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Diel Feeding Cycle in a Snailfish, *Liparis tanakai* (Gilbert et Burke)

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Summary

The diel feeding cycle in a snailfish, which changes its food habits with growth and development, inhabiting Sendai Bay was investigated by examining stomach contents. The diel change in stomach content weight indices shows that the snailfish feeds actively from midnight to dawn but not in the daytime.

Food composition of the snailfish varies from body size to body size.

The author has studied the life history of a snailfish *Liparis tanakai* inhabiting Sendai Bay. From the earlier study, it is known that the snailfish transformed their food habits during a single-year life (Honda *in* Kawasaki *et al.* (1)).

Furthermore, I have studied the diel feeding cycle of the snailfish in order to grasp the features of food acquisition pattern in the snailfish in detail.

Materials and Methods

The study was carried out on board a commercial trawler in Sendai Bay on June 17 and September 9-10, 1982. Tracks of operation are indicated by arrows in Fig. 1. The trawl was hauled in shallow waters (30-35 m in depth) in June and also in southern offshore waters (37-53 m in depth) in September. The operation was made 9 times from 3:50 AM to 4:30 PM with an average hauling time of 59 minutes in June, and also 10 times from 8:00 AM to next 6:10 AM with an average hauling time of 97 minutes in September. Samples were preserved in 10 per cent formalin solution. Body length, body weight and stomach contents were measured and examined.

Results

The aim of the study was to know the diel changes in the quantity and composition of food ingested.

