On Faecal Pellets and Food Habits of Emperor’s Slit Shell, *Mikadotrochus hirasei* (PILSBRY)

Kohman Y. ARAKAWA*, Daisaburo NAKANO**, Osamu TSUKADA**
and Takaharu HOSHINO***

(Introduction)

Late in March 1978, several specimens of Emperor’s Slit Shell, *Mikadotrochus hirasei* (PILSBRY), were captured alive in trawl net by Mr. T. YAGURA at a depth of 150 m at 10 miles east off Ichie-zaki, Wakayama Prefecture, Honshu, Japan and were sent to Toba Aquarium for public exhibition as well as for biological studies.

Fortunately enough, one of these animals kept in a rearing tank of the Aquarium happened in a little while to produce a considerable amount of faeces. After preserved in 10% formalin, they were embedded in gelatine in order to prevent from disintegration during transportation and handed over to the senior author (KYA) for dissection and examination of constituents of faecal material.

Before going further, we would like to express our gratitude to Mr. Haruaki NAKAMURA, the Director of Toba Aquarium, for his generosity in placing the materials at our disposal and to Mr. Akio TAKI, Zoological Institute, Faculty of Science, Kyoto University for the references.

(Descriptions)

Faecal pellets: Faeces of this animal are usually voided from the slit of body whorl of the shell accompanied with a small quantity of mucus. The faecal pellets are rod-shaped with uneven surfaces, 4~5 mm in diameter, very coarse in surface texture and muddy brown in colour. The cross-section of the pellets is roughly rounded in outline and shows no localization of constituents of materials (Text-figs. 1 & 2).

* Hiroshima Fisheries Experimental Station, Ondo, Hiroshima Pref. 737-12.
** Toba Aquarium, Toba, Mie Pref. 517.
*** Mukaishima Marine Biological Station (Hiroshima Univ.), Mukaishima, Hiroshima Pref. 722.
Text-fig. 1. Exterior view of the faecal pellets of Emperor's
Slit Shell, Mikadotrochus hirasei (PILSBRY). ペニオキナエビスの糞塊
2. Cross-section of the faecal pellets of the same. 同上断面

Food habits: The pellets are composed almost entirely of undigested materials which may be of spongy origin, with a mixture of other skeletal matters, such as broken shell-pieces of foraminifera, serpulids and of bivalves and frustules of diatoms containing some sand grains. A closer examination of constituents of the faecal materials treated with nitric acid reveals the existence of various types of sponge spicules and skeletons as shown in Table 1 and Pl. 1. While on the other hand, it is interesting to note that many of these animals kept in captivity aquarium fed on flesh meat of clam (Tapes philippinarum) and one fed starfish (one of Asterinidae) selectively out of various kinds of foods (slices of raw fish, living polychaetous worm etc.) provided.

Producer of the pellets: The animal of which faeces are used is 88.05 mm in shell height, 102.5 mm in shell width and 350.0 g in total live weight.

Discussion

It has been reported (Matsumoto et al., 1972; Sekido et al., 1976) that the faecal pellets of slit shells (such as Mikadotrochus and Perotrochus) are shed in the form of long continuous rods with no surface-sculptures presumably referable to “Orthocylindric” sype (ARAKAWA, VTFB). The faeces of the present species seem to be quite similar in appearance to those of the previously reported ones.

On the food habits, Woodward (1901) suggests that Mikadotrochus is regarded as mono-carnivore, preying selectively on a sponge. His examination of the stomach contents of two specimens of the species showed a large quantity of sponge spicules bound by tissue which belong to one of the “Halichondrina (a species of Amphilectus)”*. Based on this fact, he concluded that staple

* The genus Amphilectus is placed in the Order Poecilosclerina according to modern classification of Porifera.
food of Pleurotomarians is a living sponge.

Our results from examination of the constituents of the faecal materials in *M. hirasei* agreed well with those of Wooward (1901) in *M. beyrichi*, while in the case of the former, species of a sponge taken as food contains a wide variety compared with that of the latter (Table 1). Further, speculating as to the relationships between the nature of the food and the structure and function of the characteristic shape of radular teeth of this species, he states "...the hooked teeth would be useful in tearing away great pieces of the sponge, and the brush teeth might at the same time rasp away some of the flesh from the spicules". Nevertheless, it was found that the slit shell kept in captivity shows considerably wide adaptability for food (Table 1), during the course of experiment for food preference by Matsumoto et al. (1972). Further results which support this view have also been achieved by Sekido et al. (1976) for *Perotrochus teramachii* and by the present authors for *M. hirasei* (Table 1).

