Cruise Report of the Flying Squid Survey by the
Kanki Maru No. 3 in April/May, 1990

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1990 September
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This paper may be cited in the following manner:
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ABSTRACT

The following flying squid survey was conducted using the Kanki maru No. 3 in the area of 32°30' to 38°30'N and at 172°30' to 177°30'E in the north Pacific Ocean during April and May in 1990: (1) comparison of the catch of flying squid by surface and subsurface gillnets, and obtaining information on the incidental catch of salmonids, marine mammals and sea birds (at 11 stations), (2) fishing survey of flying squid with automatic jigging machines (at 15 stations) and (3) tagging experiment of flying squid caught by automatic jigging machines and by hand jigging (at 15 stations). In this survey, 30 tans of surface gillnet (115 mm mesh) and 30 tans of subsurface gillnet, which was modified from the surface gillnet to be set at a depth of 3 m from the surface, were linked together and the simultaneous operations of surface and subsurface gillnets were conducted to compare the catch.

By the surface gillnet (323 effective tans), a total of 224 squid and fin fish was caught including 146 flying squid, 38 yellowtail and 19 great blue shark. In addition, a steelhead was caught incidentally. By the subsurface gillnet (320 effective tans), a total of 74 squid and fin fish was caught including 61 flying squid and 9 great blue sharks. Although surface gillnets caught incidentally 3 sooty shearwaters (2 dead, 1 alive), subsurface gillnets did not catch any sea birds. No marine mammals were caught incidentally by either type of net.

A total of 258 flying squid was caught by eight automatic jigging machines at 15 stations, and a total of 214 flying squid was caught by hand jigging at 12 stations. Of the total of 472 flying squid caught by the automatic jigging machine and hand jigging, 360 squid were tagged and released.

The mantle length of the flying squid caught by gillnets ranged from 25 cm to 49 cm (mode: 40 cm) for combined sex. Most female flying squid larger than 40 cm and males larger than 30 cm were mature. The mantle length of the flying squid caught by jigging machines and hand jigging ranged from 16 cm to 47 cm for combined sex. In both catch, three different groups that have the modes at 17 cm to 18 cm, 30 cm, and 40 cm to 44 cm were observed.
1. Introduction

The National Research Institute of Far Seas Fisheries conducted a survey on the flying squid stock in the north Pacific Ocean using four scientific research vessels in 1990 (Hayase et al. 1990) as a continuation of 1989. The objectives of the research conducted by the Kanki maru No. 3 were as follows: (1) comparison of the catch of flying squid and non-target species by surface gillnet and subsurface gillnet operations; (2) fishing survey of flying squid by using automatic jigging machines and hand jigging and tagging of squid. The following report summarizes the information obtained by the research cruise by the Kanki maru No. 3.

2. Method of Research

1) Research Vessel

   Kanki maru No. 3  246.93 GT  850 hp

2) Researcher

   Takashi Domon (Resources Division, Fisheries Agency of Japan)

3) Crew

   Mr. Yasuyuki Fukushi and 11 crew members

4) Period

   Departure from Yamada: April 19
   Fishing survey with gillnets, automatic jigging machines, hand jigging and oceanographic observation: April 29 to May 14
   Arrival at Yamada: May 26

   The dates used in this report are based on Japanese time.

5) Area

   North Pacific Ocean (32°30' to 38°30'N and 172°30' to 177°30'E). (Fig. 1).

6) Items of Research

   (1) Oceanographic Observations

   At each station, surface water temperature was measured by sampling of water. Water temperature from surface to a depth of 300 m was measured by
MBT-600. During the cruise, surface temperature at each hour and the sea weather was recorded.

(2) Comparison of Catch of Flying Squid and Non-Target Species by Surface and Subsurface Gillnets

The number of survey stations was 11. Thirty tons of surface gillnet (115 mm mesh) was linked to the 30 tons of subsurface gillnet for the operation. The subsurface gillnet was made by hanging the netting of the ordinary commercial gillnet from the surface float line with suspension lines to set up with the position of the upper end of the netting at a depth of 3 m from the surface (Fig. 2). The net was cast one hour before sunset, and the net was hauled before sunrise. The catch reported here is the number of fish which were retrieved on board the vessel, and fish which were entangled in the net but dropped out in visible scope were recorded as dropouts. The catch (in number) was recorded by surface and subsurface gillnets. For flying squid, catch weight was also recorded by type of gillnet. A part of the squid catch was frozen and brought back to the National Research Institute of Far Seas Fisheries for biological measurements.

