PREDATORY BEHAVIOR OF THE XANTHID CRAB
ERIPHIA SMITHII BREAKING THE SHELLS
CONTAINING HERMIT CRABS

With 1 Table and 3 Text-figures

by

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イボイワオウギガニのヤドカリ類に対する捕食行動

表 1, 図 3

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Abstract: The Xanthid crab *Eriphia smithii* preys on hermit crabs. Two chelae, ambulatory legs, and mouth parts are used for capturing them. The crab breaks shells with hermit crabs in them by using its massive and powerful master claw. About 70% of the crabs are right-handed. Many species of shells occupied by hermit crabs are found at Banda Shore. *E. smithii* breaks these shells.

Introduction

Many crabs, such as *Calappa flamea* (HERBST) (SHOUP, 1968), *C. gallus capellonis* LAURIE (TAKEDA and SUGA, 1979), *Calpilius maculatus* (LINNAEUS), *C. convexus* (FORSCAL) (VERMEIJ, 1976), *Eriphia squamata* STIMPSON, *Ozius verreauxii* SAUSSURE (BERTNESS and CUNNINGHAM, 1981), prey on gastropods or hermit crabs. The Xanthid crab *Eriphia smithii* MACLEAY, an Indo West-Pacific species distributing in the temperate to the tropical zone, inhabits the intertidal zone of the rocky shore and preys on the sea-snails and hermit crabs. In this article, the predatory behavior of *E. smithii* observed in the laboratory.

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Materials and Methods

The crabs ranging from 21.7 to 34.3 mm in carapace length are collected at the rocky shore near the Banda Marine Station of Tokyo University of Fisheries in Chiba Prefecture. They are reared in the cycling sea water aquaria in the laboratory and are fed with shells containing hermit crabs, *Pagrus geminus* and *Clibanarius virrescens*.

Results

Morphology of the Crab

Eriphia smithii has a master and a minor claw. The massive master claw (crusher)

Fig. 1. *Eriphia smithii* with master (A) and minor (B) claws in ventral view.

Fig. 2. *Eriphia smithii* which is breaking the shell *Turbo multiformis* containing the hermit crab.

(Fig. 1) is strong and is utilized to crush or break shells. The minor one (nipper) (Fig. 1) is relatively slender and is employed for taking food. The crabs with right master claw account for about 70% of the specimens collected at Banda Shore.

Predatory Behavior

Upon finding a shell occupied by a hermit crab, *E. smithii* holds the shell by using two chelae, ambulatory legs and mouth parts. The crab inserts its dactil into the shell and rolls the shell by using its chelae and ambulatory legs. After repeating this act of inserting and rolling several times or more, the crab puts its master claw into the aperture and breaks the edge or the middle part of the shell (Fig. 2). When the chela reaches the body of the hermit crab, the crab nips it with the minor claw and pulls out a part or the whole of the prey and eats it. In many cases, claws and ambulatory legs of hermit crabs are eaten at first.

Sometimes, the hermit crab tries to run away from the shell which is holded by the crab. The action of the crab is so rapid that the hermit crab has scarcely any

Table 1. The main shells which are occupied by hermit crabs in Banda Shore.

Family	species
Trochidae	<i>Tristichotrochus unicum</i> (DUNKER)
	<i>Monodonta labio</i> (LINNE)
	<i>Chlorostoma lischkei</i> (TAPPARONE-CANEFRI)
	<i>Omphalius pheifferi</i> (PHILIPPI)
	<i>Umbonium (Suchium) moniliferum</i> (LAMARCK)
Turbinidae	<i>Lunella coronata coreensis</i> (RECLUZ)
	<i>Turbo (Marmarostoma) stenogyrus</i> (FISCHER)
Neritidae	<i>Theliostyla albicilla</i> (LINNE)
Potamididae	<i>Batillaria cumingii</i> (CROSSE)
Cypraeidae	<i>Purpuradusta gracilis japonicus</i> (SCHILDER)
Muricidae	<i>Thais</i> spp.
	<i>Ergalatax contractus</i> (REEVE)
Buccinidae	<i>Pisania (Japeuthria) ferrea</i> (REEVE)
	<i>Babyronia japonica</i> (REEVE)
	<i>Pollia mollis</i> (GOULD)
Pyrenidae	<i>Pyrene (Sundamitrella) impolita</i> (SOWERBY)
	<i>Pyrene testudinaria tylerae</i> (GRIFFITH et PIDGEON)
	<i>Pyrene punctata</i> (BURGUIERE)
Nassariidae	<i>Reticunassa hiradoensis</i> (PILSBRY)
	<i>Alectrion suflatus</i> (GOULD)

Fig. 3. The shells broken by *Eriphia smithii*. A: *Turbo stenogyrus* B: *Chlorostoma lischkei* C: *Thais clavigera* D: *Theliostyla albicilla*.

chance to escape.

Broken Shell Species and Predatory Mark

Shells containing hermit crabs belong to many families as in Table 1. The predatory marks are shown in Fig. 3. The typical predatory mark is observed in Turbinids as in Fig. 3A, in which the aperture is broken and middle part of the shell is broken. In Trochids, the half part of the shell is broken (Fig. 3B), and sometimes, the shell is crushed into pieces. *E. smithii* is unable to break large shells.

Discussion

Eriphia smithii shows the same behavior of capturing hermit crabs as in *Calappa* (SHOUP, 1968; TAKEDA and SUGA, 1979) and *Daldorfia* (ZIPSER and VERMEIJ). *Calappa* is most specialized in morphological adaptations for opening molluscan shells, while

E. smithii breaks shells by its massive and powerful master claw. *E. smithii* is one of the *Eriphia* species bearing great chelae (VERMEIJ, 1977), and is almost right-handed, breaking many species of shells inhabit rocky shores of the temperate zone. The crab preys on shells occupied with hermit crabs in natural environment although it is scarcely observed to break shells in the field. The way of breaking shells by left-handed crabs is almost the same as that of right-handed ones, but it is not known which hand works more efficiently in getting food.

References

- BERTNESS, M.D. and C. CUNNINGHAM, 1981. Crab shell-crushing predation and gastropod architectural defense. *J. Exp. Mar. Biol. Ecol.* 50: 213-230.
- SHOUP, J.B. 1968. Shell opening by crabs of the genus *Calappa*. *Science* 160: 887-888.
- TAKEDA, M. and H. SUGA, 1979. Feeding habits of box crabs, *Calappa*. *Res. Crustacea* 9: 43-46.
- VERMEIJ, G.J. 1976. Interoceanic differences in vulnerability of shelled prey to crab predation. *Nature* 260: 135-136.
- VERMEIJ, G.J. 1977. Patterns in crab claw size: The geography of crushing. *Syst. Zool.* 26: 138-151.
- ZIPSER, E. and G.J. VERMEIJ, 1978. Crushing behavior of tropical and temperate crabs. *J. Exp. Mar. Biol. Ecol.* 31: 155-172.

要 約

イボイワオウギガニは、貝類、ヤドカリ類を捕食する。餌を発見すると鉗脚、歩脚、および口部を用いて囲うように餌を抱え込む。大鉗脚（坂田地先では、約70%が右鉗脚が大きい）で貝の殻口を割るか、螺層部に穴をあけ、中に棲むヤドカリを捕食する。実験に用いたヤドカリは、イソコバサミとホンヤドカリであり、多くの貝の種を宿貝としている。貝殻の割られ方には特徴がある。