each pan weighed an average of 18 kg.

Albacore were processed by three procedures depending upon size. For 3-4 kg fish, the "belly" area was resected and retained; the remainder was discarded. Five to 7 kg fish were filleted, and larger albacore were frozen in the round after the pectoral and tail fins had been removed. The "belly" cuts and fillets were arranged in freezer pans.

A limited quantity of large Pacific pomfret, approximately 30 cm forklength, were processed. They were placed in freezer pans after the head and viscera were removed.

Billfish and large salmon sharks were processed by removing the head, tail, and viscera. The salmon sharks were then frozen in the round. Small billfish were cut into cross-sectioned pieces to fit the freezer pans; larger billfish were filleted,

and the fillets were then trimmed to pack neatly into the freezer pans.

The packed freezer pans were stacked in the blast freezer and left for 8-9 hours at approximately -35° C. The squid and fish were then removed from the freezer pans, covered with an ice glaze, and stacked in the storage hold without packaging.

SIGHTING SURVEYS

Marine Mammal Sighting Surveys:

Sighting surveys were conducted from approximately one hour after sunrise to one hour prior to sunset during the transit from Hakodate to the fishing area and opportunistically after fishing operations commenced. They were primarily carried out from the starboard bridge wing or from within the pilothouse on the starboard side. Observer eyelevel was approximately 6.5-7.0 m above the water surface. The area from directly ahead to 90° abeam of either side of the vessel and extending from the vessel to the horizon was scanned. Opportunistic sighting effort during the fishing operations was primarily conducted from the top of the poop deck superstructure. The area around the vessel to the horizon was scanned from an observer eyelevel of approximately 9.0-10.0 m above the water surface.

Sighting effort was classified into two categories: (a) "on effort" involving systematic scanning while the vessel was underway at relatively constant speed during daylight hours, winds were less than 15 kts, and visibility was greater than 500 m; and (b) "off effort" for less rigorous scanning conducted

under other conditions, e.g. during set and haul operations.

A total of 94.0 hours of "on effort" marine mammal sighting surveys were conducted while in transit to the initial fishing operation position (1-11 July) and after fishing operations had begun, 17.5 hours and less than one hour during July and August, respectively. The time demands for conducting observations on fishing operations in the latter periods precluded "on effort" sighting surveys during transits between fishing operation locations scheduled on successive days. Sixty-five sightings were recorded during "on effort" sighting surveys.

Species sighted during the surveys included northern right whale dolphin, Pacific white-sided dolphin, Dall's porpoise, True's porpoise (Phocoenoides dalli, truei type), unidentified beaked whales (Family Ziphiidae), sperm whale (Physeter macrocephalus), sei whale (Balaenoptera borealis), fin whale (Balaenoptera physalus), northern fur seal, and northern elephant seal (Mirounga angustirostris).

During fishing operations, 120 sightings of seven species were made. These included Dall's porpoise, Pacific white-sided dolphin, sei whale, fin whale, sperm whale, northern fur seal, and northern elephant seal. Aside from northern fur seals, Dall's porpoise were the most frequently sighted species during set operations (11 sightings/35 animals); none were observed during haul operations. Pacific white-sided dolphin were the only other identified small odontocete sighted (3 / 28), all during set operations. Northern fur seals were observed during

set operations (13 / 17) but were more commonly sighted during haul operations (78 / 121).

Seabird Surveys:

Sighting surveys for seabirds were conducted opportunistically while the vessel was underway during daylight hours, winds were less than 25 kts, and visibility was greater than 4 nm. The surveys were conducted from the starboard bridge wing with observer eyelevel at approximately 7.0-7.5 m above the water surface. The 90° sector originating from directly ahead to abeam of the vessel and extending from the vessel to 300 m was scanned. Counts were conducted for 10-minute periods. A total of 66 ten-minute counts were completed during the transit to the initial fishing operation position (1-11 July) and 17 ten-minute counts were completed once fishing operations commenced.

