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ECOLOGICAL NOTES ON *CHIROSTYLUS DOLICHOPUS*
(ANOMURA : GALATHEOIDEA : CHIROSTYLIDAE)
AT MIYAKE-JIMA, JAPAN*

With 9 Text-figures

by

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ムギワラエビ *Chirostylus dolichopus* の生態観察

挿図 9

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Abstract: *Chirostylus dolichopus* was noted to show three types of feeding behaviour. Type 1 is the principal behaviour of scrape feeding by legs. Type 2 is comb-out feeding by maxillipeds extend. Type 3 is direct feeding by chelipeds or maxillipeds, scraping and munching objects directly, although this is an exceptional case of feeding behaviour. Grooming or cleaning carapace, abdominal segments, branchial chamber and eggs by the fifth legs was noted in this species as in other Decapoda Crustacea. *C. dolichopus* appears to have a longevity of about one year and one brooding, requiring a long period of incubation.

Introduction

In the past few years, we have been studying sublittoral biota of Miyake-jima by SCUBA diving. During the survey, *Chirostylus dolichopus* was rarely found in the shallow waters around the island. In the present paper, the ecology of this species is discussed with special attention directed to its feeding behaviour on the basis of data obtained from field and laboratory observations.

* This is contribution number 4 from the Z. NAKAI Laboratory.

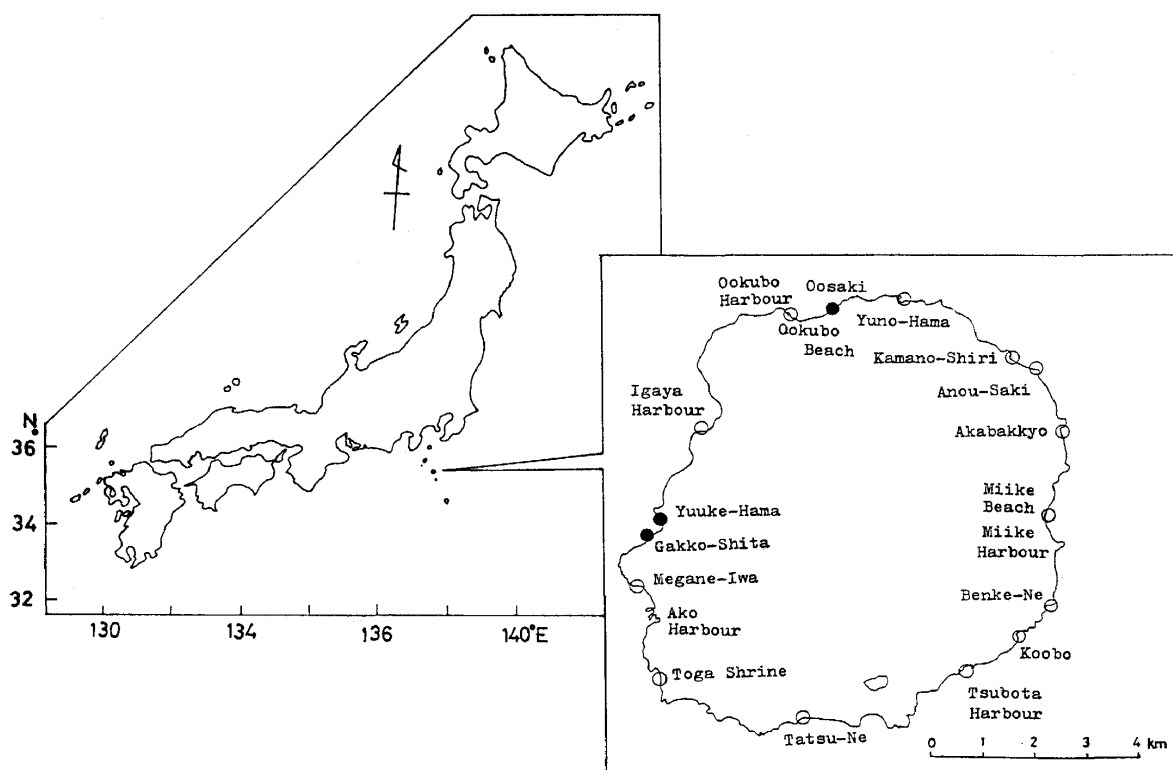


Fig. 1. Stations in Miyake-jima where *Chirostylus dolichopus* was observed. Open circle: survey stations, Closed circle: stations at which *C. dolichopus* was found.

