Preliminary Report of Biological Information Obtained from 1990 Summer Pollock Stock Research in the Bering Sea by *Daian maru No. 128*

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ABSTRACT

The Japan-U.S. Cooperative Resource Survey using jointly the midwater trawl and quantitative echo sounder system was conducted in 1990, as a continuation of the studies which were conducted in 1988 and 1989, with the objectives to estimate the biomass and obtain information on the ecology of pelagic pollock which are distributed in the Bering Sea. The survey was conducted using the Daian maru No. 128, a landbased dragnet trawler from July to September, 1990. This report provides an outline of the biological research and some preliminary results of that research.

A total of 28 tows was conducted with the midwater trawl and 5 tows were made with the bottom trawl for sampling of adult pollock. Trawling was conducted when a certain density of fish signs was observed on the monitor of the echo sounder system.

In the length composition of pollock, a significant difference was recognized by area. Modes in the length composition by area were observed at 47 cm for the southern continental shelf, and at 37 cm for the northern continental shelf, and had a tendency to be smaller, as latitude went to north. In addition, pollock ranging between 20 cm and 30 cm in body length which were observed on the northern continental shelf were not observed on the southern continental shelf. In contrast, there was no significant difference in the Basin area between north and south where the mode was recognized at approximately 49 to 50 cm.

Further, while a total of 38 tows was conducted with the midwater trawl for the sampling of juvenile pollock, we are still analyzing the data and will report fully after completion of the analyses.
1. Introduction

A series of research conducted in the international waters of the Bering Sea began in the summer of 1988, using jointly acoustic systems and midwater trawl with the objective of clarifying the biomass and ecology of pelagic pollock caught by five countries including Japan. This survey was conducted jointly by the National Research Institute of Far Seas Fisheries, National Research Institute of Fisheries Engineering, and the U.S. Alaska Fisheries Science Center (AFSC). The areas surveyed were the Aleutian Basin excluding the U.S.S.R. 200 mile zone, and the eastern continental shelf area. The acoustic system used for this survey was the quantitative echo sounder system which was developed by the National Research Institute of Fisheries Engineering. Although the analyses of data collected have not yet been completed, we report here an outline of the research and results obtained to date from surveys conducted using sampling gear such as the midwater trawl.

2. Materials and Methods

The 1990 survey was conducted using the Daian maru No. 128, a chartered landbased dragnet trawler (279 GT and 2,600 hp), from June 28 to October 5, 1990. The calibration of the quantitative echo sounder system and collection of basic data for this system took place from June 29 to July 9, and the field surveys were conducted in the Bering Sea from July 17 to September 26. The survey areas are shown in Fig. 1 and the cruise schedule are shown in Table 1.

The operational patterns during the survey were as follows: acoustic data were collected by the quantitative echo sounder system for 24 hours a day, while cruising along the transect lines, and species and length composition for the major echo signs were examined from the samples taken by the midwater trawl nets. In these cases, when a certain degrees of echo signs appeared on the monitor, the vessel returned to the area at which the echo signs had appeared, and sampling with the midwater trawl net was conducted. The midwater trawl net was 84.35 mm in length excluding the cod-end. The mesh size around the net mouth was 300 mm, and 100 mm at the near cod-end. The cod-end was 30 m in length with mesh sizes of 110 mm to 120 mm. The trawl sampling conducted for adult pollock is referred to as the adult fish trawl in this paper. When the echo signs appeared to show fish on the bottom layer on the continental shelf area, the groundline was attached to the midwater trawl net, and on-bottom trawling was conducted.

Samples were sorted by species and the weight and number of each was recorded. However, when samples were large, the species composition of the whole catch was estimated from the composition of a randomly selected subsample. For pollock, the fork length (hereafter referred to as length) was measured for each sex. However, when pollock catches were large, a randomly selected subsamples of about 400 fish was measured, and their length composition applied to the entire catch for that haul. Of other species, for jellyfish only the total weight was recorded, with no counts made, because jellyfish were usually broken into pieces and counting was impossible.
In addition, at times a net with a mesh size of 4 mm was attached to the inside of the cod-end of the midwater trawl net, and sampling for juvenile fish was conducted principally during several hours after sunset. This procedure is hereafter referred to as the juvenile fish trawl.

