

## A BRIEF REVIEW OF THE SQUID SURVEY BY HOYO MARU No. 67 IN SOUTHEAST AUSTRALIAN WATERS IN 1979/80

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### Abstract

The Japan Marine Fishery Resource Research Center (JAMARC) carried out the Gould's squid, *Nototodarus gouldi*, resource survey in conjunction with the Australian fisheries authorities, using the commercial jigging boat Hoyo Maru No. 67, in southeast Australian waters between November 1979 and April 1980. This programme was the third year of the Japanese Fisheries Technical Assistance to the Australian Commonwealth. The major purpose of the survey was to develop the Gould's squid resource on a commercial scale and to collect biological information about squid and oceanographic data on the fishing ground.

### Catch

The catch distribution of the *N. gouldi* for the 1979/80 season is shown in Figure 1. During the 117 days fished, a total of 43.7 tons of the *N. gouldi* was caught (Table 1). Only 14 squids of the pelagic species *Todarodes filippovae* were taken incidentally off the east coast of Tasmania. Of the total catch 42.4 tons came from 117 usual night-time fishing stations and only 1.3 tons were caught during 22 experimental daytime operations. Quantities of squid caught by month rose from 3 tons in November to 12.6 tons in February, fell to 10.8 tons in March, and further to 5 tons in April. The bulk of the catch was obtained in February and March. The catch per unit effort also increased steadily through the season, peaked in February and fell in March. Figure 2 shows the distribution of the catch per unit effort.

A total of 20 tons—almost half the season's catch—was taken in the western part of the Bass Strait in 51.5 fishing days. The other significant ground was the continental shelf between Capes Otway and Northumberland. Here 11.6 tons were produced in 20 fishing days and the catch rate was about 0.6 ton per day fished. This area also contributed to the joint feasibility fishing survey in South Australian and Victorian waters in 1979/80 season.

Hand jigging was observed to have been efficient in southeast Australian waters and the squids jigged by hand were large and sexually mature. Another noteworthy character of fishing for *N. gouldi* in the area concerned is that there were few cases of an intensive catch

of squid in a short time, as has been experienced very often for the New Zealand common squids, *Nototodarus* spp.

### Environmental Factors

**Wind:** Fishing efficiency is diminished through high wind-induced waves and swells when the wind exceeds force six on the Beaufort scale. It was rather windy in the southeast region of Australia in the 1979/80 season. One fishing day was lost in November, five in December, one in February and one in March because of rough weather.

**Water temperature:** Surface water temperatures of 14° to 18°C were distributed in southeast Australian coastal waters throughout the season. The temperature of the 1979/80 season was lower by about 1° to 2°C than in the previous season. The thermocline observed during the season, especially in the Bass Strait, was not as well developed as the one in the 1978/79 season, while a conspicuous thermocline was distributed on the continental shelf west of Cape Otway.

### Body Length

Females seem to grow about 5 cm larger than males. The jigged females range from 10 to 40 cm mantle length, while males range from 10 to 35 cm mantle length. Figure 3 shows length frequency distributions of squid by month throughout the area surveyed. Although a population for a summer fishery was clearly defined, grew steadily through the season, and



