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GROWTH OF NOTOTHENIID FISH, *TREMATOMUS BERNACCHII* AND *PAGOTHENIA BORCHGREVINKI* REARED IN AQUARIUM

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Abstract: Antarctic notothenid fish, *Trematomus bernacchii* and *Pagothenia borchgrevinki* were reared in the aquarium at the Kamogawa Sea World, Japan. Two *T. bernacchii* and 4 *P. borchgrevinki* individuals survived for about 2000 days in good condition. Growth in the body length and body weight of both species was observed. One individual of *T. bernacchii* spawned once a year since 1984. During about 1 month before spawning the fish stopped feeding. The similar behavior in feeding was observed in the other individual of *T. bernacchii*.

1. Introduction

Rearing of Antarctic marine organisms was commenced on 20 April 1982 in the aquarium for the cold region organisms of the Kamogawa Sea World, Chiba Prefecture, Japan (SAKAKIBARA *et al.*, 1984). All specimens reared were collected in the Syowa Station area (69°00′S, 39°35′E) in the 1981–82 summer. At the end of September 1978, the specimens, which had survived for about 2000 days, were as follows; two kinds of notothenid fish, *Trematomus bernacchii* (2 individuals) and *Pagothenia borchgrevinki* (4); an echinoid, *Sterechinus neumayeri* (5); an asteriod, *Odontaster validus* (1); a gastropod, *Neobuccinum eatoni* (2); and a nemertine, *Lineus corugatus* (5). A red alga, *Phyllophora antarctica* had been cultivated. The specimens reared appeared to be in a good condition. In particular, the growth of two kinds of fish was clearly observed and an individual of *T. bernacchii* spawned regularly.

In this paper, we report the growth of the fish in conjunction with the food consumption and the spawning.

2. Materials and Methods

Each individual of fish was separately kept in a glass container of 30 cm in width, 60 cm in length and 45 cm in height. The purification of water and the control of water conditions were made as described in SAKAKIBARA *et al.* (1984). The condition of water was monitored with conventional methods adopted by the Kamogawa Sea World. The fish were fully fed at 5 day intervals. The food was composed of northern shrimp (*Pandalus borealis*) 76.5%, short-necked clam (*Tapes philipinarum*) 11%, anchovy (*Engraulis japonicus*) 9%, and larval stages of chum salmon *Oncorhynchus keta*, high eyes

(*Oryzias latipes*), gluttonous goby (*Chasmichthys gulosus*) lake prawn (*Palaemon paucidens*) and others 3.5%. The quantity of food consumed by fish was recorded. The measurements of body length and body weight of fish were made once a month since 1984 though at lengthy intervals in 1982 and 1983.

3. Results and Discussion

The condition of sea water in the rearing container is shown in Fig. 1. No remarkable influence on fish by the change of water condition was observed throughout the experiment. The changes in food consumption rate of *T. bernacchii* and *P. borchgrevinki* as expressed by % of the weight of food consumed by a fish in a day to the body weight of fish are shown in Figs. 2 and 3. The lowering of feeding activity for 1 to 2 months in *T. bernacchii* occurred every year since 1984. In the case of *T. bernacchii* No. 2, the reduction time in feeding activity coincided with the period just 1 month before spawning as indicated in Fig. 2. *T. bernacchii* No. 1, which was considered immature because of its small body size, also showed the similar periodicity in feeding activity, but the lowering of feeding activity occurred 2 to 4 months before the spawning of *T. bernacchii* No. 2. *T. bernacchii* No. 1 had not been sexed not to damage the rearing specimen. These periodicities are reflected in the growth curve for body weight (Fig. 6), although the growth pattern in body weight was different between the two specimens. The growth in body weight of *T. bernacchii* No. 2 began to increase just after spawning. The body weight of *T. bernacchii* No. 1 began to increase 2 to 4 months