Species sighted during the surveys included blackfooted albatross, Laysan albatross, northern fulmar (Fulmarus glacialis), Buller's shearwater, short-tailed shearwater, sooty shearwater, Bonin petrel (Pterodroma hypoleuca), Cook's petrel (Pterodroma cooki), Hawaiian petrel (Pterodroma phaeopygia), mottled petrel (Pterodroma inexpectata), Stejneger's petrel (Pterodroma longirostris), Leach's storm petrel (Oceanodroma leucorhoa), red phalarope (Phalaropus fulicarius), arctic skua (Stercorarius parasiticus), long-tailed skua (Stercorarius longicaudus), and south polar skua (Catharacta maccormicki).

During net set and haul operations, blackfooted albatross and Laysan albatross were the most frequent species observed; the

most numerous of the two was the blackfooted albatross by a factor of approximately 5:1. They rested on the water along the corkline and fed upon the remains of fish, squid, and other organisms in the gear webbing. During haul operations, flocks of up to 80 albatross frequently aggregated astern of the vessel to feed upon offal, the discarded remains of processed squid, fish, and sharks.

Passing flocks of 2-15 Buller's shearwater were occasionally observed while larger flocks of up to 35 were rarely sighted. Dark shearwaters, i.e. short-tailed, sooty, and flesh-footed shearwaters, were infrequently sighted and usually in groups of 1-2 birds. Aside from albatross, none of the other seabird species were observed actively feeding near or along the gill net in the water.

Net Debris Surveys:

Net debris surveys were conducted concurrently with marine mammal and seabird surveys from the starboard bridge wing and opportunistically during net set and haul operations from vantage points on top of the poop deck superstructure, approximately 9.0-10.0 m at eyelevel above the sea surface. The estimated effective range for detecting gear fragments was 50 m and highly dependent upon sea surface conditions.

Eleven fragments of fishing gear were observed, 5 during haul operations (Table 8). Of the 11 gear fragments, 5 were identified as gill net, 2 as trawl gear, and 4 were undetermined.

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APPENDIX

Table 1. Set data for observations aboard the commercial Japanese high-seas gillnet vessel, Shunyo Maru No. 18, 1 July - 14 August 1986.