According to Kawasaki *et al.* (1), the growth pattern of the snailfish is

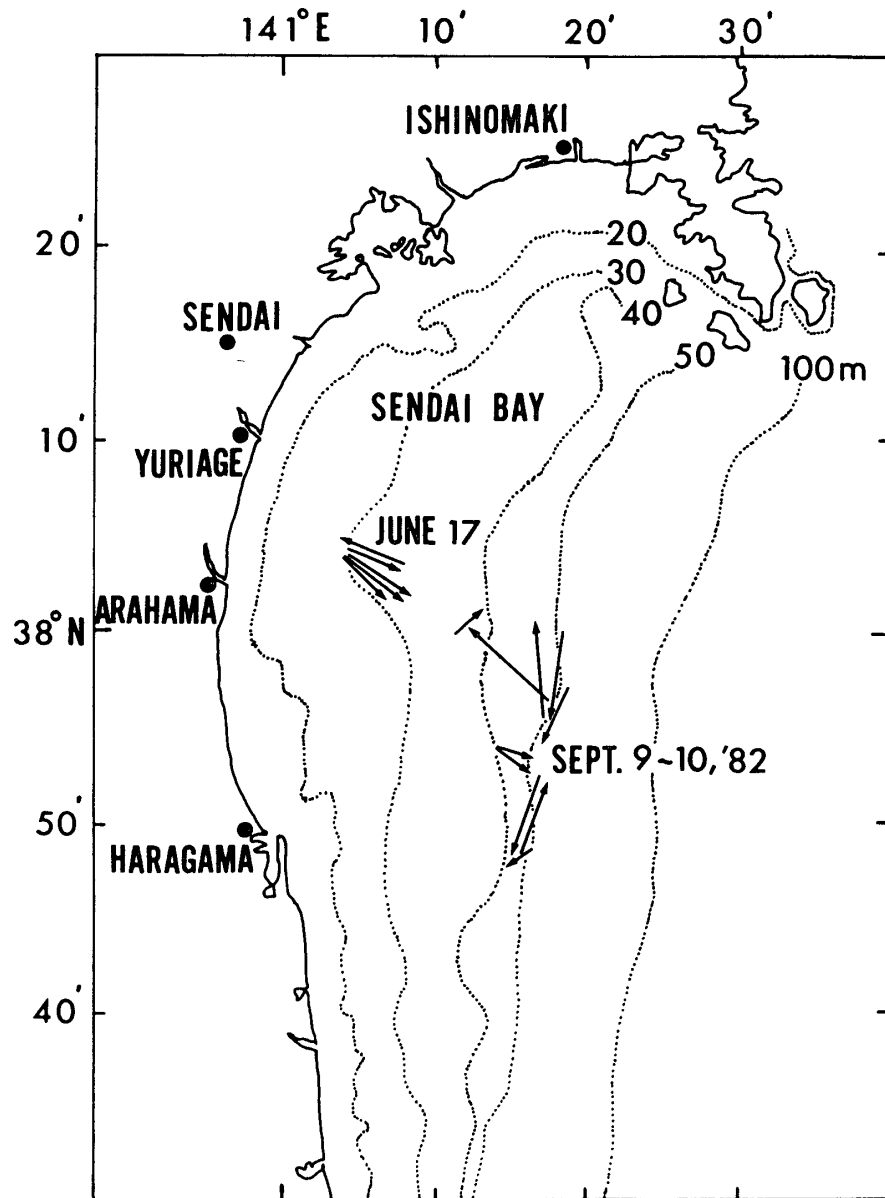


FIG. 1. Tracks of trawlers.

divided into four phases. June corresponds to the middle of Phase I, the period of fast growth, and September to the later Phase II, one of slow growth. There is little sexual difference in growth before September. Therefore I treated the results of both sexes together.

Stomach Content Weight Index

Stomach Content Weight Index ($SCI = 10^2 \times \text{Stomach Content Weight (g)} / \text{Body Weight (g)}$) was used as an indicator of food quantity ingested. Diel change in SCI in June is shown in Fig. 2. Although the observations were obtained only in the daytime in June, the SCI was observed to be high at dawn

