Bull. Fac. Fish., Mie Univ.
No. 8 : 11—17
October 1, 1981

Bathynomus (Isopoda: Cirolanidae) Attacking Sharks Caught in a Gill-net

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Baited traps have been developed for capturing commercially important benthic or near-bottom crustaceans. In the Kumano-nada region along the Pacific coast of central Japan, however, the trapping of the important and commercially attractive crustaceans to the bait sometimes failed to capture them due to serious damage of the bait by abundant bathynomids lacking in economic value. The bathymetric records of the bathynomids have been plotted mainly at depths from 200 m to 600 m according to the samples collected by the baited traps set under the continental slope waters.

On the fisheries training course by the training vessel "Seisui-Maru", bottom gill-nets which were set at a site (the Kumano-nada region) of 33°-45'N and 136°-08'E with the depth of 520 m on 18 November 1980 caught an armor shark *Dalatias licha*. This shark, known generally as a deep-sea shark, was already been dead when the gill-nets were raised. But the shark would have been presumably alive when it was caught in the gill-nets judging from the fact that the shark had become tangled in the nets. The shark showed an abdomen swollen abnormally, and anal parts badly damaged. We found a total of 18 individuals of giant isopods *Bathynomus döderleini* in addition to a snubnosed parasitic eel *Gymnosimenchelys leptosomus* within its abdominal cavity. The bathynomids and snubnosed eels, contained within the shark's abdominal cavity, were still alive, even on board the vessel. As far as is known, it has been not documented that the bathynomids attack live fish. So we believe that the bathynomids entered the shark's body shortly after the shark was killed due to tangling in the nets, and then they entered the abdominal cavity by destroying the anal parts of the shark.

Keywords; *Bathynomus*

Of the five species known to date within the genus *Bathynomus* (SHIH 1972), only a bathynomid *B. döderleini* have been found in the coastal waters of Japan; the geographical distribution of *B. döderleini* goes along with the warm Kuroshio Current area along the Pacific coast of Japan, and so the bathynomids have not been found in the marginal seas of the northwestern Pacific (SEKIGUCHI *et al.* 1981). In spite of their enormous size, the bathynomids are classified as the littoral-bathyal benthos

(WOLFF 1970) and their bathymetric records have been plotted mainly at depths from 200 m to 600 m according to the samples collected by the baited traps set under the continental slope waters (HATTORI *et al.* 1980; SEKIGUCHI *et al.* 1981). The baited traps have resulted in a growing awareness of the organisms such as the scavenging giant isopods bathynomids which were previously caught only rarely due probably to technical difficulties inherent in sampling gear available concerning organisms, sufficiently small or sluggish.

In Japanese fisheries, baited traps were developed originally for capturing commercially important benthic or near-bottom crustaceans. However, the trapping of the commercially attractive and important crustaceans by the bait sometimes failed due to serious damage of the bait by abundant bathynomids lacking economic value (YAMAGUCHI and KOBAYASHI, unpublished data). The baited traps which were set at depths shallower than 100 m often failed to capture the bathynomids; the bait (a whole fish kept frozen until used) was often destroyed leaving skin and/or bone the same as those in the traps which were set at depths deeper than 200 m and succeeded in capturing numerous bathynomids. We have now evidence that damage of the shallow-water trap's bait is caused by a small-sized isopod *Idothea* spp. which are usually able to pass through mesh-openings (2–4 cm) of the traps. During the course of operating bottom gill-nets set at various depths, the fish caught in the gill-nets were often damaged leaving skin and bone. Deducing from the observations as stated above on the baited traps, damage of the fish which were caught in the gill-nets set at depths shallower than 100 m must be caused by the isopod *Idothea* spp.. Unfortunately, we have not yet evidence concerning what would damage the fish caught in the gill-nets set at depths deeper than 200 m, though it was assumed that the bathynomids would be responsible for damage of the fish trapped by the gill-nets.