Set No.	Date	Begin Time	End Time	No. of Sect's	Set Position Begin N	Set Position Begin W	Set Position End N	Set Position End W	Set Bearing	Water Temp. Range, °C	Wind[1] (°)(B)	Swell (°)(m)	Weather	Vis nm[2]
01	7-11	1154	1439	7	41°00.1'	164°10.8'	40°59.9'	164°45.8'	270°	13.4-14.5	090-3	090-1.0	C	7
02	7-12	1105	1408	8	40°49.3'	165°27.9'	40°49.1'	164°48.9'	090°	14.1-14.8	250-3	250-1.0	F	0-5
03	7-14	1051	1349	8	41°41.6'	158°49.8'	41°41.3'	158°08.6'	090°	14.6-15.6	100-1	320-0.5	F-M	0-6
04	7-15	1059	1356	8	41°54.4'	159°14.7'	41°57.7'	158°34.0'	090°	14.2-14.7	180-2	180-0.5	pF	0-6
05	7-16	1126	1421	8	41°41.9'	160°39.8'	41°34.8'	161°20.0'	265°	15.2-16.2	0	250-1.0	F	0-2
06	7-17	1147	1443	8	41°53.3'	162°50.5'	41°53.0'	163°31.0'	270°	15.0-17.2	270-1	270-0.5	F	0-2
07	7-19	1128	1424	8	41°39.4'	169°56.5'	41°40.9'	170°34.7'	270°	14.2-15.2	121-1	110-1.0	C-F	5-6
08	7-20	1134	1429	8	40°53.3'	169°54.5'	40°50.8'	170°33.9'	265°	15.8-16.0	030-1	030-1.0	C	7
09	7-21	1145	1444	8	41°16.1'	169°18.1'	41°13.6'	169°57.2'	270°	15.3-16.2	060-2	060-1.0	bC	6
10	7-22	1141	1449	8	41°21.7'	169°13.8'	41°16.5'	169°56.4'	260°	14.6-16.0	010-3	010-1.5	C	6
11	7-23	1127	1427	8	41°34.5'	168°44.3'	41°33.4'	169°24.6'	270°	14.3-15.2	340-2	340-1.5	C-R	4-5
12	7-24	1125	1342	6	41°36.0'	169°01.2'	41°35.2'	169°33.0'	270°	14.7-15.9	100-1	100-1.0	bC	6
13	7-25	1119	1342	6	41°28.9'	167°58.7'	41°37.4'	168°25.0'	280°	14.2-14.6	045-3	360-1.5	C-F	3-5
14	7-27	1055	1358	8	41°51.6'	164°19.8'	41°54.2'	163°39.8'	090°	14.4-15.1	130-3	130-2.0	O-C	6
15	7-28	1054	1354	8	41°51.8'	164°26.1'	41°53.4'	163°46.5'	090°	14.5-15.1	180-2	130-1.0	bC-F	4-6
16	7-29	1105	1404	8	41°55.6'	163°38.8'	41°54.7'	162°58.6'	090°	15.5-15.6	260-3	260-1.0	F	1-6
17	7-30	1025	1325	8	41°58.5'	162°31.4'	41°53.2'	161°47.1'	095°	15.3-15.9	290-3	310-1.0	C-M	5-6
18	8-01	1041	1336	8	43°54.2'	158°49.2'	43°55.3'	158°07.6'	090°	13.8-14.0	330-2	330-1.0	C-F	5-6
19	8-02	1015	1310	8	43°56.9'	158°00.6'	43°57.4'	157°18.3'	090°	13.8-14.6	180-1	180-0.5	C-BC	6-7
20	8-03	1010	1304	8	43°56.0'	158°11.4'	43°56.0'	157°30.1'	090°	13.9-14.3	230-2	230-1.0	bC-M	5-6
21	8-04	1004	1259	8	43°46.1'	158°22.1'	43°48.7'	157°40.2'	085°	14.3-14.7	180-2	300-1.5	C	6
22	8-05	1023	1321	8	43°47.0'	158°27.2'	43°47.5'	157°44.2'	090°	14.4-15.1	220-3	220-1.0	F	0
23	8-06	1027	1329	8	43°41.7'	158°28.3'	43°44.1'	157°46.0'	085°	14.5-15.0	250-3	250-1.0	F	0-2
24	8-07	1104	1343	7	43°26.0'	158°16.9'	43°32.7'	157°40.7'	080°	15.0-15.4	210-3	210-1.5	F	0
25	8-08	1055	1359	8	43°20.1'	158°25.1'	43°18.9'	157°40.0'	090°	15.0-15.5	215-3	215-1.0	R-F	2-4
26	8-09	1103	1409	8	* 43°17'	*158°14'	43°17.2'	157°33.0'	090°	15.2-15.7	200-2	200-1.0	bC-F	1-6
27	8-10	1134	1446	8	43°16.4'	158°21.5'	43°16.8'	157°39.1'	090°	15.1-15.7	240-3	240-1.5	M-F	1-3
28	8-11	1215	1512	8	43°29.7'	156°39.8'	43°34.1'	155°57.9'	080°	14.7-15.1	220-2	280-1.0	F-D	0-2
29	8-12	1118	1418	8	43°30.6'	155°59.5'	43°33.1'	155°18.5'	085°	15.0-15.9	220-3	220-1.5	F	0
30	8-13	1101	1359	8	43°10.5'	155°45.6'	43°14.1'	155°06.0'	080°	16.4-16.9	240-2	240-1.5	pF	4-5

* NNSS unit temporarily inoperative. Assigned set position is noted.
Weather codes: c=cloudy; D=darkness; F=fog; M=mist; O=overcast; R=rain; BC=blue, clear; bC=broken clouds; pF=intermittent fog.
Wind[1]: e.g. 090°-3 = wind is 090° at Beaufort 3; 0 = calm.
Vis., nm[2]: visibility. Range indicates variable visibility for specified time period due to weather.

Table 2. Haul data for observations aboard the Japanese high-seas squid gillnet vessel, Shunyo Maru No. 18, 1 July - 14 August 1986.

