ASPECTS OF THE ROLES OF SQUID IN FOOD CHAINS OF THE ANTARCTIC MARINE ECOSYSTEMS* (EXTENDED ABSTRACT)

Takahisa NEMOTO, Muneo OKIYAMA

Ocean Research Institute, University of Tokyo,
15-1, Minamidai 1-chome, Nakano-ku, Tokyo 164

and

Masanori TAKAHASHI

Japan Marine Fishery Resource Research Center,
3-4, Kioi-cho, Chiyoda-ku, Tokyo 102

Squid (Cephalopoda) are important organisms in marine food chains. However, there are very few studies of their ecological roles in marine ecosystems of the Antarctic. Seventy-six specimens of squid, large (35.5 cm in mantle length) and small (*ca.* 4 cm), have been collected in the course of mid-water trawl operations by the Japanese pilot fishery for the Antarctic krill, *Euphausia superba*, in the waters between 90°W and 50°W north of the South Shetland Islands during the period of 1980–81 and 1981–1982. The trawl employed had a large mouth with an opening of 615.4 m², a length of 62 m and a 26 m cod-end. The inner mesh of the anterior part of the net was 2 cm, and that of the posterior part 1.3 cm. The squid collected are all considered to be young juveniles distributed at shallower depths than adults. Two species, *Kondakovia longimana* and *Moroteuthis knipovitchi*, are dominant. *Alluroteuthis antarcticus*, *Pholidoteuthis boschmai*, *Brachioteuthis picta* and *Galiteuthis glacialis* also occurred in the collections.

The maximum mantle length of *K. longimana* and *M. knipovitchi* is 35.5 cm (Fig. 1); a value far greater than those of squid generally caught by smaller nets. The mode for the mantle length of *K. longimana* occurs at 20 cm, which is also much greater than the corresponding values (generally $<$10 cm) of the squid caught with RMT and IKMT nets sofar (ROPER, 1977).

The size distribution of cephalopods obtained by trawls is compared with the size distribution of *K. longimana* and *M. knipovitchi*, estimated from the beaks found in the stomachs of sperm whales (Fig. 2). Sperm whales, *Physeter catodon*, feed on *K. longimana* mainly larger than 40 cm in mantle length in the Antarctic. The maximum length of squid mantle attaining to 50–60 cm in the stomach of sperm whales is considered to be due to *K. longimana* which is the principal food of sperm whales in the Antarctic. The specimens caught by trawl were smaller than those fed sperm whales. The sizes of *M. knipovitchi* eaten by sperm whales are also generally larger than those taken by our trawl (Fig. 3). These squid consume various kinds of food, but they feed mainly on macro-zooplankton and micro-nekton. Krill is the main food item of squid

* Full paper is submitted to the Proceedings of the Fourth SCAR Symposium on Antarctic Biology.