Study Area

Miyake-jima is one of the Izu islands situated to the south of Izu Peninsula. There are many places for diving along the coast, but research plan was quite often hindered by rough sea conditions. Researches were regularly conducted around the island about once a month, frequently possible to diving at Oosaki (Ookubo Beach) and Tsubota Harbour (Fig. 1).

Methods

After first finding *Chirostylus dolichopus* in September 1981, SCUBA divers searched for this species along the entire coast of the island. Living specimens were brought to our laboratory for observation. They were kept in a 5 to 10 liter plastic vessel containing seawater that was made to circulate under the same temperature as in the field. The specimens were fed with Metra Min (Tetra Werk, Germany) or crushed dry shrimps.

Results

Distribution and Habitats

The record of the occurrence of *C. dolichopus* is as follows:

Sep. 20, 1981, Yuuke-Hama, 12 m depth. 1 specimen

Oct. 17, 1981, Gakko-Shita, 25 m depth. 1 specimen

Nov. 26, 1983, Oosaki (Ookubo Beach), 12 m depth. 1 specimen

Sep. 30, 1984, Oosaki (Ookubo Beach), 12 m depth. 3 specimens

Nov. 10, 1985, Oosaki (Ookubo Beach), 12 m depth. 3 specimens

C. dolichopus was found in the waters mostly along the northern and western shores of the island directly facing the Kuroshio current from autumn to early winter (Fig. 1).

Most specimens were found clinging to Antipatharia or Gorgonacea (Fig. 2) except one female with eye-bearing eggs, which was walking on Porifera (Ogawa and Matsuzaki, in press). All specimens were females with eggs, but no male specimen was found.

Feeding Behaviour

C. dolichopus was observed to have three types of feeding behaviour under laboratory conditions.

Type 1: Leg scrape feeding

In the case that this animal is reared without a commensal host, it cling to objects such as air stones by using its second to fourth long legs. All these legs are regularly groomed or cleaned from the base to the distal regions by chelipeds (Fig. 3). Chelipeds are densely provided with bristle brushes on the medial surfaces of fixed finger and dactyl (Fig. 4). This structure is suited for grooming or cleaning. After grooming or cleaning, chelipeds are scraped by the third maxillipeds (Fig. 5) to obtain debris for food.

Type 2: Comb-out feeding

Soon after food was supplied, *C. dolichopus* extended its third maxillipeds as much as possible and moved them as if it were combing for obtaining food directly (Fig. 6).

Type 3: Direct feeding

In a case that animals settle in a small bottle with other sampling organism, *C. dolichopus* was engaged in active scraping and munching on such sessile organisms as Porifera by using its chelipeds and maxillipeds.

Grooming or Cleaning

As noted in other Decapoda Crustacea (BAUER, 1981), it is confirmed that *C. dolichopus* grooms or cleans its carapace, abdominal segments and branchial chambers by the fifth legs specially adapted for this purpose. Egg-bearing females often cleans their eggs with the fifth legs. The abdomen with eggs is often stretched, and the pleopods are flapped to ventilate the eggs (Fig. 7).