Haul	Begin		End		Haul Position				Wind[1]	Swell		Vis.
					Begin		End					
No.	Date	Time	Date	Time	N	W	N	W	(°) - (B)	(°) - (m)	Weather	nm[2]
01	7/11	2120	7/12	0452	41°01.5'	164°49.9'	41°00.0'	164°18.8'	100-3	100-2	R - M	0-6
02	7/12	2115	7/13	0532	40°49.1'	164°49.6'	40°47.3'	165°27.6'	250-3	250-2	F - C	0-5
03	7/14	2115	7/15	0559	41°41.8'	158°11.8'	41°39.5'	158°46.8'	180-2	180-1	F	0-2
04	7/15	2113	7/16	0522	42°01.4'	158°31.0'	41°53.5'	159°12.5'	200-2	200-1	F	0-1
05	7/16	2115	7/17	0532	41°38.0'	160°38.3'	41°35.8'	161°17.1'	270-1	270-1	F	0-2
06	7/17	2120	7/18	0650	41°52.9'	163°34.2'	41°57.6'	162°54.1'	090-2	090-1.5	F - BC	0-8
07	7/19	2118	7/20	0559	41°41.7'	170°33.2'	41°39.0'	169°59.5'	130-1	130-1.5	F - C	0-6
08	7/20	2132	7/21	0704	40°46.5'	170°38.8'	40°55.0'	170°01.3'	050-1>050-3	050-1.5	F - bC	0-6
09	7/21	2132	7/22	0743	41°14.1'	170°05.1'	41°18.0'	169°21.5'	010-3	010-2	C	0-6
10	7/22	2126	7/23	0801	41°15.1'	169°58.3'	41°21.6'	169°18.3'	010-3>040-3	010-2	C - R	0-5
11	7/23	2126	7/24	0544	41°32.8'	168°47.7'	41°35.8'	169°27.0'	180-1	360-1>310-1	C - O	0-7
12	7/24	2227	7/25	0505	41°34.9'	169°34.0'	41°38.6'	169°06.6'	030-2	030-1.5	C	0-6
13	7/25	2156	7/26	0504	41°25.8'	168°01.3'	41°35.2'	168°31.9'	360-1>360-3	040-1.5	F - R	0-5
14	7/27	2116	7/28	0645	41°57.2'	163°39.6'	41°48.4'	164°14.2'	230-2>230-3	230-1.5	C - bC	0-6
15	7/28	2125	7/29	0552	41°55.6'	163°44.7'	41°50.6'	164°25.5'	230-2>230-3	230-1.5	C - bC	0-6
16	7/29	2125	7/30	0551	41°53.2'	162°52.5'	41°55.3'	163°36.4'	270-2	270-1.5	pF - C	0-6
17	7/30	2124	7/31	0506	41°52.6'	161°48.2'	41°58.4'	162°27.0'	270-2	270-1	C	0-6
18	8/01	2135	8/02	0444	43°55.0'	158°07.4'	43°56.0'	158°49.8'	315-1	315-1	C	0-6
19	8/02	2133	8/03	0519	43°57.7	157°15.2'	43°58.9'	157°56.8'	215-1>215-2	180-1>215-1	C	0-6
20	8/03	2132	8/04	0556	43°54.0'	157°25.2'	43°55.3'	158°06.6'	225-2>270-2	260-2	C - F	0-5
21	8/04	2129	8/05	0552	43°48.0'	157°29.6'	43°47.2'	158°19.1'	220-2>200-2	250-1>210-1	BC - F	0-6
22	8/05	2131	8/06	0701	43°46.7'	157°41.0'	43°47.9'	158°20.2'	225-3	225-1.5	F - R	0-3
23	8/06	2132	8/07	0637	43°47.2'	157°43.6'	43°45.0'	158°25.8'	220-2>220-3	220-1	C-F-R	0-5
24	8/07	2152	8/08	0550	43°32.2'	157°34.2'	43°22.9'	158°10.9'	210-2	210-1	R - F	0-4
25	8/08	2123	8/09	0626	43°18.5'	157°36.8'	43°19.8'	158°21.2'	310-3>200-2	290-1>200-1	C-M-O	0-7
26	8/09	2125	8/10	0703	43°17.9'	157°26.5'	43°15.7'	158°10.3'	230-3	230-1.5	F	0-3
27	8/10	2125	8/11	0626	43°16.4'	157°33.3'	43°18.7'	158°12.5'	220-3	220-1.5	F - bC	0-5
28	8/11	2155	8/12	0627	43°35.6'	155°53.3'	43°29.2'	156°30.3'	220-2	220-1	F - bC	0-2
29	8/12	2156	8/13	0618	43°33.3'	155°18.3'	43°30.3'	155°56.4'	220-2	220-1	C - F	0-1
30	8/13	2126	8/14	0553	43°15.6'	155°00.8'	43°08.4'	155°42.1'	220-1	220-1	F	0

Weather codes: C=cloudy; D=darkness; F=fog; M=mist; O=overcast; R=rain; BC=blue, clear; bC=broken clouds; pF=intermittent fog.