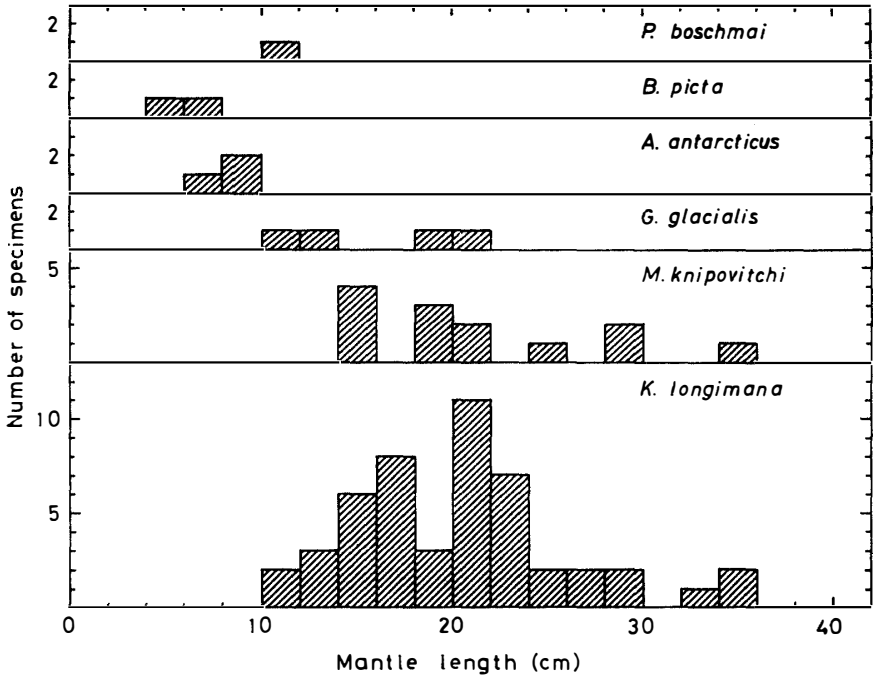

Fig. 1. Size distribution of squid collected by trawl operations of krill fisheries in the Antarctic in the 1980/81 and 1981/82 seasons.

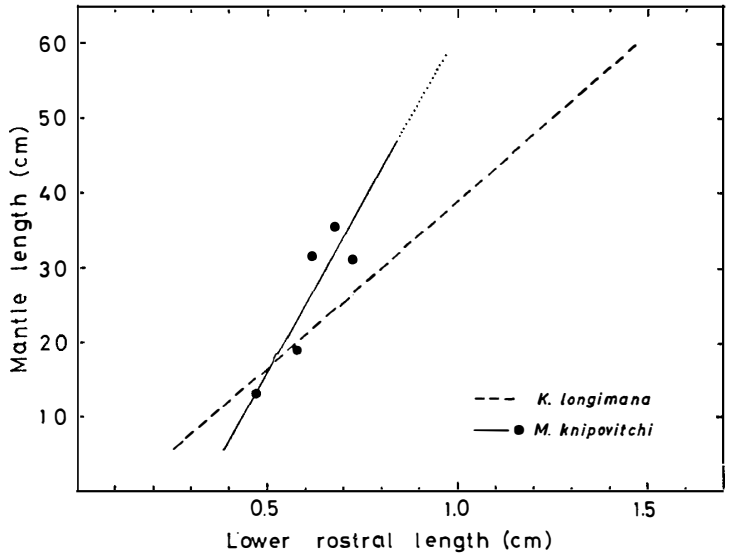

***Fig.** 2. Relation between lower rostral length and body length of two species of squid in the Antarctic. The line of* K. longimana *is redrawn from Fig. 55 in* CLARKE *(1980), and that of* M. knipovitchi *is calculated from the data in Table 24 of* CLARKE *(1980).*

in the Antarctic.

The eyes of food items are very clearly detected in the stomach contents of squid, although other body parts are broken and digested. The counting and measuring of the eyes of euphausiids allows determinations of the species, size and numbers taken by squid. The number of the krill found in the stomachs of *K. longimana* ranged from 2 to 54. The probable size distribution and biomass of euphausiids were also calcu-

