

Kleptoparasitism of polychaetes against *Serpulorbis imbricatus* (Gastropoda: Vermetidae) by ingesting its mucus net

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Gastropod Vermetidae is a sessile suspension feeder mostly inhabiting the rocky inter- and sub-tidal seashore. The feeding way of vermetids is unique: they secrete mucus net from their foot (suprapedal gland), expose it to the water current and ingest it together with stuck suspension. Some researchers have shed light on the feeding ecology of vermetids (Hughes, 1985; Kappner, 2000). However, the interspecific interactions between the vermetid and the other animals have not been focused well, although they often dominate the benthic communities in some area. Even fragmentary information will contribute to reveal their roles in benthic communities.

This paper reports the laboratory observation that some polychaetes ingested the mucus net of vermetid gastropod *Serpulorbis imbricatus*. Along the coast of Japan, *S. imbricatus* is the most common vermetid. It often dominates the rocky platform of Echizen Seashore, Fukui, central Japan (Ishida, unpublished data).

Materials and Methods

Individuals of *S. imbricatus* were collected at the rocky subtidal zone of Takasu beach, Matsukage, Fukui (N36° 7', E136° 3') in September 2003. This site was prevented from direct waves with a small island and wave-dissipating concrete blocks, and *S. imbricatus* settled on both the platform and small rocks. I collected them with rocks in September 2003, brought back to the laboratory of Fukui City Museum of Natural History, and kept in a 25L glass aquarium filled with natural or artificial seawater. Seawater temperature was kept at around 25 °C. They were fed with nauplii or eggs of *Artemia* (brine shrimps), with inducing their mucus net secretion by the water current of a circular pump. The aquarium was illuminated by a 20W fluorescent lamp

imitating sunlight wavelength during the daytime and by infrared LEDs during the nighttime. Foraging behavior of *S. imbricatus* was recorded with a CCD camera (Sony CCD-TRV85) and a time lapse VCR (Panasonic AD-6740). These recordings originally aimed to carry out another experiment to analyze the feeding behavior of *S. imbricatus*.

Results

Analysis of the movie revealed that a polychaete which hid itself in a crevice of the *S. imbricatus* shell appeared into the water, caught the mucus net, and swallowed it in ca. one minute (Figure 1). This movie was registered in Movie Archives of Animal Behavior (Ishida, 2003). After the recording, the polychaete was removed from the shell and was identified as *Perinereis cultrifera* (Polychaeta: Nereididae).

In the other *S. imbricatus*, some of *P. cultrifera* and two species of Polychaeta (*Nereis* sp. and *Ophisthosyllis* sp.) appeared from the shell crevice and crept around the aperture of *S. imbricatus*. Unhatched eggs or hatched egg capsules of *Artemia* were found in the gut contents of these polychaetes.

The behavior in Figure 1 was the only one case of the ingestion during the daytime (at around 15:58). All of the other cases of polychaetes' appearance were observed during the nighttime.

Discussion

The movie (Ishida, 2003) and Figure 1 shows that *P. cultrifera* apparently ingested the mucus net of *S. imbricatus*. Mucus net ingestion was not obvious during the nighttime, but it is probable that the other two polychaetes may also ingest the

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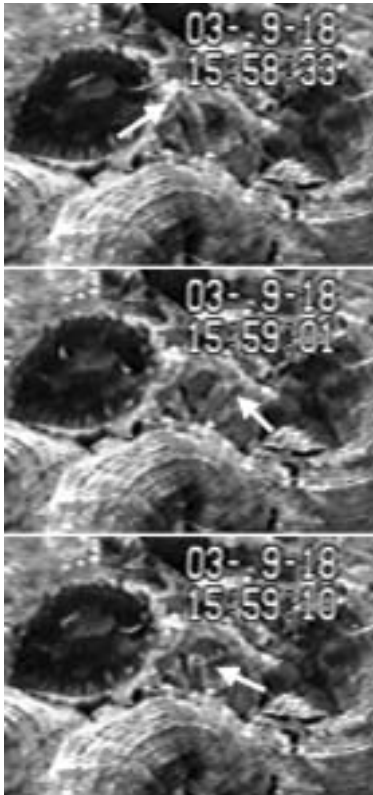


Figure 1: Sequential photographs of *P. cultrifera* ingesting the mucus net of *S. imbricatus*. Each arrow indicates the head of *P. cultrifera*, which was pulling the net. Longer diameter of shell aperture (left side) is ca. 13 mm. These photographs were processed from the movie (Ishida, 2003) registered on Movie Archives of Animal Behaviour.

図1：クマドリゴカイがオオヘビガイの粘液系を摂取する連続写真．矢印はそれぞれ粘液系を引っ張るゴカイの頭部を示す．オオヘビガイの殻口(左)の長径は約13 mm．この写真は動物行動の映像データベースに登録した映像 (Ishida, 2003) から作成した．

mucus net, by judging from their behavior and gut contents. The mucus of *S. imbricatus* works to catch suspension and contains its own food, so the mucus ingestion of these polychaetes is considered as a kind of kleptoparasitism against *S. imbricatus*. To my knowledge, this is the first report of kleptoparasitism against a suspension feeder.

The reason for nocturnal frequent ingestion may be that the suspension mass and the feeding activity of *S. imbricatus* increase during the nighttime (Ishida, unpublished data), or that the polychaetes escapes from predators using visual cues during the daytime.

In general, *P. cultrifera* is a deposit feeder. It is unclear how large part of the polychaetes' food resource depends on the mucus net. It is also unclear how much effect brings on host *S. imbricatus*. Seemingly there is no direct positive effect on *S. imbricatus* from the polychaetes. However, there are mutual inquiline relationships in some benthic communities, e.g., an animal provide habitat for the other and entrust it with defense from predators (e.g., alpheid shrimp and gobiid fish: Harada, 1969; Karplus, 1987; coral and trapeziid crabs: Weber & Woodland, 1970; Pratchett, 2000). It will need to investigate the possibility of such relationship between the polychaetes and *S. imbricatus*.

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オオヘビガイの粘液系を摂取することによるゴカイ類の盗み寄生

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オオヘビガイ (*Serpulorbis imbricatus*) の殻のすき間に潜むクマドリゴカイ (*Perinereis cultrifera*) が、オオヘビガイの粘液系を摂取することが室内飼育下で観察された。クマドリゴカイの他にゴカイ科の一種 (*Nereis* sp.) とシリス科の一種 (*Ophisthosyllis* sp.) も同様に殻のすき間から見いだされ、夜間にオオヘビガイの殻口付近を這う行動と胃内容物から、この二種も粘液系摂取をしてい

ると推定された。オオヘビガイの粘液系は自らの餌である懸濁物を得るためのものなので、ゴカイ類の粘液系摂取は一種の盗み寄生 (kleptoparasitism) といえる。ゴカイ類が粘液系にどれくらい頼っているのか、またオオヘビガイがどの程度影響を受けているのかは現在のところわからない。ゴカイ類はオオヘビガイに正の影響を与えてはいないように思われるが、共生関係の有無を検証する必要があるだろう。

なお、観察された行動の映像は「動物行動の映像データベース」に登録されている（データ番号：momo031205pc01b，URL: <http://www.momo-p.com/>）。