Wind[1]: e.g. 100-3 = wind 100° at Beaufort 3. The symbol > indicates a change in conditions during the specified time.

Vis[2]: visibility. Range indicates variability in visibility due to weather conditions.

Table 3. Summary of the incidental take of marine mammals observed in 30 haul operations aboard the Japanese, high-seas, squid gillnet vessel, Shunyo Maru No. 18, 1 July - 14 August 1986. Note: D=number of dead animals landed; R=number of animals released alive; and L=number of dead animals not landed.

Haul	Lissodelphis borealis			Lagenorhynchus obliquidens			Phocoenoides dalli			Callorhinus ursinus			Stenella coeruleoalba		
No.	D	R	L	D	R	L	D	R	L	D	R	L	D	R	L
01	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
02	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
03	1	0	0	1	0	1	0	0	0	1	0	0	0	0	0
04	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0
07	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0
08	10	1	3	0	0	0	0	0	0	0	0	0	0	0	0
09	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	1	1	0	2	0	0	0	0	0	0	0	0	0
11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	6	0	2	0	0	0	0	0	0	0	0	0	0	0	0
13	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
14	2	0	4	2	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
19	0	0	0	0	0	0	1	0	0	4	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
23	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	27	2	14	5	0	3	4	1	2	14	2	0	1	0	0
				Pacific Whitesided Dolphin			Dall's Porpoise			N. Fur.			Striped Dolphin		

Table 4. Summary of the incidental take of seabirds observed in 30 haul operations aboard the Japanese, high-seas, squid gillnet vessel, Shunyo Maru No. 18, 1 July - 14 August 1986. Note: D=number of dead animals hauled on board; R=number of animals released alive; and L=number of dead animals observed and not hauled aboard.

Haul	Puffinus griseus			Puffinus tenuirostris			Puffinus sp.			Diomedea nigripes			Diomedea immutabilis			Other		
No.	D	R	L	D	R	L	D	R	L	D	R	L	D	R	L	D	R	L
01	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	*1	0	0
02	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
04	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	5	0	1	0	0	0	0	0	0	0	0	0
08	1	0	0	1	0	0	6	0	0	3	0	1	1	0	0	!1	0	0
09	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	*1	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
19	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	2	0	0	1	0	0	32	1	2	7	0	1	5	0	1	3	0	0

Legend: * = Fleshfooted shearwater (Puffinus carneipes)
! = Buller's shearwater (Puffinus bulleri)

Table 5. Summary of catch from 30 haul operations observed on board the Japanese squid gillnet vessel, Shunyo Maru No. 18, 1 July - 14 August 1986.