(3) Fishing Survey of Flying Squid with Automatic Jigging Machines and Hand Jigging and Tagging Experiment

At 15 stations, including the same stations as those for gillnet surveys, fishing survey and tagging experiment for flying squid were conducted using automatic jigging machines and hand jigging. The fishing survey with automatic jigging machines was conducted with a total of 8 machines, 4 machines at each gunwale, for about 2 to 5 hours after the sunset. Hand jigging was started 2 hours after the cast of the gillnets and continued for about 1 to 3 hours and was operated by average of 5 people. Out of 472 flying squid caught, 360 were tagged and released after the mantle length measurements.

3. Results

1) Oceanographic Observation

The lowest surface water temperature at each station was 12.1°C (St. 9) and the highest temperature was 17.8°C (St. 15). The isothermal lines of 13°, 14° and 15°C (surface temperature) distributed closely with each other. A cold water with the temperature less than 13°C was observed near St. 9 (38°30'N, 175°E).

2) Comparison of Catch of Flying Squid and Non-Target Species Caught by the Surface and Subsurface Gillnets

The total number caught (and weight for flying squid) and dropouts by species and by type of net are shown in Table 1. Flying squid was dominant in the catch and accounted for 69% of the total. The CPUE of flying squid
The squid CPUE (squid/100 tans) at each station by type of net is shown in Fig. 4. The CPUE was generally higher in the northern survey area.

By 11 surface gillnet operations (323 effective tans), a total of 224 squid and fin fish was caught, including 146 flying squid, 38 yellowtail, and 19 great blue shark. As for salmonids, a steelhead was caught at St. 9 (38°30'N, 175°E) on May 8. In addition, three sooty shearwaters were caught incidentally (2 dead, 1 alive). Although a total of 320 tans of effective gillnets was used for the subsurface gillnet operations, almost the same as the number of effective tans used for the surface gillnet operations, the number of flying squid caught decreased to less than half (61 squids) of that of surface gillnets. The catch of other species was also low. The CPUE of the four major species obtained by the surface and subsurface gillnets was plotted on the x-y coordinates. The results show that the CPUE obtained by the surface gillnet was higher for all four species; flying squid, albacore, yellowtail and great blue shark (Fig. 5). In addition, no sea bird was caught incidentally by the subsurface gillnet. The number of dropouts of flying squid and fish was more in the surface gillnet than the subsurface gillnet.

3) Fishing Survey of Flying Squid with Automatic Jigging Machines and Hand Jigging and Tagging Experiment

The catch in number of flying squid by the squid jigging method and the number of flying squid released are shown in Table 2. The number of flying squid caught by automatic jigging machines and by hand jigging were similar and were 258 and 214, respectively. The CPUE (squid/machine/hour) was high at St. 7 (37°30'N, 177°30'E) and at St. 14 (34°30'N, 172°30'E) for the jigging machine operations (Fig. 6). Three hundred sixty mantle lengths of flying squid were measured and then tagged and released. There is no recovery report to date.

4) Mantle Length Frequency Distribution of Flying Squid Caught by the Gillnets

The mantle length frequency distribution of the flying squid caught by the surface and subsurface gillnets are combined for all stations and shown in Fig. 7. For the squid caught by the surface gillnet, the mantle length ranged from 25 cm to 49 cm with mode at 33 cm and from 40 cm to 41 cm. For those by the subsurface gillnet, the mantle length ranged from 30 cm to 45 cm with modes at 33 cm and from 40 cm to 42 cm. Most female flying squid larger than 40 cm and males larger than 30 cm were mature. The mantle length frequency distribution for combined types of gillnet at each station is shown in Fig. 8. In west of 175°E, southern stations had higher frequency of small-sized squid.

5) Mantle Length Frequency Distribution of Flying Squid Caught by the Automatic Jigging Machine and Hand Jigging

The mantle length frequency distribution of the flying squid caught by the automatic jigging machine and hand jigging are shown in Fig. 9.
squid of small-sized, mid-sized and large-sized groups with the modes at 17 cm to 18 cm, 30 cm and 40 cm to 44 cm, respectively were caught by both machine and hand jigging. The percentage of small-sized squid was higher in the catch by automatic jigging machines, and the percentage of mid and large-sized squid was higher in the catch of hand jigging. In addition, small-sized squid with a mode at 17 cm to 18 cm was obtained by jigging but not obtained at all by gillnets. This may be due to the mesh selectivity.

References, Tables 1 and 2 and Figs. 1 to 9 are in English in the Japanese document.