In view of the above facts, we find it difficult to avoid the conclusion that Mikadotrochus shows a considerable adaptability for food according to environment and should be referable to steno-carnivore rather than to mono-carnivore.

**Table 1.** Comparisons of food habits of *Mikadotrochus* and *Perotrochus* under different life-environment.

<table>
<thead>
<tr>
<th>Predator</th>
<th>Kind of food taken in habitat (References)</th>
<th>Kind of food taken in captivity (References)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Mikadotrochus beyrichi</em></td>
<td><em>Amphilectus</em> (?) sp. [&quot;Haliclondrina&quot;] (Woodward, 1901)</td>
<td>*Slices of raw fish, <em>Trachurus japonicus</em> (Matsumoto et al., 1972)</td>
</tr>
<tr>
<td></td>
<td><em>Haliclona</em> (?) sp. [Haplosclerina: Halicionidae]</td>
<td>*Meat of clam, <em>Tapes philippinarum</em></td>
</tr>
<tr>
<td></td>
<td><em>Hamacantha</em> (?) sp. [Poecliosclerina: Amphilectidae]</td>
<td>(The present authors)</td>
</tr>
<tr>
<td><em>M. hirasei</em></td>
<td><em>Myxilla</em> (?) sp. [Poecliosclerina: Myxillidae]</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Suberites</em> (?) sp. [Hadromerina: Suberitidae]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(The present authors)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>?</td>
<td></td>
</tr>
<tr>
<td><em>Perotrochus teramachii</em></td>
<td>?</td>
<td></td>
</tr>
</tbody>
</table>

- Living fish, *Limanda* sp.
- Synthetic diet for carp
  (Hayashi, S.: pers. comm.)
- Slices of raw fish, *Trachurus japonicus* (Sekido et al., 1976)
要 約

1978年3月下旬、和歌山県市江崎沖で採捕されたベニオキナエビ Mikadotrochus hirasei (PILSBRY) 数個のうち1個体が、採捕後間もなく餌を排泄した。これをもとに、本種の糞の形状およびその内容について吟味するとともに、飼育下における本種の食性についても二、三実験を試み、若干興味ある知見を得た。

1. 本種の糞の構造は、すくぶる単純で、直径4〜5mmの円筒状。表面はきめが粗く、特定の形をつぼきさなない。断面はほぼ円形で、内容物は側った分布を示さない。既に報告されているオキナエビ M. beyrichi (HILGENDORF) (MATSUMOTO et al., 1972) およびテラマチオキナエビ Perotrochus teramachii KUKUODA (SEKIDA et al., 1976) などの糞とよく似た特徴を示す (Text-figs. 1 & 2)。

2. 本種の糞の内容は、大部分が Haliolina (?), Hymenodesmia (?), Hamacantha (?), Mysilla (?), Suberites (?) など海綿類の骨片や骨格あるいは組織がかかなり、これに若干の管棲多毛類、有孔虫類、二枚貝類などの貝殻片や砂粒がふくまれる (Pl. I)。この結果は、オキナエビの胃内容物について調べた WOODWARD (1901) の報告と一致し、オキナエビガイ科 Pleurotomariidace のうち、少なくともオキナエビガイ属 Mikadotrochus は、天然では海綿類を食べているということができるよう。

3. 一方、本種は飼育下に給餌実験の結果、与えられたゴカイ類、アジ肉、アサリ剥き身、生きたヒトデ類のうち、アサリとヒトデを好んで摂食した。オキナエビについての MATSUMOTO et al. (1972) の実験結果も、ウカメ、アサリ、アジ肉のうちから、アサリとアジをえらんで摂るなど、ほぼ本種と同様性質の選択性を示しており、オキナエビガイ属の動物は、環境に応じて、食物についてはかなりの適応性をもつことが知られ、半肉食性 mono-carnivore というより、狭肉食性 steno-carnivore とみなすのが適切かもしれない。

References


The contents of the faeces in *Mikadotrochus hirasei* (PILSBRY). ペニオキナエビスの糞塊内容物 (4, 5 を除きすべて海綿類の骨片)
1. *Hamacantha* (?) sp., Porifera ([Skeleton]) 2. *Haliclona* (?) sp., Porifera (Oxea [Skeleton])
3. Generic and specific position indeterminable, Porifera (Tylote & Isochela)
4. *Coscinodiscus* sp., Diatom けい藻の一種 5. Foraminifera 有孔虫の一種
6. *Hamacantha* (?) sp., Porifera ([Skeleton]) 7. Generic and specific position indeterminable, Porifera (Triacts)
8. Generic and specific position indeterminable, Porifera (Oxea (Tylote & Isochela))
11. Generic and specific position indeterminable, Porifera (Isochela)