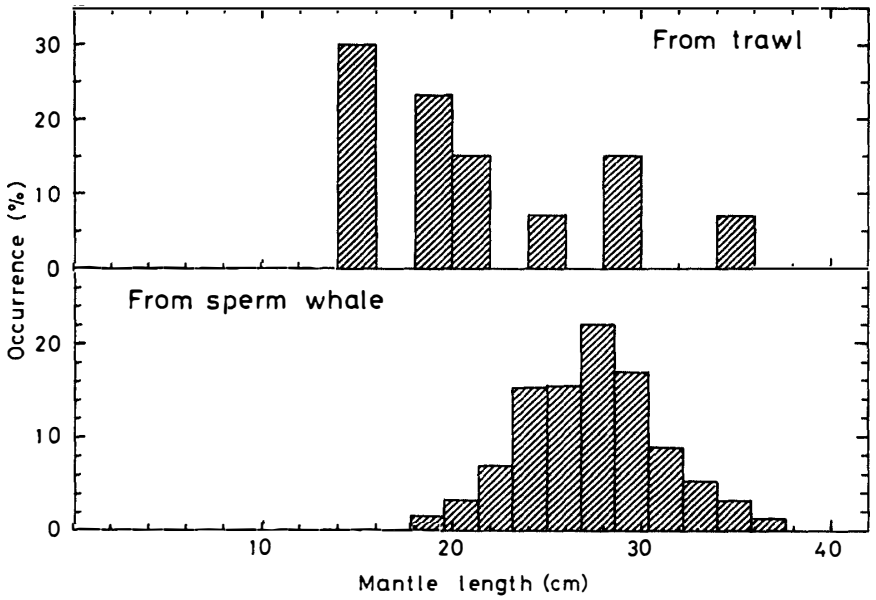

Fig. 3. Size distribution of Moroteuthis knipovitchi *collected by trawl operation of krill fisheries in the Antarctic in 1980/81 and 1981/82 seasons and found in the stomachs of sperm whales in the Antarctic (*CLARKE, *1980).*

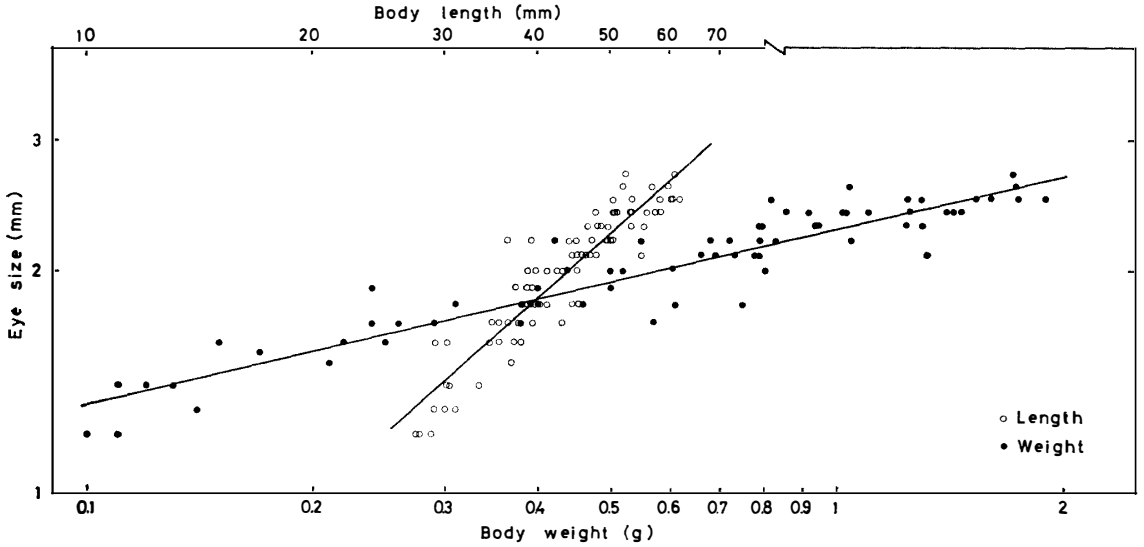

Fig. 4. Relations of eye size, body length and body weight of Euphausia superba *in the Antarctic.*

lated from an equation on the relation of eye size, body length and body weight (Fig. 4).

An amphipod, *Themisto gaudichaudii*, is also a major component of the food of *K. longimana*. Small euphausiids, *Thysanoessa macrura*, and large chaetognath, *Sagitta gazellae*, are also found in the stomach of *K. longimana*, which indicates that the species is a plankton eater. Fish are considered to be a major food item for *M. knipovitchi*, together with *E. superba*. Cannibalism appears to be rather common in these squid.

The length of the nidamental gland in all of our specimens belonging to *K. longimana* and *M. knipovitchi* was shorter than the values given by CLARKE (1980), so that our specimens were apparently immature (Fig. 5).

