SHORT COMMUNICATIONS

Evidence of Slug Predation on Land Snail Eggs¹

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During a field survey made on land mollusks, many eggs of several land snail species drilled by an unidentified slug were found. In this article, laboratory and field observations of the drilling of land snail eggs by this carnivorous slug are reported.

The slug and eggs of *Satsuma mercatoria* (Stylommatophora: Camaenidae) were collected for laboratory observation in the forest of Sueyoshi Park, Naha City, Okinawa (26° 13'N, 127° 40'E) in October 1983. The egg was about 4 mm in diameter with a hard calcareous shell. These materials were kept in a plastic dish with wet filter paper in the laboratory.

The adult slug was about 2 cm long and gray in color on the dorsal side with obscure black dots (Fig. 1-A), in contrast to its ventral side which was reddish brown. Optic tentacles were short and black. This slug secretes a minimal amount of mucus on its body surface. The morphological characteristics are comparable to those of *Incillaria* sp. reported by MINATO (1976) from the Yonaguni-jima and Ishigaki-jima Islands of the southern Ryukyus. This species has been seen throughout the islands of the southern and central Ryukyus as far north as Iheya-jima Island (KUROZUMI, unpublished data).

MINATO (1976) identified this species as *Incillaria* sp. but its precise generic position seems to require further detailed study.

When it encountered an egg, the slug fixed its head to the egg. It then retracted its optic tentacles and kept this posture until it had completely digested the egg (Fig. 1-B). Feeding was performed by external digestion by inserting its proboscis into the egg. The time required to consume one egg of *S. mercatoria* was about 30 min. In Fig. 1-C, the proboscis has been withdrawn to

artificially pull the slug away from the egg; fully expanded, it extended about 2 mm. Color of the consumed egg turned from yellowish brown to pure white. The feeding scar was an elliptic hole about 0.5 mm long by 0.2 mm in short diameter (Fig. 1-D). There was a narrow scraped part on the margin of the hole.

In the southern part of Okinawa-jima Island, this slug generally lives on and around limestone rocks in the forest. The main prey of the slug detected in Sueyoshi Park was eggs of land snails such as *S. mercatoria*, *Bradybaena circulus* and *Aegista elegantissima*. Predation was frequently observed in *S. mercatoria*, which lays eggs in rock crevices. I found this slug also in the forests of Kerama Islands, where there was no limestone, and in the coastal forest of Iheya-jima Island, and on these islands too, the suspected predation scars were observed.

This slug attacks not only eggs, but also the snails themselves. It drilled into the shell of prosobranch snails such as *Georissa fukudai* and *Cyclophorus turgidus* in the same manner as it did the eggs, and consumed the soft part of the snail. In predation of the pulmonate snail, *A. elegantissima*, the slug actually inserted its body into the prey shell through the aperture and, probably using its proboscis, digested almost the entire snail body. I observed such feeding twice.

I have frequently found the slug in the wet part of the forest in Sueyoshi Park, but never in dry, open places such as cultivated land. This seems to be an important point when we consider use of the slug as a biological control agent against the giant African snail, *Achatina fulica*, because the latter generally lives at the edge of forests or dry and open places. The giant African snail is a serious introduced pest of crops in the Pacific Islands including the Okinawa, Amami and Ogasawara Islands of Japan. Its biological control has often been attempted by the introduction of predators such as carnivorous land snails, glowworms and turbellarians, but effective control has not yet been attained (MEAD, 1961, 1979). To use this slug as a successful biological control agent against the giant African snail, attention must be given to the differences in habitat preference of the two species.

According to T. TAKARA (personal communication), drilled eggs of the giant African snail have frequently been found in the limestone forests of

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Fig. 1. Characteristics of slug predation on the egg of the land snail *Satsuma mercatoria*. A: the predatory slug. B: the beginning of egg predation. C: showing the proboscis (p) and mucus. Scale indicates 1 cm. D: holes drilled in the egg shell by the slug and hatchlings of *S. mercatoria*. All photos were taken by Mr. S. HORI.

Okinawa-jima Island, and the drilling was suspected to be caused by the attack of a carnivorous reduvid bug (unspecified species). However, observations of the feeding scar on the eggs (excluding *A. fulica*) obtained at the southern part of this island revealed that they were similar to those described here. Therefore, egg predation may be attributable to the slug.

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