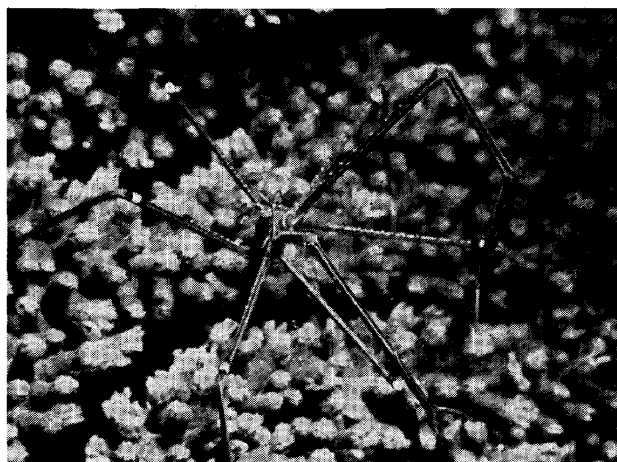


Fig. 2. *C. dolichopus* inhabiting Gorgonacea at Oosaki.

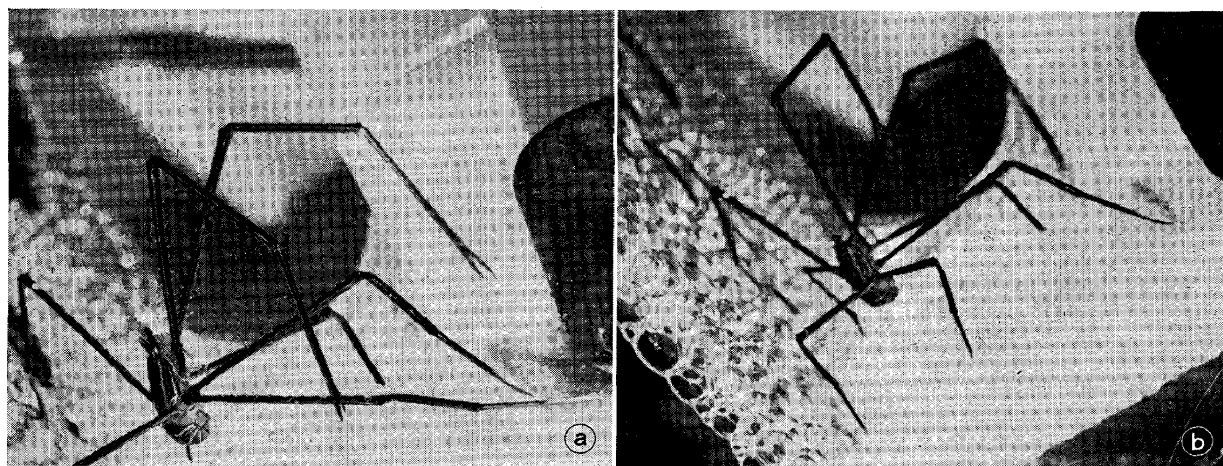


Fig. 3. Grooming or cleaning behaviour of *C. dolichopus*. a: right 3rd leg grooming by right cheliped, b: left cheliped grooming by right cheliped.



Fig. 4. Densely arranged bristle brushes of cheliped.



Fig. 5. Scraping cheliped by third maxillipeds.

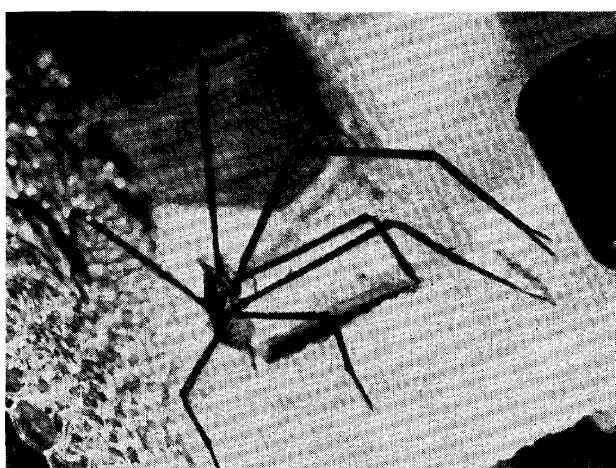


Fig. 6. Comb-out feeding by third maxillipeds extended.