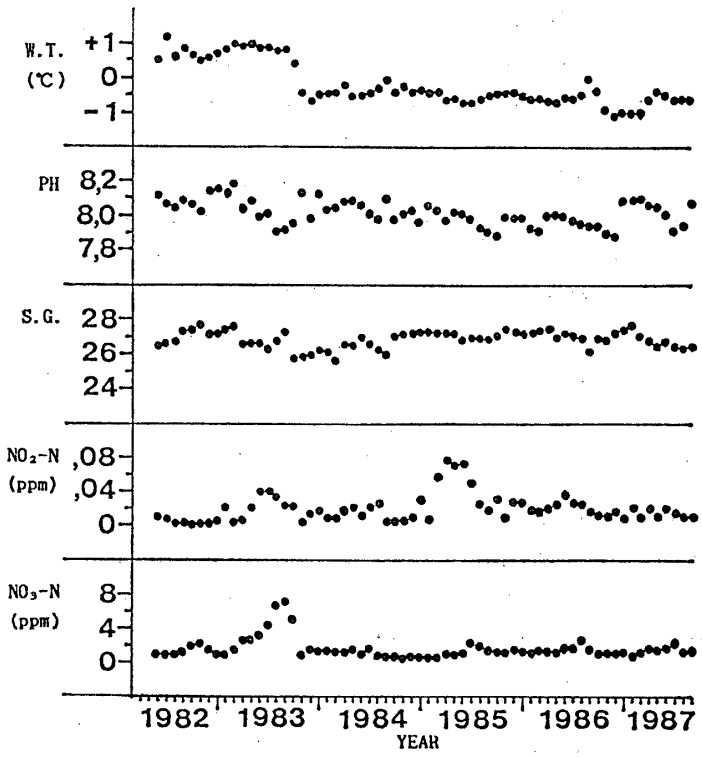

Fig. 1. Conditions of sea water in the rearing containers of Antarctic marnie organisms.

after the low feeding activity period and continued to increase for 2 to 4 months though it stopped increasing during the other months. The lag time in the growth of body weight of *T. bernacchii* No. 1 seemed to become short as it grew.

The food consumption rates of *P. borchgrevinki* before the early 1983 and in the later three quarters of 1984 were generally high but a remarkable decrease was observed in late 1983 though its causes were unclear (Fig. 3). After 1984 the rate decreased gradually. The variation in the body length and weight of *T. bernacchii* and *P. borchgrevinki* is illustrated in Figs. 4–7. The growth rate of body length in *T. bernacchii* is rather small compared with that in *P. borchgrevinki* (Figs. 4 and 5).

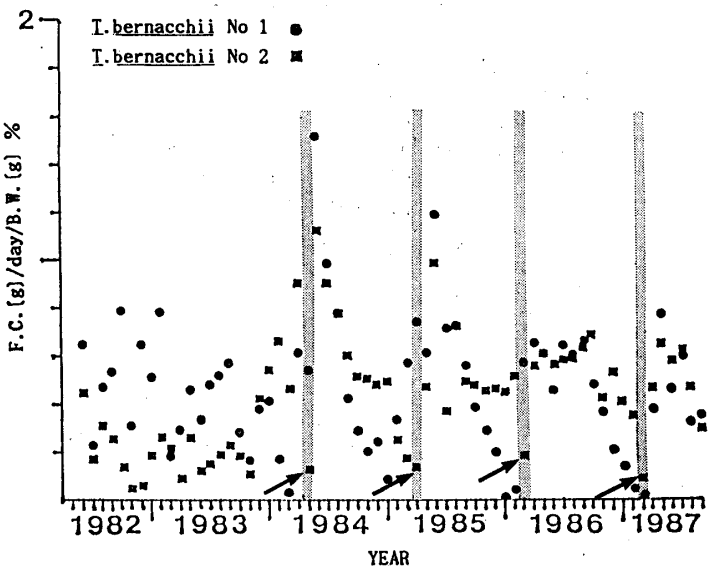

Fig. 2. Food consumption rate of T. bernacchii. *The periods in which* T. bernacchii *No. 2 did not take food and of the spawning are indicated by shadows and arrows.*

