RESULTS OF THE 1991 CANADA-JAPAN EXPERIMENTAL SQUID JIG FISHERY OFF BRITISH COLUMBIA

by

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Submitted to the
INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

by the
Canadian National Section

October 1991

THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER:

ABSTRACT

During July and August, 1991 a cooperative experimental jig fishery for neon flying squid (*Ommastrephes bartramii*) was conducted with Japanese participants. A description of the fishing operations is provided. One Japanese jigging vessel participated in the experiment and fished at 14 stations. Ocean temperature and salinity values were recorded at each station using a CTD and hull mounted temperature probes. The total catch was 4267 kg or 1897 animals. Eight species were caught on the jigs. Neon flying squid comprised 90% of the total catch in weight. The catch rate for flying squid was 0.0572 kg/jig/hr. Higher catch rates were associated with higher sea surface temperatures.
INTRODUCTION

Exploratory surveys investigating the neon flying squid (Ommastrephes bartrami) resource off the west coast of Canada started in 1979 (Bernard 1980) using drift gillnet in conjunction with jigging in the 320 km Canadian Fishing Conservation Zone (FCZ) and ended in 1987 (Jamieson and Heritage 1988). Investigations started again in 1990 between Department of Fisheries and Oceans (DFO) and Anchor Trading International, Inc. for the purpose of conducting a joint Canada-Japan experimental squid jigging fishery off the west coast of British Columbia. Preliminary results of that experiment were presented by Shaw and Jamieson (1990). During the spring of 1991 Anchor Trading International, Inc. repeated the experimental jig fishery off the coast of British Columbia. Only one Japanese squid jigging vessel was sent from Japan to conduct fishing operations. If the catch rates of flying squid were deemed economically viable then additional vessels would participate in the fishery. The results for the 1990 and 1991 experiment address the issue of harvesting neon flying squid using jigs.

The purpose of this year's experiment was the same as outlined for last year. In brief, the experiment would provide additional information on describing the distribution and abundance of neon flying squid and incidental catch, and whether the concentrations of squid are sufficient to justify commercial exploitation in the 320 km FCZ. This paper contains information regarding catch statistics for squid and other fish species in relation to ocean temperature. A complete report describing the results both statistically and biologically for 1990 and 1991 is in preparation (Shaw et al. in prep).

METHODS

The experimental fishery was to start in July a few days prior to the full moon lunar cycle. The fishery was to proceed for 2 weeks and if the catch rates of neon flying squid were deemed commercially viable then the Japanese fishing company, Sanko Gyogyo Co., would send 4 additional vessels to participate in the fishing operations. The vessel that received the fishing permit was the SANKO MARU No. 18, which was the same vessel that participated in the 1990 experiment. The vessel was permitted to fish the waters extending seaward of the 19 km territorial sea limit off the coast to the 320 km FCZ. A Canadian scientific observer was placed aboard the vessel for the duration of the experimental fishery. His duties were to observe and record fishing activities, monitor catch, collect biological data, and conduct conversion factor tests.

Fishing equipment, activities and catch monitoring procedures were the same as outlined in the 1990 report (Shaw and Jamieson, 1990). In brief, the vessel was 67.9 metres in length and carried a complement of 23 persons. It was equipped with 50 jigging machines each with two oblong shaped spools. All machines were controlled by a computer mounted in the wheelhouse.
The jig configuration was standard on all the machines. Each line contained on average 16 jigs each spaced approximately 1 m apart by nylon monofilament leaders. The standard machine line squid jigs were 44 mm to 55 mm long, with one to two rosettes of barbless hooks (tines) 1.17 cm to 1.3 cm long. The body of the jigs were made of either hard or soft plastic in a variety of colours and shapes.

Handjigging was also conducted at each station. Approximately 2 jigs per handline was used. These jigs were constructed of either metal, soft or hard plastic bodies with two rosettes of barbless hooks (tines) 1.17 cm to 1.4 cm long. Other equipment used on the lines were battery operated lights to attract the squid.

Fishing operations started at 2000 hr and continued until 0600 hr the next day. Prior to each set the sea surface temperature was recorded from the hull mounted sensor on the vessel, and from a Conductivity-Temperature-Depth (CTD) instrument. The CTD provided both temperature and salinity profiles to a maximum depth of 115 m. During each fishing operation the catch was monitored, conversion factors calculated, and biological samples collected. All species were identified, measured for length either mantle length (ML) for squid, fork length (FL) for non-shark fish species, or total length (TL) for shark species. All species were identified to sex and weighed. Electrophoretic and stomach samples were collected from neon flying squid and pomfret. Stomachs were also examined for other species.

RESULTS

Fishing was conducted at 14 stations from July 16 to August 2, 1991. Due to poor catch rates the fishing master and the Japanese company representatives decided to terminate the experiment. The fishing area was inside the 320 km FCZ between 48°N and 53°N Latitudes (Fig.1). The majority of the fishing stations was in the vicinity of seamounts, such as the Bowie Seamount (Stn.5), Union Seamount (Stn.2), southern Explorer Seamount (Stns. 8-10), and southern Heck Seamount (Stns.11-14). All of the fishing was conducted at night using 250 Kw of light. Between 11 and 13 machines and 8 to 10 handlines were fished each night. There was a total of 127 hours of active fishing operations. The total fishing gear effort was 66,767 jig*hours.