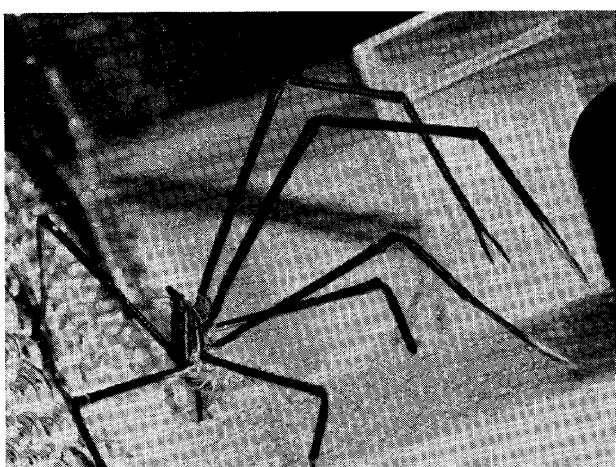


Fig. 7. Mode of ventilation by abdominal segment.

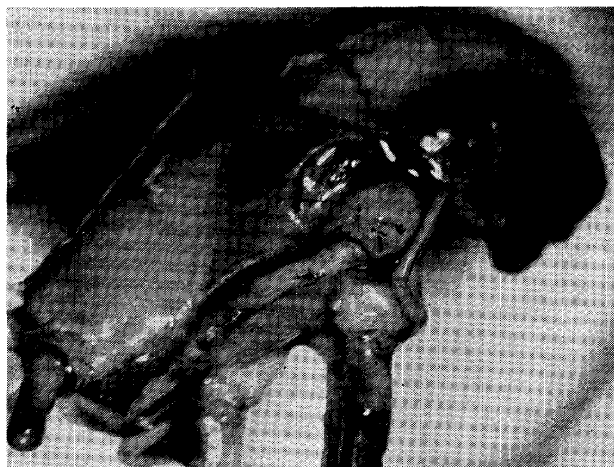


Fig. 8. Left fourth leg, regenerated within nine days.

Regeneration

One ovigerous female lost its left fourth leg, but this leg was regenerated (Fig. 8). It developed well and a white streak of specific character on regenerated leg appeared. The leg grew 5.7 mm in 9 days, and thus the average rate of growth was 0.63 mm per day.

Longevity and Number of Broodings

New ovigerous females of *C. dolichopus* were found at the same habitat from which old specimen had been removed one year later. Under laboratory conditions, a fully mature female completely disjointed its legs at the time of death, following the release of zoea larvae. Thus, longevity is apparently about one year.

Brooding seems to occur only once due to the long period of incubation and shedding of advanced zoea (Ogawa and Matsuzaki, in press).

Discussion

BAUER (1981) revised the grooming or cleaning behaviour of the Decapoda Crustacea including Galatheoidea. Basically, he concluded that grooming is a behaviour to remove epizoic growth on the body surface. Very recently, MARTIN and FELGENHAUER (1986) noted the same observation on freshwater Galatheoidea, *Aegla*, the act of dropping off scraped macroscopic debris (BAUER, 1975). However, putting debris into the mouth after grooming has been observed only in *C. dolichopus*.

C. dolichopus has long legs adapted for clinging to a host and is arranged with bristle setae and might be provided with mucous glands as for feeding apparatus. A known unique method of feeding is a passive method of filtering food through the antennae demonstrated by the sand crab *Emerita* (Anomura, Hippidea) (EFFORD, 1966).