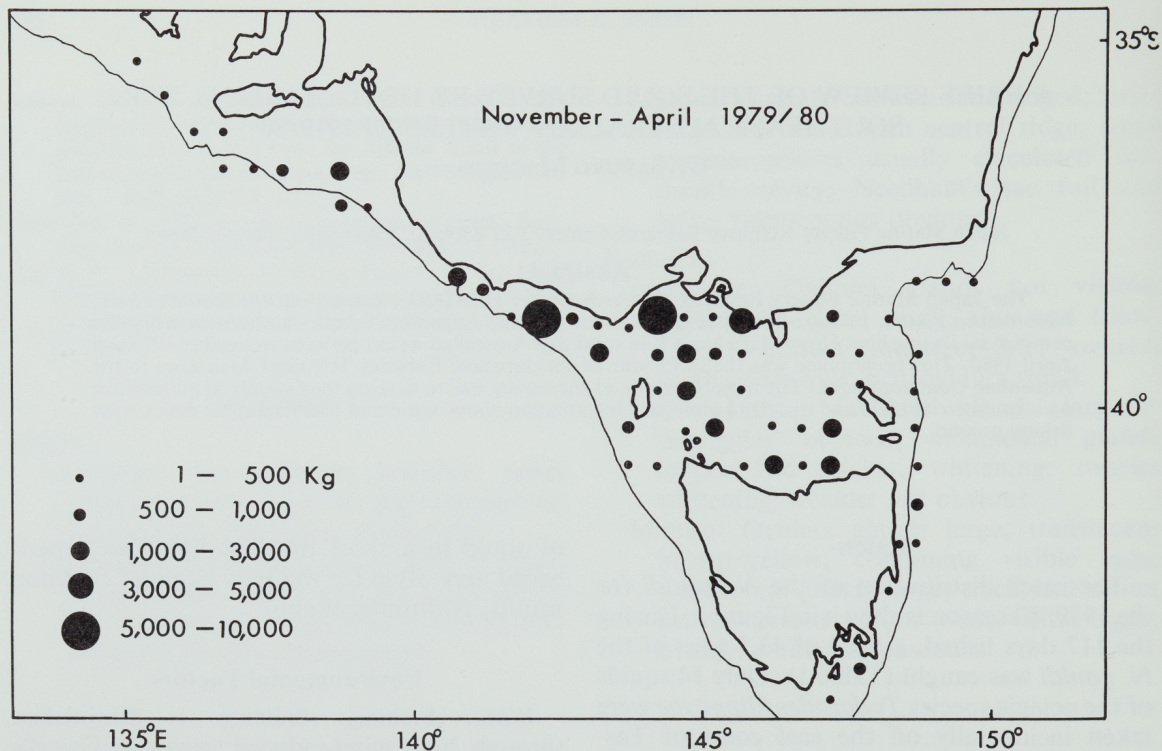


Figure 1. Catch of Gould's squid, *Nototodarus gouldi*.

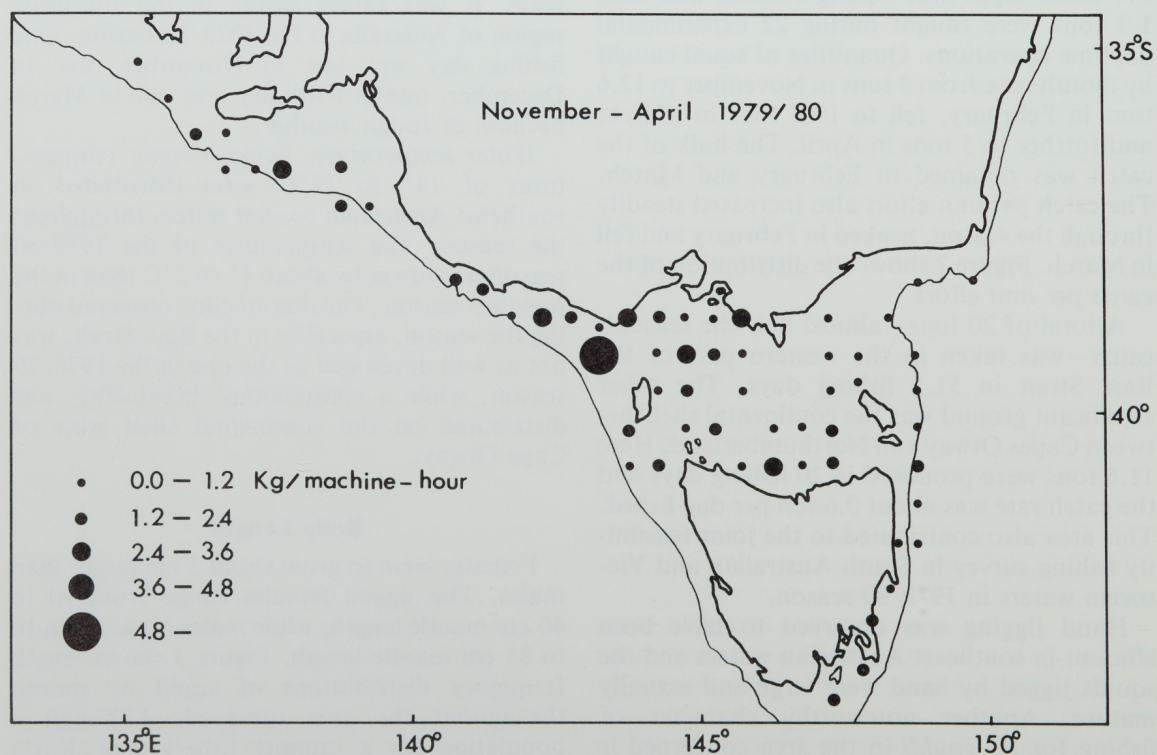


Figure 2. Catch per unit effort (excluding the daytime experimental catch).