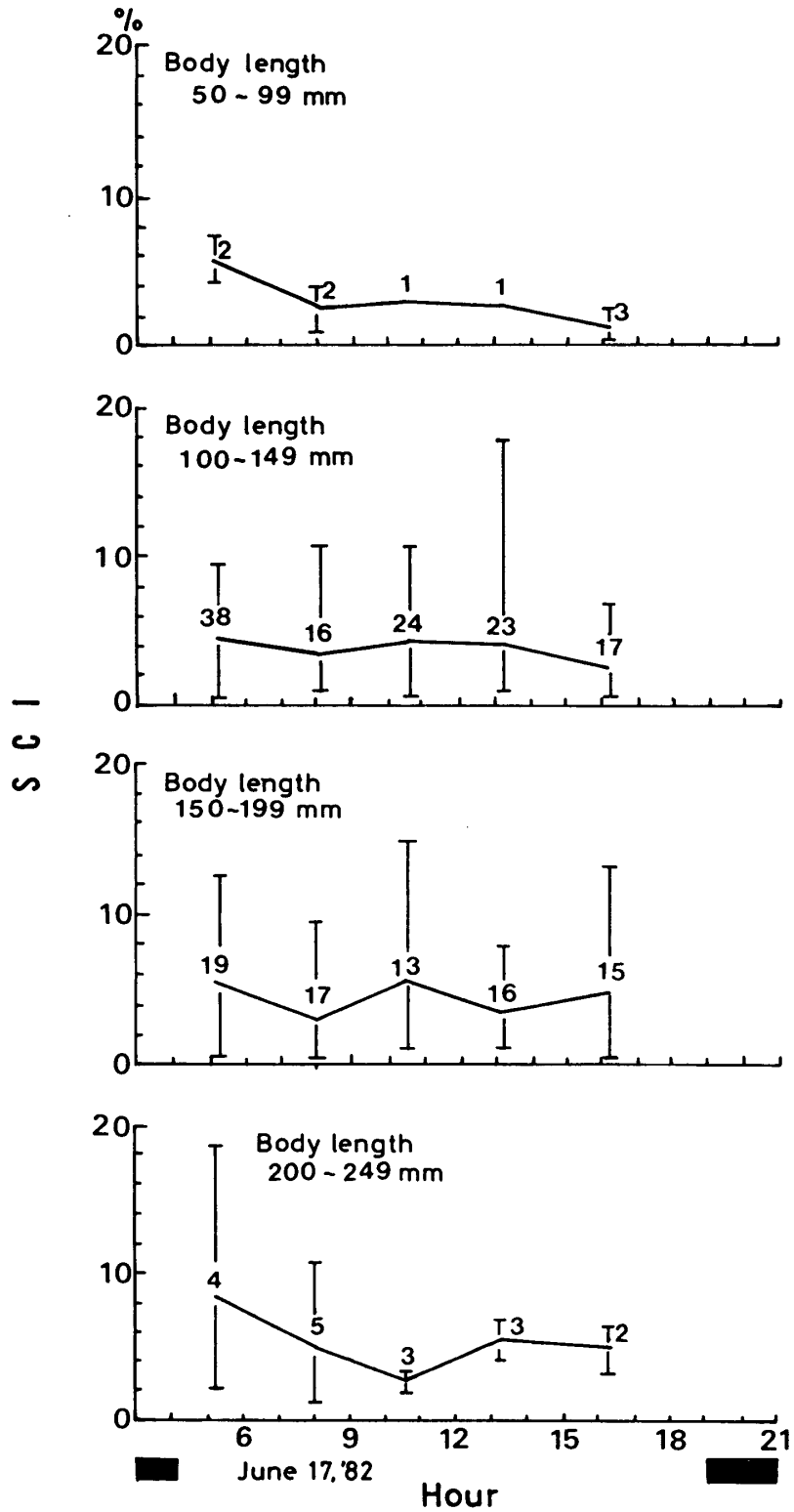


FIG. 2. Diel feeding activity in snailfish on June 17, 1982, indicating the mean and range of Stomach Content Weight Index ($SCI = 10^2 \times \text{Stomach Content Weight (g)} / \text{Body Weight (g)}$), with sample size. Horizontal thick blocks along the bottom line denote the nighttime.

and tended to decrease from 5:00 AM to 4:00 PM over the whole range of body length (Fig. 2).

Diel change in SCI in September when the observation was made over 24 hours is shown in Fig. 3. The SCI tends to decrease to the lowest 1 per cent in the daytime and to start increasing at dusk. The SCI in the length interval of 100–149 mm rises slowly from dusk to midnight and peaks just after dawn. The SCI of the fish of 150–199 mm is apt to increase just prior to dusk, before it is kept at about 2 per cent level until midnight, followed by an abrupt rise until dawn. After dawn, the SCI begins to decrease again. The percentage of empty stomachs, indicated by broken line in Fig. 3, is about 10 per cent at the most, showing their rare occurrence.