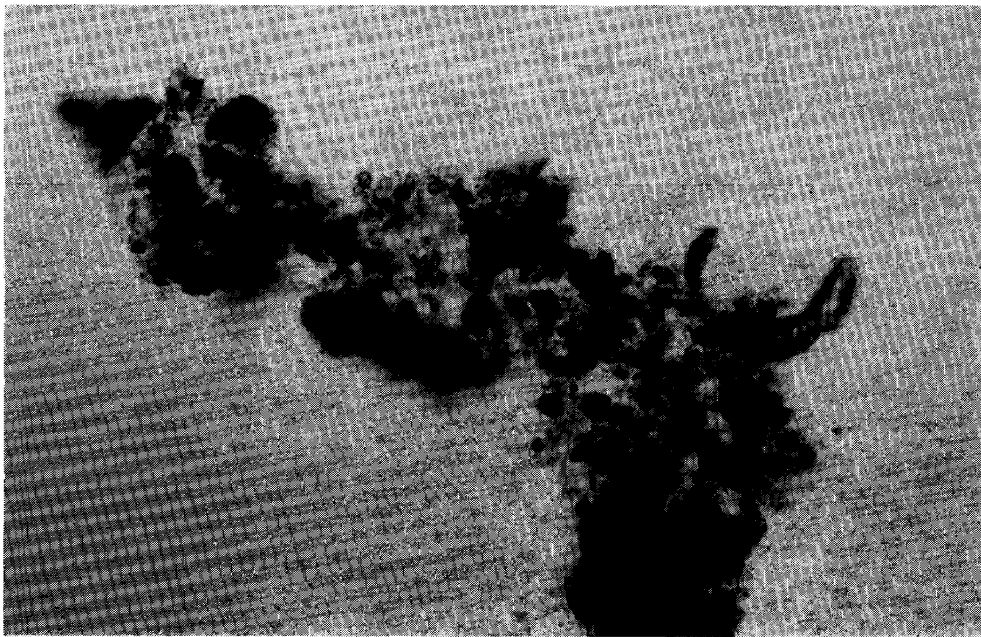


Fig. 9. Stomach contents of *C. dolichopus* preserved at field site.

Recently, for explanation of the evolutionary sequence of decorating behaviour, WICKSTEN (1980) introduced a particulate feeding behaviour of spider crab. *Erileptus spinosus* extends their legs into a current gather detritus from which they later pick edible particles. In the case of *C. dolichopus* soon after food was supplied they slowly stretched its long clinging legs alternately and Type 1 feeding is accelerating.

Based on the morphology of a preserved specimen included, BAUER (1981) speculated behaviour and considered a possibility of systematic relation or even evolution on behaviour. But it should be kept in mind that, as the great entomologist FABRE (1921) cautioned, on the basis of the considerable number of his observations, the functions of appendages or structures cannot be determined simply by examining preserved samples. Throughout observation of *C. dolichopus* both in aquarium and *in situ*, it became clear that appendages for grooming or cleaning serve a more developed function of feeding.

Under natural conditions, this behaviour is thought to be a principal means for feeding, as the stomach contents are mainly detritus and sand grains as shown in Fig. 9.

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要 約

三宅島周辺浅海域に生息するムギワラエビの摂餌生態を実験室内にて観察した。本種には3タイプの摂餌方法がみられる。第1のタイプは鉗脚で歩脚の Grooming や Cleaning を行った後、第3顎脚を使って鉗脚指節・掌節剛毛に捕捉された懸濁物質塊を掻き取り、これを摂餌する方法である。この行動は休みなく、ほぼ規則的に行われる。現場で固定した標本の胃内容物は、デトライタスと砂粒であったことから、この摂餌方法が基本的なものと思われる。第2のタイプは粉末餌料等を投与した直後にみられるもので、第3顎脚を伸ばし、盛んにすき取り運動を行い懸濁餌料を直接捕捉する方法である。また、餌料を投与すると歩脚を順番にゆるやかに伸ばし、タイプ1の摂餌も同時に始まる。第3のタイプは狭い容器内でみられた特殊な場合で、海綿類など他の試料と一緒に入れた際、これを鉗脚・第3顎脚で直接捕捉しむさぼり食うものである。本種はツノサンゴ類やヤギ類に懸着共生するのに都合の良い極めて長い歩脚を有しているが、これを十脚甲殻類に広くみられる Groomng や Cleaning の他に、摂餌の機能に利用している。なお、これまでの観察記録から、本種の寿命はほぼ一年、抱卵は年1回と推定される。