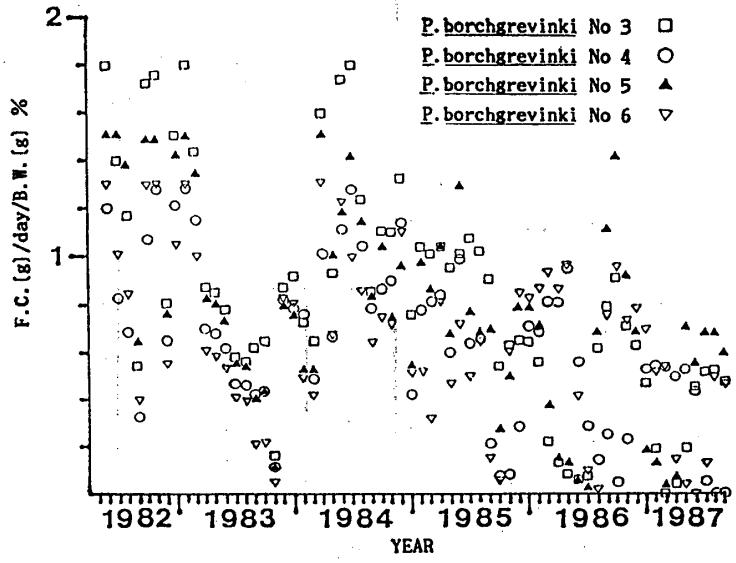

Fig. 3. Food consupmtion rate of P. borchgrevinki.

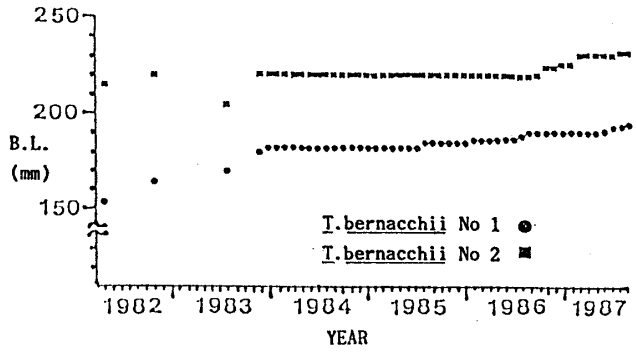

Fig. 4. Changes of body length of T. bernacchii.

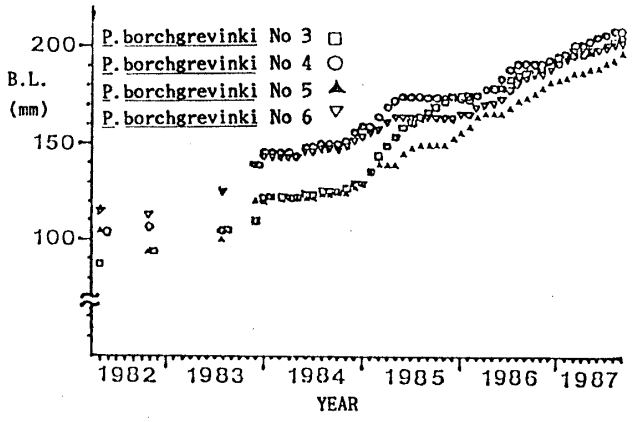

Fig. 5. Changes of body length of P. borchgrevinki.

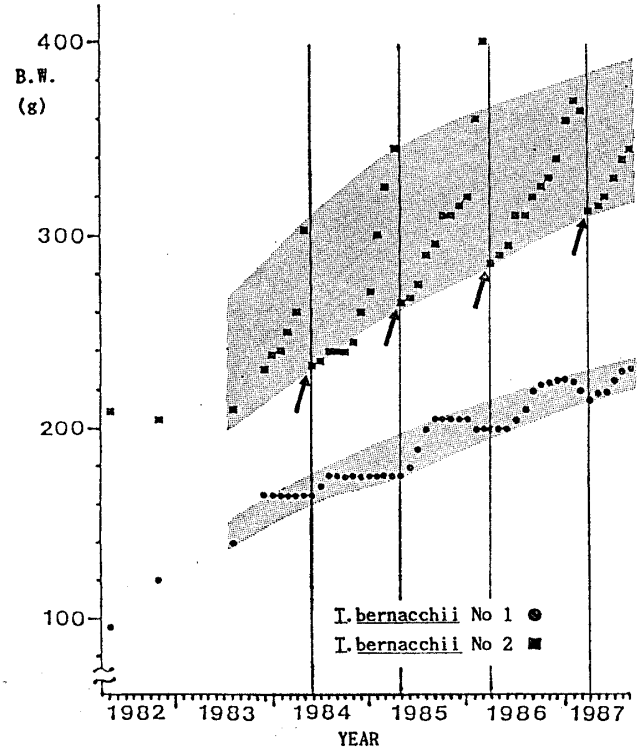

Fig. 6. Changes of body weight of T. bernacchii.

The body weight of *T. bernacchii* increased with periodical fluctuation as mentioned above (Fig. 6). The body weight of *P. borchgrevinki* also increased and its growth pattern resembled that of *T. bernacchii* No. 1.