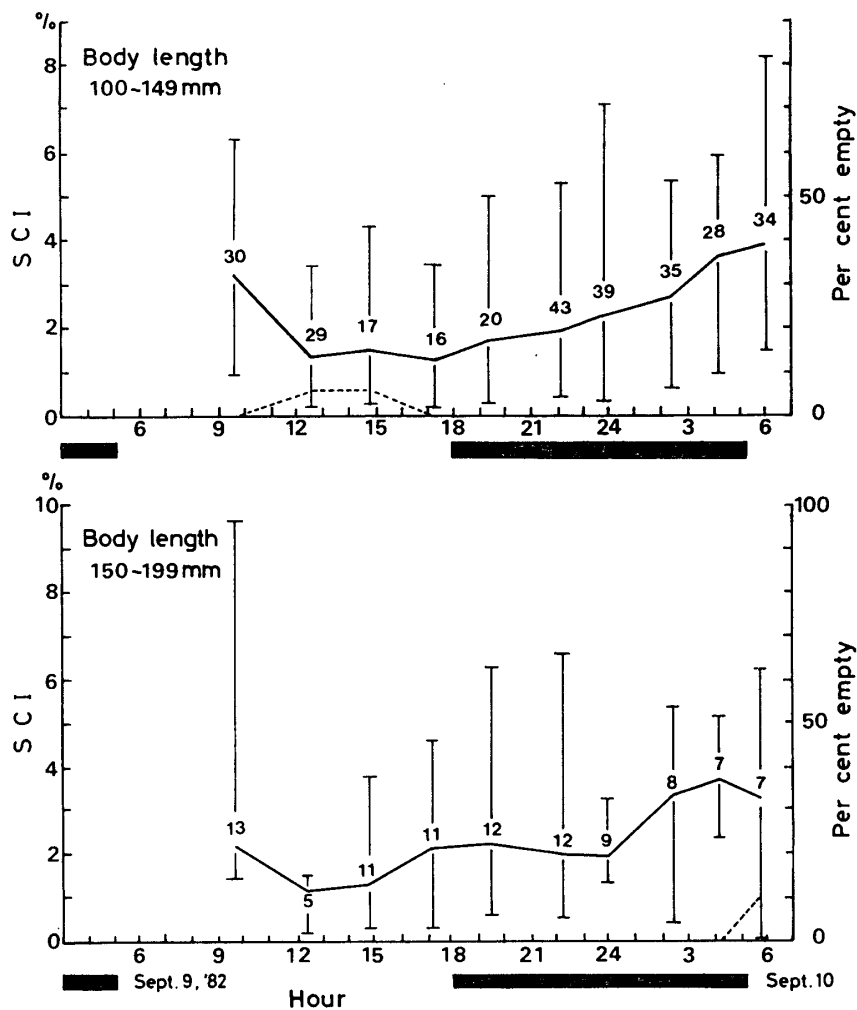


FIG. 3. Diel feeding activity in snailfish on September 9-10, 1982. Broken line is drawn for the proportion of empty stomachs. For further explanation, see Fig. 2.