Haul No.	O. b.	T. a.	B. j.	S. a.	A. f.	A.f./ C. sp	M. m.	X. q.	O. sp	L. sp	Misc. Fish	P. q.	L. d.	Misc. Shark
01	1,166	0	276	0	0	4	0	0	0	0	0	15	0	0
02	ND	2	686	3	0	2	0	0	0	0	0	9	1	0
03	602	759	41	9	0	13	4	0	0	4	4	6	3	3
04	601	337	75	30	5	2	3	0	0	0	1	3	16	4
05	259	349	46	5	6	3	1	0	0	2	3	6	6	1
06	559	755	4,062	0	1	0	4	0	0	6	0	7	1	1
07	490	7	5,895	0	6	0	1	0	0	4	0	10	3	1
08	1,269	1,410	1,178	37	3	0	1	3	0	8	0	67	0	0
09	1,813	253	15,085	4	0	0	5	5	0	0	1	121	0	0
10	1,856	271	1,935	6	3	0	14	2	0	2	0	94	0	0
11	1,792	423	1,034	1	2	4	3	0	0	0	0	29	0	0
12	1,554	98	8,455	0	1	3	0	1	0	0	1	42	0	0
13	1,115	50	2,920	4	0	0	1	0	1	0	0	3	1	0
14	3,228	71	295	0	7	0	1	1	0	1	0	38	0	1
15	1,473	230	175	1	3	0	0	2	0	1	0	34	0	0
16	1,128	640	170	3	9	0	3	2	0	0	0	125	0	0
17	462	590	325	36	5	0	2	4	0	0	0	196	0	1
18	843	123	285	1	3	0	0	1	0	0	0	7	3	0
19	1,654	247	590	0	5	0	0	0	0	3	4	13	0	0
20	2,072	171	1,965	1	3	0	0	0	0	0	5	8	1	0
21	4,208	55	1,340	0	1	0	0	0	0	0	0	13	1	1
22	2,726	12	3,720	1	0	0	1	0	0	0	0	11	2	0
23	2,845	44	3,910	2	0	0	0	0	0	0	0	24	2	0
24	2,959	30	1,870	0	3	0	1	0	0	0	0	400	3	0
25	3,178	21	510	0	0	0	2	0	0	0	0	264	0	0
26	2,780	55	410	2	5	0	8	0	0	0	0	107	0	0
27	958	44	100	9	1	0	12	0	0	0	0	28	0	0
28	1,685	86	2,500	14	5	0	2	0	0	0	0	92	0	0
29	1,475	63	1,260	5	1	0	2	0	0	0	0	235	0	0
30	1,103	65	1,720	1	0	0	8	2	0	0	0	598	0	0

Table 5 (Continued). Summary of catch from 30 haul operations observed on board the Japanese, high-seas, squid gillnet vessel, Shunyo Maru No. 18, 1 July - 14 August 1986.

Legend for column designations:

A. f. = Alepisaurus ferox	B. j. = Brama japonica	C. sp. = Chauliodus sp.	L. sp. = Luvarus sp.
L. d. = Lamna ditropis	M. m. = Mola mola	O. b. = Ommestrephes bartrami	O. sp. = Oncorhynchus sp.
P. g. = Prionace glauca	S. a. = Seriola aureovittata	T. a. = Thunnus alalunga	X. g. = Xiphias gladius

Table 6. Summary of marine mammal sightings from surveys conducted on on board the Japanese squid gillnet vessel, Shunyo Maru No. 18, 1 July - 14 August 1986. Noted as number of sightings (groups) - number of animals.

	During Transit 1-11 July		During Fishing Operations 11 July-14 Aug.	
	On Effort	Off Effort	On Effort	Off Effort
Lissodelphis borealis	3 - 14	0 - 0	0 - 0	0 - 0
Lagenorhynchus obliquidens	10 - 84	5 - 16	1 - 6	3 - 28
Phocoenoides dalli	17 - 55	0 - 0	0 - 0	9 - 28
Phocoenoides dalli, truei type	4 - 15	1 - 3	0 - 0	0 - 0
Phocoenoides sp.	2 - 8	1 - 2	0 - 0	2 - 7
Unidentified porpoise	3 - 6	1 - 5	0 - 0	3 - 7
Beaked whale (Family Ziphiidae)	2 - 4	0 - 0	0 - 0	0 - 0
Mesoplodon sp.	1 - 2	0 - 0	0 - 0	0 - 0
Physeter macrocephalus	1 - 1	0 - 0	0 - 0	6 - 22
Balaenoptera borealis	0 - 0	0 - 0	0 - 0	3 - 4
Balaenoptera physalus	0 - 0	0 - 0	0 - 0	1 - 2
Unidentified whale	0 - 0	0 - 0	0 - 0	1 - 1
Callorhinus ursinus	12 - 13	1 - 1	0 - 0	91 -138
Mirounga angustirostris	0 - 0	0 - 0	0 - 0	1 - 1

Table 7. Summary of seabird sightings from surveys conducted on board the Japanese, high-seas, squid gillnet vessel, Shunyo Maru No. 18, 1 July - 14 August 1986.