Materials

On the fisheries training course by training vessel "Seisui-Maru" of The Faculty of Fisheries of Mie University bottom gill-nets were employed in the Kumano-nada region along the Pacific coast of central Japan. Because of depth, short distance from land and high productivity of the surface waters, the Kumano-nada region where the continental shelves and sharp slopes have developed is one of the most prosperous fishing grounds of Japan for pelagic fish and benthic crustaceans. Bottom gill-nets were set at a site of 33°–45′ N and 136°–08′ E. The depth was 520 m. The gill-nets were lowered at night on 18 November 1980 and were left for 12 hours. Water temperature was 7–8° C just above the bottom.

Observation

We found an armor shark *Dalatias licha* (120 cm in length) caught in the gill-nets

which were lifted aboard the vessel the following morning. This shark, known generally as a deep-sea shark, had already been killed when the gill-nets were raised. But the shark would have been presumably alive when it was caught in the gill-nets, judging from that the shark became tangled in the gill-nets. The shark showed an abdomen swollen abnormally, and the anal parts completely destroyed. Then, we cut with a knife from its anus to the abdomiral cavity open; we found a total of 18 individuals of giant isopods *Bathynomus döderleini* (4–12 cm in length) in addition to snubnosed parasitic eels *Gymnosimenchelys leptosomus* (12–15 cm in length) within its abdominal cavity (Pl. 1 and Fig. 1). The bathynomids were all 8–12 cm in length except for one specimen. All specimens of the bathynomids did not carry eggs and/or young. While our trap's data to date have no data in winter, absence of the bathynomids carrying eggs or young may indicate that the female carryirg eggs or young is not attracted to the bait, as was suggested in the previous paper (SEKIGUCHI *et al.* 1981). This is the case with the giant amphipods attracted to the baited traps (SHULENBERGER 1976).

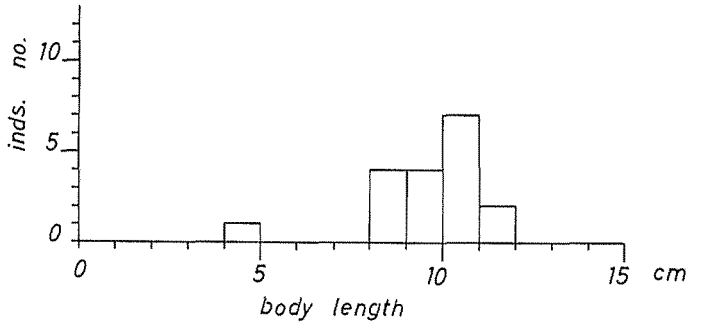

Fig. 1. Lengths of *Bathynomus döderleini* found within the abdominal cavity of an armor shark *Dalatias licha*.

The bathynomids and snubnosed eels, found within the abdominal cavity, were still alive even on board the vessel. The bathynomids are well known as the scavenging giant isopods and were captured easily by the baited traps set at depths deeper than 200 m in the Kumano-nada region (SEKIGUCHI *et al.* 1981). As far as known, it has been not documented that the bathynomids attack live fish. So we believe that the bathynomids touched the shark's body shortly after the shark was killed due to tangling in the gill-nets, and then they invaded the abdominal cavity by destroying the anal parts, together with the snubnosed eels. In fact, the bathynomids which were preliminarily kept alive in an aquarium on board the vessel fed vigorously on the dead fish given as bait, with the result that the bait was destroyed completely leaving only skin and bone. It is interesting that these bathynomids seized at first the abdominal parts of the bait by means of grasping appendages. On the other hand, snubnosed

eels scavenging the bait could not cause any damage to the bait in the aquarium observed. So we conclude that serious damage of the fish trapped by the gill-nets which were set at depths deeper than 200 m in the Kumano-nada region were caused mainly by the bathynomids. The possibility still remains that small-sized scavenging invertebrates, passing through the netted wall of the baited traps, may be responsible for the damage of the fish caught in the deep-sea gill-nets. This point will be not resolved until we employ the baited traps wrapped by many small meshed nets in the comming seasons.