The total catch during this experiment on all gear types was 4267 kg or 1746 animals (Table 1). Eight species were caught on the jigs. Neon flying squid comprised almost 90% of the total catch in weight. Blue sharks (Prionace glauca) comprised about 8% of the catch in weight. Pacific pomfret (Brama japonica) were not abundant, less than 1% of the total weight. In terms of total number of animals caught, neon flying squid predominated (92% of the total) followed by eight arm squid (Gonatopsis borealis) (3% of the total). A pink salmon (Oncorhynchus gorbuscha) was caught on a jig at station 4.

Catch rates (CPUE) are expressed as kilograms of species per jig*hour fished (kg/jig*hr). Because the catch was not separated by gear type, a conversion factor (Shaw et al. in prep.) was applied to the handjig effort to
convert it to machine effort. The total CPUE, or pooled CPUE, was calculated by
summing all catch and machine effort, then dividing catch by machine effort. The
CPUE for neon flying squid during this experiment was very low at 0.0572
kg/jig*hr (Table 2). CPUE estimates for all other species were considerably
less.

CTD data was recorded at each station for a total of 14 casts. The
temperature and salinity profiles for each station are presented in Figure 2. The
sea surface temperatures recorded in the fishing area ranged from 12.1° to
16.2°C. A thermocline was evident in the temperature profile at each station.
Temperatures were relatively isothermal to depths from 10 m to 40 m. The jigs
were set to fish to a maximum depth of about 100 m to 150 m. At these depths the
temperatures ranged between 6°C and 7°C. CPUE estimates for neon flying squid
increased from 0 to 0.17 kg/jig*hr as the temperature changed from 12.1°C to
16.0°C, respectively, (Fig. 3). Generally very few squid were caught north of
50°N Latitude. No squid were caught at the northern stations (4-6) off the Queen
Charlotte Islands where temperatures ranged from 12.1°C to 13.9°C. The fishing
operations ended in the warmer waters.

With the exception of station 1, salinity values were relatively constant
throughout the water column in the top 100 m. Surface salinity values ranged
from 23.87% to 32.37%, and at depths from 31.47% to 33.02% (Fig. 2).

Monitoring of squid dropoffs was not conducted because of the very low
catch rates.

DISCUSSION

The 1991 experiment still demonstrates that neon flying squid can be caught
on jigs. However, little is known about the annual variability of squid
abundance in the Canadian zone. The sea surface temperatures recorded during
the 1991 fishery appear to be cooler compared with the temperatures for the same
time period for 1990. In 1991 the northern extension of the 15°C isotherm was
off Vancouver Island with 12°C waters off the Queen Charlotte Islands. During
July 1990 the 15°C isotherm extended north along the coast of the Queen Charlotte
Islands. This coincided with a catch rate of 0.090 kg/jig*hr for neon flying
squid(Shaw et al. in prep.), almost 2X higher as compared with the 1991 results.
Also, during the same fishing period in 1990, this vessel caught 40.3 tonnes of
neon flying squid as compared with 3.8 tonnes in 1991.

It is difficult to determine what factors influence the availability of
squid in the Canadian zone. However, during this short experiment it appears
that ocean temperature may be a factor. Another factor that might be considered
is the manner in which the machines operate. From the 1990 results (Shaw et al.
in prep.) it appeared that handjigging for neon flying squid off Canada outfished
machines rigged with jigs. The difference was that handjigs are lowered to depth
and "jigged" until the fisherman feels the line move as a result of a squid
grasping a jig. Once the line feels heavy the fisherman hauls it aboard. This
is not the case for machine jigging where the line is lowered to the fishing
depth then hauled aboard in a jerking manner as a result of the oblong spool.
This procedure is effective when squid are in abundance such as off the Falkland
Islands but not effective when squid are less available.

In summary squid jigging may still be a potential alternative to driftnets for harvesting neon flying squid. No marine mammals, seabirds, or sea turtles were caught in 1991. Incidental catches of important commercial fish species consisted of one pink salmon and 5 rougheye rockfish (Sebastes aleutianus). Experiments of this type improve our understanding of the biology and dynamics of the squid resource in relation to ocean processes and needs to be continued.

REFERENCES


Table 1. Detailed catch (weight in Kgs) by set.

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<th>wt. nos.</th>
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<th>wt. nos.</th>
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<td>120 54</td>
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<td>12 12 5</td>
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<td>Pink salmon (Oncorhynchus gorbuscha)</td>
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**TOTAL** 366 170 292 144 146 71 9 7 13 7 17 17
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<td>220 100</td>
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<td>138 12</td>
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<td>3 2</td>
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<td>2 3</td>
<td>7 8</td>
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<tr>
<td>(Sebastes aleutianus)</td>
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<td>Pink salmon</td>
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<tr>
<td>TOTAL</td>
<td>271 106</td>
<td>304 138</td>
<td>251 103</td>
<td>305 134</td>
<td>351 154</td>
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<td>220</td>
<td>460</td>
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<td>2</td>
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<td>Rougheye rockfish (Sebastes aleutianus)</td>
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<tr>
<td>Pink salmon (Oncorhynchus gorbuscha)</td>
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**TOTAL** | 486 | 227 | 463 | 213 | 4267 | 1897 |
Table 2. Total catch (Kg) and CPUE (Kg/jig.hr) of all species caught on jigs.

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<th>CPUE</th>
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Fig. 1. Survey area with station locations where jigging and CTD casts were conducted.
Fig. 2. Temperature and salinity profiles from CTD casts completed at each of the fishing stations.
Station 3

Station 4

Fig. 2 continued.
Station 5

Station 6

Fig. 2 continued.
Fig. 2 continued.
Fig. 2 continued.
Station 11

Station 12

Fig. 2 continued.
Fig. 2 continued.
Fig. 3. CPUE of neon flying squid in relation to sea surface temperature.