The relationship between the body length and the body weight of the 2 species is shown in Figs. 8 and 9. The relations expressed with an equation $W=aL^b$, where

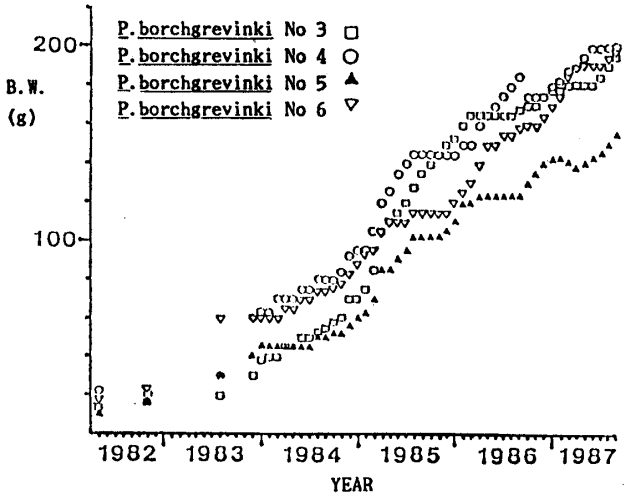

Fig. 7. Changes of body weight of P. borchgrevinki.

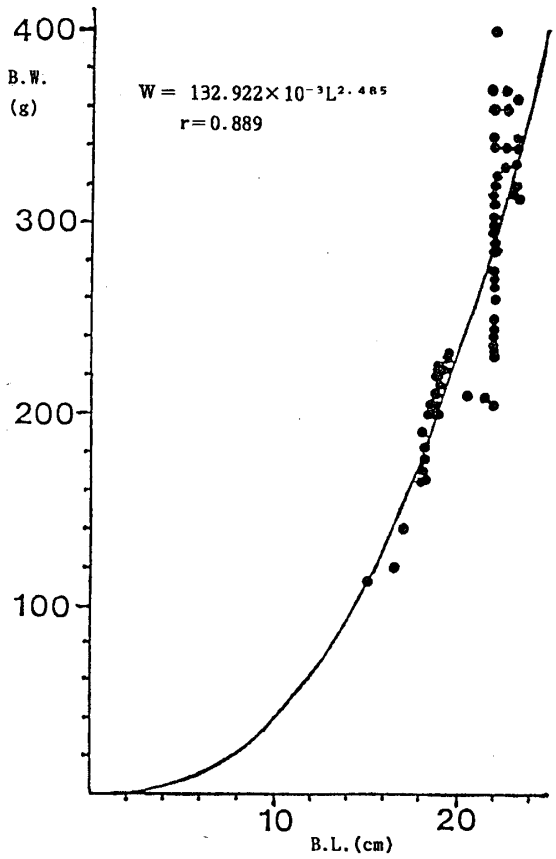

Fig. 8. Relationship between body length and body weight of T. bernacchii.

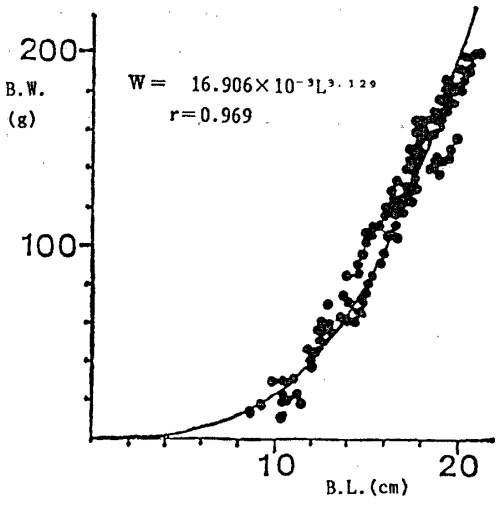

Fig. 9. Relationship between body length and body weight of P. borchgrevinki.

L=body length, W=body weight, are as follows,

$$W=132.922\times10^{-3}L^{2.485} \quad \text{for } T.\ bernacchii,$$
$$W=16.9063\times10^{-3}L^{3.129} \quad \text{for } P.\ borchgrevinki.$$

The smaller value of b for *T. bernacchii* indicates the slower growth rate of this species as it grows.

Reference

SAKAKIBARA, S., TOBAYAMA, T. and HOSHIAI, T. (1984): Rearing of Antarctic marine organisms in Japan. Mem. Natl Inst. Polar Res., Spec. Issue, **32**, 103–104.

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