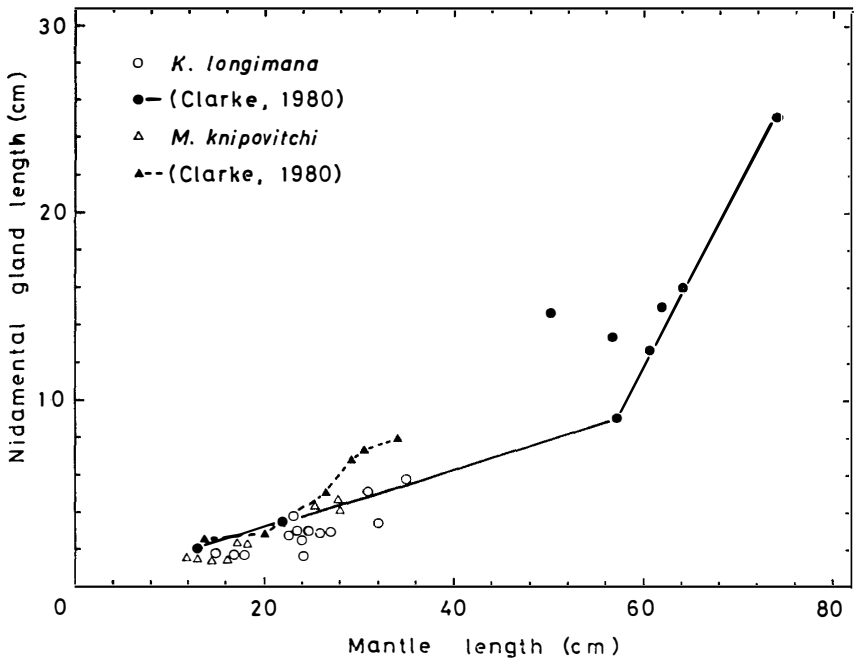

Fig. 5. The relation between nidamental gland length and body mantle length of Kondakovia longimana *and* Moroteuthis knipovitchi *in the Antarctic.*

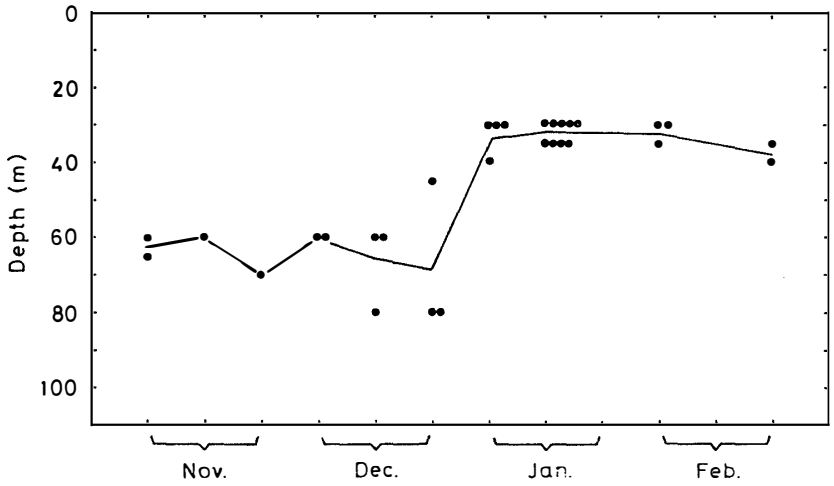

Fig. 6. Seasonal variation of distribution depth of Kondakovia longimana *caught by trawl in the Antarctic. Dots show the depth of capture of* K. longimana *and a line shows the mean.*

The depth at which most specimens of *K. longimana* were taken became shallower with the advance of the summer season in the Antarctic, with the main concentration of swarms of *E. superba* moving up from 60 to 30 and 40 m (Fig. 6).

References

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(Received April 27, 1984; Revised manuscript received May 10, 1984)