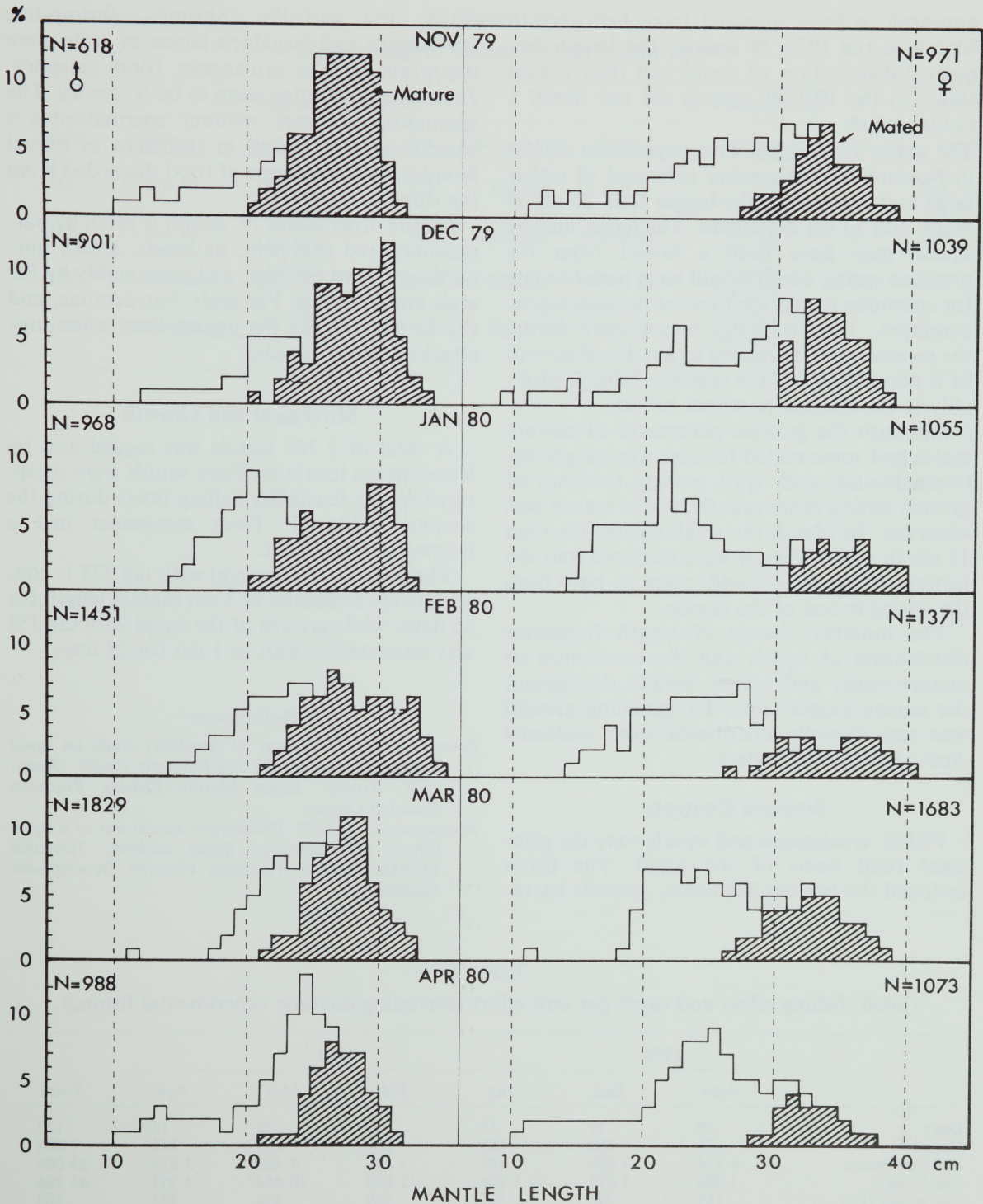


Figure 3. Length frequency distribution of squid, Nov. 1979-Apr. 1980.



appeared to have spawned from February to March in the 1978/79 season, the length frequency distribution of squid and their sexual stages in the 1979/80 season did not reveal a similar trend.