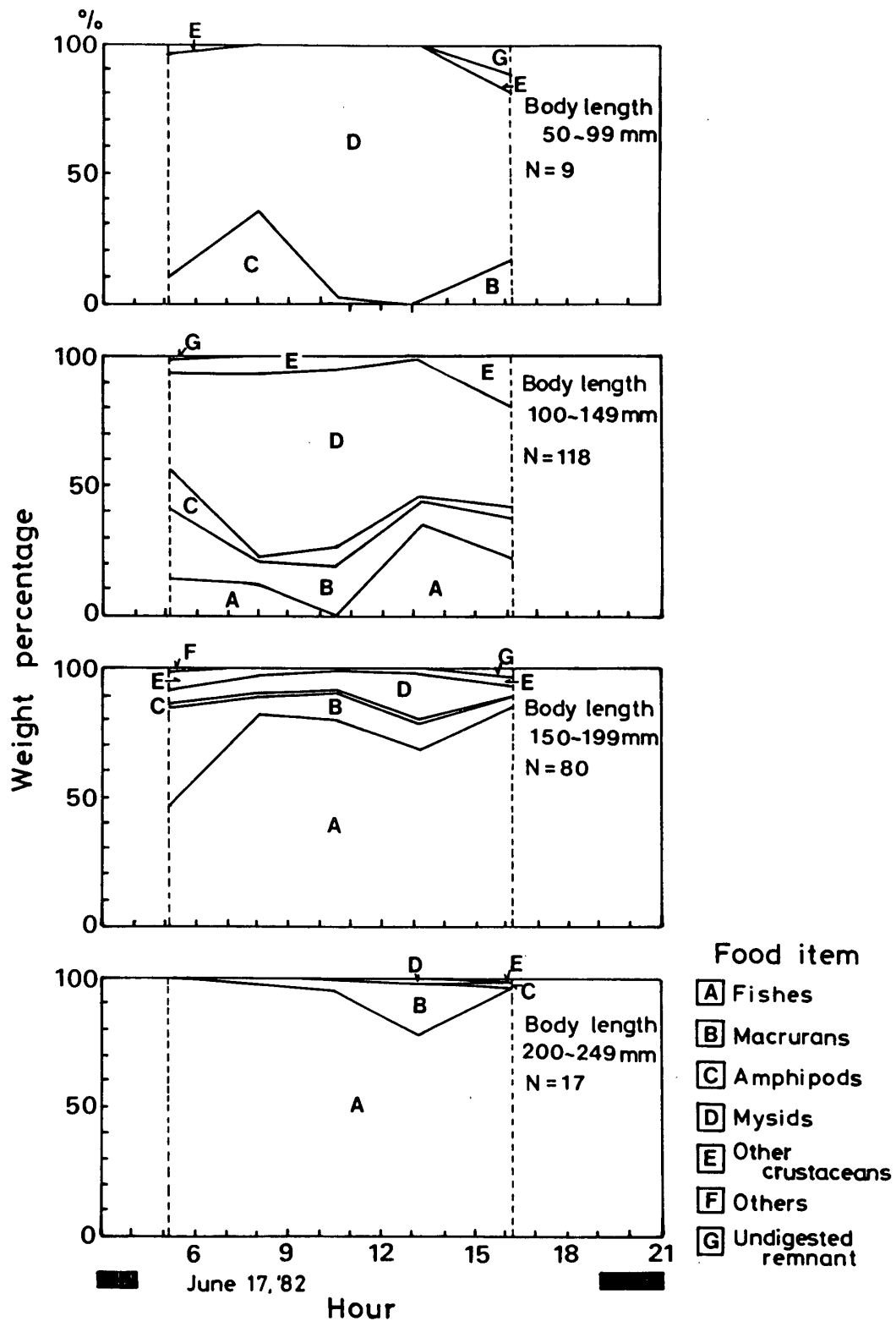


FIG. 4. Diel change in composition of food ingested in weight percentages on June 17, 1982.

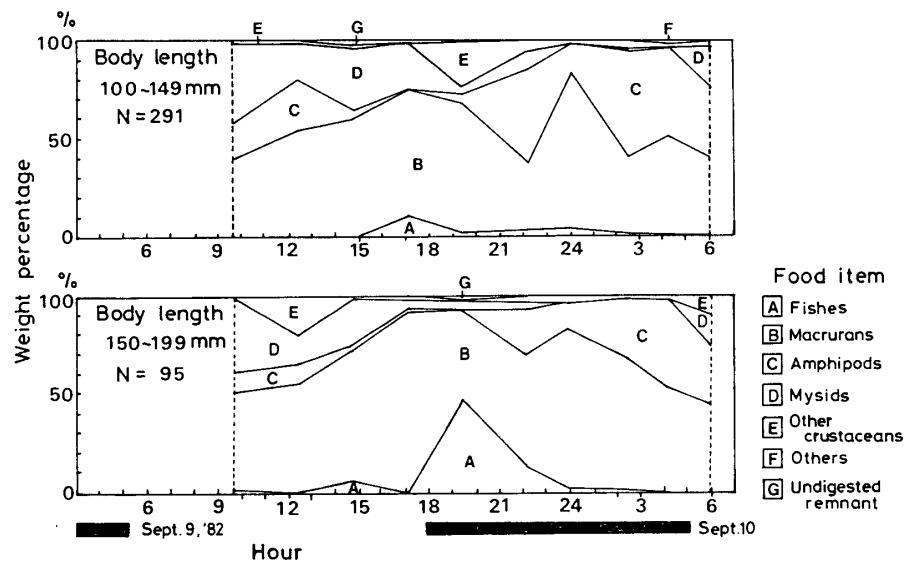


FIG. 5. Diel change in composition of food ingested in weight percentages on September 9-10, 1982.

Food Composition

Diel changes in the composition of food ingested in weight percentages in June and September are shown in Figs. 4 and 5 respectively. Major food species vary from length interval to interval. This means that the snailfish shift their food from small crustaceans, mainly mysids, to fishes, mainly the little snailfish and little Pacific cod *Gadus macrocephalus*, when they have grown to 150 mm in length.

Marked diel changes in food composition are not observed, but the proportion of fish among foods rises just after dawn over the whole range of length in September (Fig. 5). The major food is macrurans and no change occurs in food composition with growth.

Discussion

From the above results the snailfish reveal the diel feeding cycle. Feeding is not active in the daytime and they start feeding actively after dusk with peak activity from midnight to dawn, showing that the snailfish is a nocturnal feeder. This characteristic of feeding behavior is explained by the morphological characteristics of their brains with its well-developed olfactory system.

Diel feeding cycle is clearly observed in September and this seems to be due to low feeding activity. Whereas the diel change in SCI was more or less obscure in June because the SCI stayed high in the daytime, a clear change was observed in September when the SCI was low in general. Feeding activity of the snailfish would be closely related to their developmental stage. It seems that foraging is so active as to obscure the diel feeding cycle during fast growth in June, while it

becomes marked by the decline in feeding activity during slow growth in September (See Kawasaki *et al.* (1)).

The size of snailfish would have a greater influence upon their food composition than the time of day would have, which is consistent with the result obtained earlier by the present author (Kawasaki *et al.* (1)). This would be evidence of the change in selective feeding of snailfish with growth and development.

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References

- 1) Kawasaki, T., Hashimoto, H., Honda, H. and Otake, A., *Bull. Japan. Soc. Sci. Fish.*, **49**(3), 367-377 (1983)