The heights, widths of net mouth and depths of water were measured by the fish net monitoring device (manufactured by the Scanmer Co., Ltd.).

In addition, plankton sampling with a Norpac net and juvenile fish sampling with a larval net were done occasionally.

Furthermore, for preparation of the distribution chart, we utilized the program of Ishizuka (1988) and the Atlas data by U.S.A.F.S.C.

3. Results

A. Midwater Trawling Conducted for Adult Fish

(a) Species Composition

A total of 28 adult fish trawl operations was made and are identified as A90-1 to A90-28 in the data tabulated and the five on-bottom trawl hauls conducted, are numbered A90-B1 to A90-B5. The sampling stations are shown in Fig. 2 and described in Table 2. The species compositions by station are shown in Table 3. These are the composition for the entire samples at each tow: the towing time was not standardized. The dominant species taken was pollock, followed by jellyfish on the continental shelf, and by smooth lump sucker in the Basin area. At stations on the continental shelf and the continental slope, groundfishes such as flounders and Pacific cod were caught. It is considered that these were groundfish which were off the bottom. The tows were made near the bottom, and this was assumed to be the cause of the catch of these species.

(b) Distribution of Adult Pollock

Fig. 3 shows the sample (in weight) of adult pollock taken at each sampling station per standardized hour of towing time. Since the sampling was conducted when relatively strong signs were observed with echo sounding system, the figure reflects approximately the pattern of distribution of adult pollock. Judging from this, it was recognized that abundance was high on the continental slope and continental shelf of the northern Bering Sea and was low in the Basin.

(c) Sex Ratio of Adult Pollock

The sex ratios of adult fish collected on the continental shelf and continental slope areas were almost equal, but for adult fish collected in the Basin area, male fish accounted for approximately 60% at each sampling station (Fig. 4).
(d) Length Composition of Adult Pollock

The length composition of pollock by station is shown in Table 4. Although individuals less than 10 cm were also collected, they are not included in the composition show. We are now analyzing these juveniles taken jointly with the samples obtained from the juvenile trawl samplings. The survey area was divided into four geographical areas: the northern and southern parts of the continental shelf, and the northern and southern parts of the Basin area (Fig. 5). The length compositions in each area were obtained and are compared in Fig. 6. Obvious differences are recognized in the length composition of pollock in each area. That is, the length compositions on the continental shelf area had a tendency to be smaller, as latitude went north. The mode was at 47 cm on the southern continental shelf and at 37 cm on the northern continental shelf. In addition, pollock ranging between 20 cm and 30 cm in length, which were observed in the northern continental shelf area, were not observed in the southern continental shelf area. Furthermore, in the Basin area, differences were barely recognized between samples from the southern part and the northern part, and modes were observed at 49 cm to 50 cm.

B. Midwater Trawling Conducted for Juvenile Fish

(a) Sampling results for Juvenile

A total of 39 tows were made with the juvenile trawl (numbered L90-1 to L90-39). The towing speed was 4.0 knots on average. The sampling stations are shown in Fig. 7a and described in Table 2, and the species composition taken shown in Table 5. All of those samples were preserved by freezing, and are being studied, analyzed and estimation of age in days is now under way at the National Research Institute of Far Seas Fisheries.

C. Other Surveys

The midwater trawl used for this survey can not be towed in the surface layers at depths shallower than 10 m. Therefore, with the objective of determining the distribution of juvenile pollock at the surface, trawling at the surface with a Multi-net (1.3 m aperture) was conducted at a total of 26 stations. Vertical tows with a Norpac net from a depth of about 200 m were also made at a total of 25 stations. The locations of these sampling stations are shown in Fig. 8a. Analyses of the material collected are now under way.

Water temperature measurements were made by XBT at a total of 132 stations (Fig. 8b), and analyses of the data are presently under way at the Low Latitudes Oceanography Section of the National Research Institute of Far Seas Fisheries.
4. Acknowledgements

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References, Tables 1 to 5, and Figs. 1 to 8 are in English in the Japanese document.