The major component of a population caught in November to December consisted of rather large and mature squids: bigger than 25 cm in males and 30 cm in females. The large, mature squids may have been a brood from the previous spring which would have been too late for spawning in relation to some oceanographic condition. The low water temperature during the summer may be related to a reduced growth of a population for the season's fishery, probably in the autumn to winter brood.

Although the greatest percentage of mature males and some mated females was caught between January and April, a slight tendency of growth during other months of the season was observed. In March the small squids less than 15 cm in mantle length were recruited into the fishery. These small squids seem to have been the spring brood of the season.

The monthly change of length frequency distribution of squids and the occurrence of mature males and mated females throughout the season suggest that the spawning ground was very broadly distributed over southeast Australian coastal waters.

### **Stomach Contents**

Fishes, crustaceans and squids were the principal food items of the squid. The fishes included the herring-like fishes, juvenile barra-

cutas, and garfishes. Shrimps, shrimp-like crustaceans and megalopa larvae of crabs were important in the crustacean food category. Juvenile squids eaten seem to be *N. gouldi*. The spermatophore sacs without spermatophores sometimes were found in stomachs of mated females, as were scraps of food discarded from the ship.

On the other hand, *N. gouldi* is eaten by barracoutas, red snappers, flatheads, scads, gurnards, gurnard perches, and presumably by fur seals and dolphins. Fur seals, barracoutas, and sharks often broke the jigging lines when they attacked jigged squids.

### **Movement and Growth**

A total of 2 266 squids was tagged and released at ten localities. Four squids were recaptured by the feasibility fishing boats during the season (Table 2). Their movement had a westward component.

The growth of the squid with tag J33 is conservatively estimated at 3 cm mantle length for 35 days, while growth of the squid with tag J53 was estimated at least at 1 cm for 28 days.

### **References**

- ANONYMOUS. 1978. *Report of feasibility study on squid jigging fisheries in the southwestern Pacific Ocean*, 1977. Tokyo: Japan Marine Fishery Resource Research Center.
- HARRISON, A. J., 1979. Preliminary assessment of a squid fishery off Tasmania. *Squid outlook, Tasmania 1979-80*. Hobart: Tasmania Fisheries Development Authority.

TABLE 1  
Catch, fishing effort and catch per unit effort (excluding daytime experimental fishing).

	1979		1980				Total
	Nov	Dec	Jan	Feb	Mar	Apr	
Days	19	19	17	23	25	14	117
Hours	171	150	135	209	232	146	1 044
Machine-hours	4 124	3 607	3 167	5 125	5 426	3 619	25 066
Catch (kg)	3 096	5 627	5 226	12 620	10 844	4 953	42 366
Catch/day (kg)	163	296	307	549	434	354	362
Catch/hour (kg)	18	38	39	60	47	34	41
Catch/machine-hour (kg)	0.8	1.6	1.7	2.5	2.0	1.4	1.4



TABLE 2  
Squids tagged, released and recaptured.

Mark	Tagged and Released				Recaptured			
	Date	Location	No.	M.L. (mm)	Date	Location	No.	M.L. (mm)
J33	13 Jan 80	38°51'S 145°41'E	525	170-230	17 Feb 80	39°46'S 144°37'E	1	260
J48	7 Feb 80	36°57'S 138°48'E	105	250-300	10 Feb 80	37°02'S 138°12'E	1	270
J49	8 Feb 80	36°58'S 138°46'E	210	220-280	14 Feb 80	37°01'S 138°21'E	1	245
J53	3 Mar 80	38°58'S 145°33'E	315	200-250	31 Mar 80	39°09'S 144°45'E	1	260