Species	During Transit 1-11 July	During Fishing Operations 11 July-14 Aug.
Blackfooted albatross (Diomedea nigripes)	54	22
Laysan albatross (Diomedea immutabilis)	72	25
Buller's shearwater (Puffinus bulleri)	127	45
Short-tailed shearwater (Puffinus tenuirostris)	8	0
Sooty shearwater (Puffinus griseus)	31	0
"Dark shearwaters" (Puffinus sp.)	22	3
Northern fulmar (Fulmaris glacialis)	7	0
Bonin petrel (Pterodroma hypoleuca)	2	0
Cook's petrel (Pterodrodma cooki)	5	0
Hawaiian petrel (Pterodroma phaeopygia)	0	1
Mottled petrel (Pterodroma inexpectata)	4	0
Stejneger's petrel (Pterodroma longirostris)	13	0
Leach's storm petrel (Oceanodroma leucorhoa)	47	0
Red phalarope (Phalaropus fulicarius)	13	0
Arctic skua (Stercorarius parasiticus)	2	0
Longtailed skua (Stercorarius longicaudus)	0	1
Skua (Stercorarius sp.)	8	0
South polar skua (Catharacta maccormicki)	3	4

Table 8. Fishing gear fragments observed from the Japanese, high-seas, squid gillnet vessel, Shunyo Maru No. 18, 1 July - 14 August 1986.

Date	Time	Lat., N	Long., E/W	Description
7/02	1656	41°16.2'	144°18.2' E	Four white floats (c.a. 6" ln. x 5" dia.) with approximately 3 ft of line through the center. No webbing observed.
7/07	0758	39°13.6'	171°09.6' E	16-20 yellow gillnet floats bunched together, approximately 17 m of corkline. No webbing observed.
7/10	0822	*39°50'	*170°35' E	20-25 gillnet floats bunched together with approximately 20 m of blue-green line draped over. No webbing observed.
7/10	1135	39°53.8'	169°45.7' E	25 yellow gillnet floats bunched together; approximately 20 m of corkline. No webbing observed.
7/18	0608	41°57.6'	162°54.1' W	Webbing entangled or resting on kelp at surface. Appeared to be braided multifilament, i.e. trawl webbing. Haul #06.
7/19	0737	*41°41'	*169°14' E	2 m x 5 m section of light green, gillnet webbing. Just below water surface. Covered with little or no algal growth.
7/19	0742	41°41.7'	169°15.8' W	2 m x 3 m section of webbing entirely covered with algal growth. Unable to determine whether trawl or gillnet webbing.
7/30	2258	41°52.6'	161°48.2' W	Wad of webbing briefly snagged in gear during Haul #17. Appeared to be approximately 40-50 m of gillnet webbing.
8/02	0414	*43°56'	*158°51' W	C.a. 20 ft of approximately 2" dia. line covered with algal growth. No webbing observed. Haul #18.
8/09	0125	*43°20'	*158°36' W	2 m x 2 m section of webbing covered with algal growth. Unable to determine whether trawl or gillnet webbing. Haul #25.
8/10	0237	*43°15'	*158°23' W	2 m x 2 m section of multifilament, braided (trawl?) webbing covered with algal growth. Haul #26.

* Position calculated using "dead reckoning" program.