Giant isopods dominate large organic arrivals (dead fish etc.) as was seen in the baited traps (SEKIGUCHI *et al.* 1981). The significance is their consistent, overwhelming dominance in all lowerings of the baited traps set at depths from 200 m to 600 m within the warm Kuroshio Current area, especially in the Kumano-nada region along the Pacific coast of central Japan. The reason why about only one species was attracted to the bait is not clear. The crustaceans and fish which are attracted may be repelled by the numerous giant isopods. As far as our baited traps are concerned in the Kumano-nada region, the scavenging invertebrates and fish were caught rarely, and the bathynomids dominated the bait. Because of their ability to achieve high local densities rapidly in response to a organic arrival, it is probable that this isopod plays a significant role in the functioning of the continental slope's benthic communities. Our trap's results (SEKIGUCHI *et al.* 1981) suggest that a large particle of food is unlikely to exist on the bottom for very long. A large, dead animal that has settled on the bottom should not act to more than a minor degree as a stimulus for a local buildup of the less mobile benthic fauna, because it would be consumed and dispersed rapidly by the giant scavengers such as the bathynomids (see, DAYTON and HESSLER 1972; HESSLER *et al.* 1978).

Acknowledgements

The authors wish to express their hearty thanks to the captain and crew of training vessel "Seisui-Maru" of the Faculty of Fisheries, Mie University for operating the gill-nets. Thanks are due to Drs. K. SUZUKI and K. MORI for identification of a snubnosed eel *Gymnosimenchelys leptosomus*.

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Plate I

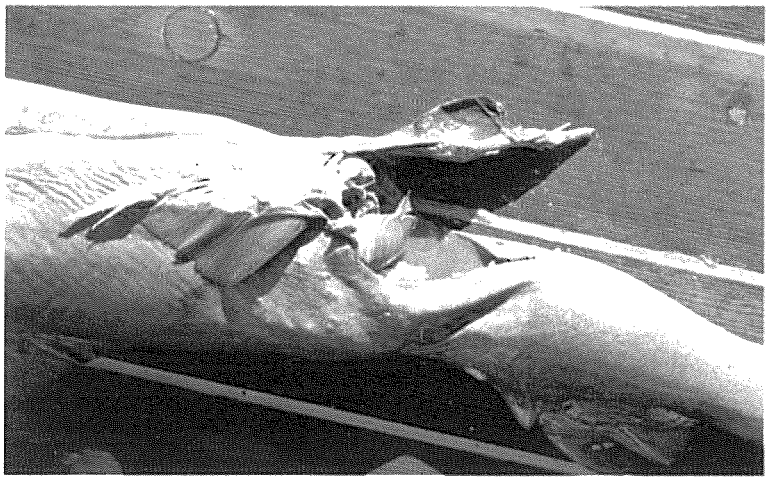
A; Anal to abdominal parts of an armor shark, broken helplessly by scavenging of *Bathynomus döderleini*.

B; To cut by knife to open the abdominal cavity. One specimen of snubnosed parasitic eels *Gymnosimenchelys leptosomus* appeared.

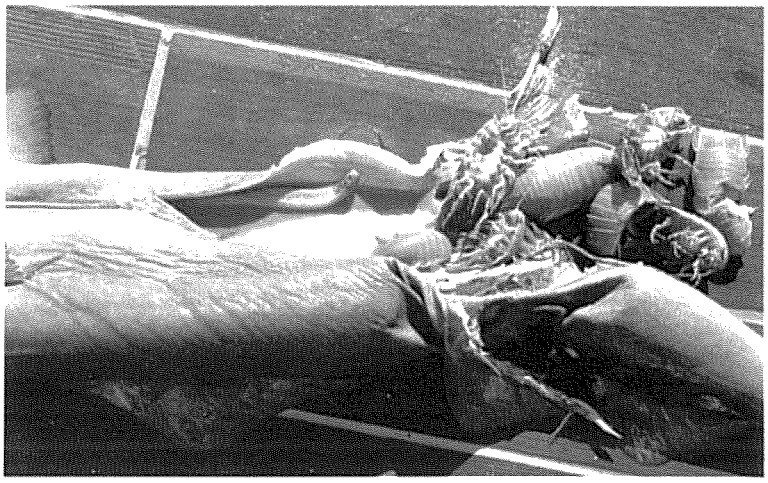
C; One specimen of *Bathynomus döderleini* found within the abdominal cavity of an armor shark.

Plate I

A



B



C