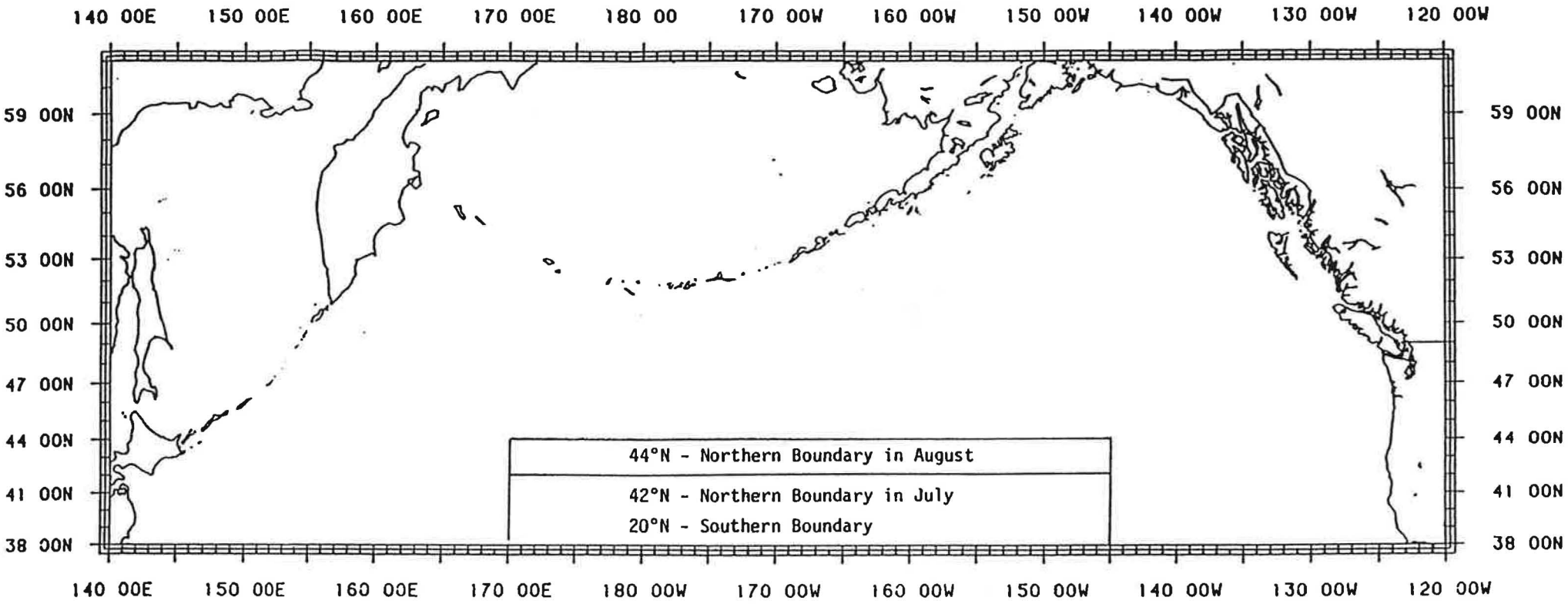

Figure 1. Japanese commercial squid gillnet regulatory area in the North Pacific.

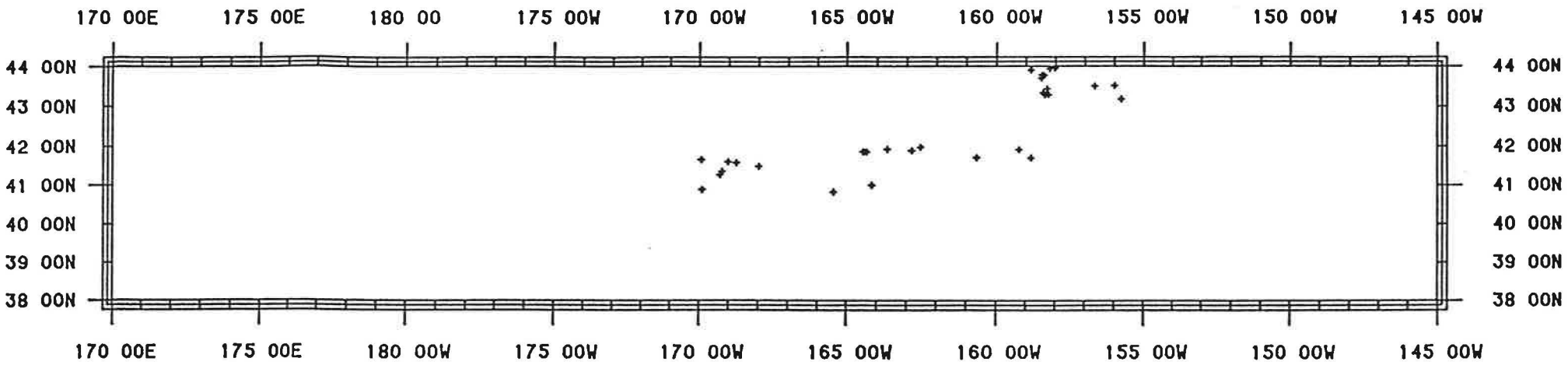

Figure 2. Observed squid gillnet set operations in 1986, July (17 sets) and August (13 sets). Japanese commercial squid gillnet regulatory area of the North Pacific Ocean - northern boundary 42°N in July and 44°N in August; southern boundary 20°N.