POLYMORPHISM IN THE CHELAE OF *DIOGENES NITIDIMANUS*
TERAO (DECAPODA : DIOGENIDAE)*

1 Text-figure and 1 Plate

by

Akira ASAKURA

(Amakusa Marine Biological Laboratory, Kyushu University, Tomioka,
Reihoku-cho, Amakusa-gun, Kumamoto-ken, 863-25)

テナガツノヤドカリの鉗脚の多型現象について

挿図 1, 図版 1

朝 倉 彰

(九州大学理学部附属天草臨海実験所**)

Abstract: Polymorphism in the male major chelae of the hermit crab, *Diogenes nitidimanus* is reported. Broad type, in which the palm is broad with many distinct teeth and granules, and Narrow type, in which the palm is narrow with irregular-sized granules, as well as several intermediate types were found. Other morphological characters are nearly alike in these types and perfectly fit the descriptions of *Diogenes nitidimanus* given by TERA0 (1913) and MIYAKE (1978). The possible relation between the body size and chela type is suggested.

Introduction

It is widely seen among decapod crustaceans that one of the pereopods is greatly enlarged (major chela), and obvious polymorphisms of the major chela have been known in brachyuran crabs (HARTNOLL, 1982; SAKAI, 1935, 1976) and a ghost shrimp (SAKAI, 1969). In these, dimorphisms of male major chelipeds in *Uca lactea* (SAKAI, 1935, 1976; YAMAGUCHI, 1973), *Uca marionis* (TAKEDA and YAMAGUCHI, 1973), and *Uca dussumeri* (YAMAGUCHI and TAKEDA, 1973) as well as intersexual forms of the major chela in male *Uca pugilator* (MORGAN, 1920) are well known.

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** 〒863-25 熊本県天草郡苓北町富岡

In hermit crabs, the morphology of the male major chela is used as one of the key characters in identifying species and has been regarded as a fairly reliable and invariable trait. During my current study on the biology of a sand-dwelling hermit crab, *Diogenes nitidimanus*, however, I found that the major (left) chelipeds in the males show a remarkable polymorphism, which is reported here from specimens collected from the Amakusa Islands, northwest Kyushu.

Material and Methods

D. nitidimanus is a small hermit crab common in sand flats in the Japanese temperate region (MIYAKE, 1978). The crab uses shells from gastropods living in the same and neighboring area, such as sand snails, *Umbonium moniliferum*, predatory snails, *Hinia festiva*, horn snails, *Batillaria multiformis*. The main habitat of the crabs is from the lower intertidal to shallow subtidal zones (ASAKURA and KIKUCHI, 1984).

Collections were made in June 1984 at three locations in the Amakusa Islands of northwest Kyushu; Higashihama flat in Amakusa Shimoshima Island, Hondo flat in Amakusa Kamishima Island and Oyano flat in Oyano Island. All of the flats are located in the mouth of the Ariake Sea.

Sediment samples were collected at random near E.L.W.S. of each flat and sieved through a mesh of 2.0 mm opening. The sieve residues were put into the preservative (10% formalin solution) and brought to the laboratory. Specimens of *D. nitidimanus* were sorted out, their shield lengths were measured, the morphological characteristics of the chelae were noted, and the chelae were photographed.

Results and Discussion

Sexual dimorphism in the major chela of *D. nitidimanus* was very clear. Text-fig. 1 shows the major chelae of the females from the Oyano, Hondo and Higashihama flats; the chelae were smaller in size in relation to their body than those of the males, and the palm was comparatively broad. No obvious morphological variations was observed.

Polymorphism in the chelae was observed only in the males. Plate VI, Figs. 1-6 show the major chelae of the males from the Oyano, Hondo and Higashihama flats. The chelae in Figs. 1 and 2 have a broader palm and many acute tooth-like granules on the surface [broad type], and those in Figs. 5 and 6 have a narrower palm with rather fewer granules [narrow type].

Text-fig. 1. The female major chelae of *D. nitidimanus*, a. The major chela of a crab from Oyano flat. b. The major chela of a crab from Hondo flat. c. The major chela of a crab from Higashihama flat. (A horizontal bar under the figures indicate 0.5 cm.)

Morphological characteristics of these chelae are as described below;

Broad type (Plate VI, Figs 1 and 2): Palm broad, upper dorsomesial margin with five rows of acute teeth, ventrolateral margin with two rows of granules, dorsal face with several rows of tooth-like granules, two of them pronounced, lower face with many granules of various sizes; dorsomesial margin of movable finger with two rows of teeth; cutting edge of immovable finger with acuminate teeth at distal end and at median portion; movable finger not overreaching immovable finger.

Narrow type (Plate VI, Figs. 5 and 6): Palm narrow, dorsomesial margin with two or three irregular rows of tooth-like granules, ventrolateral margin with two rows of minute, irregular sized granules, whole surface covered with many granules of various sizes; dorsomesial margin of movable finger with two rows of teeth; cutting edge of immovable finger with acuminate teeth at distal and at proximal portion, movable finger distantly overreaching opposing one. This type is as described for the species by TERA0 (1913) and MIYAKE (1978).

Several intermediate types were also found, two of which are shown in Plate VI, Figs. 3 and 4. The chela in Fig. 4 bears a broad palm covered with many minute granules on the surface of the palm, and it is rather near the narrow type in having an elongate movable finger. The chela in Fig. 5 is very much like the broad type, but the rows of teeth and granules on the palm are not fully developed as in the broad type.

Morphological characteristics in other details, *e. g.* the carapace, walking legs and minor right cheliped were nearly alike in all of these types, all which also fitted descriptions of *D. nitidimanus* provided by TERA0 (1913) and MIYAKE (1978).

In the Oyano population, many males had the broad type chelae, but the narrow type and various intermediate types were also found. In the Hondo and Higashihama populations, however, were represented mostly by the narrow type, partly by the broad type and several intermediate types. In every flat, they coexisted each other, and no behavioral difference in shell fighting and precopulatory guarding (see HAZLETT, 1966, for intraspecific behavior of hermit crabs), involving interactions between various types, were observed.

There seems to be a relation between the body size of the crab and the type of major chela, for the broad chelae are limited in larger males. The mean size of the males collected from the Oyano flat in June 1984 was 3.55 mm (SD=0.90, n=272) in shield length, whereas those from the Hondo and Higashihama flats were 2.99 mm (SD=0.26, n=527) and 2.47 mm (SD=0.45, n=172) respectively (Asakura, 1987). The proportion of the broad type specimens was obviously higher in the Oyano-flat population than that of either the Hondo-flat or the Higashihama-flat population, although, I did not obtain accurate quantitative data about these proportions. Further detailed study is needed about the relation between the crab size and the type of chela.

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要 約

九州北西部・天草諸島で採集されたテナガツノヤドカリ *Diogenes nitidimanus* TERAO において、オスの大鉗脚に多型が見られた。幅広い掌部を持ちその表面が多く的小棘や顆粒で覆われるタイプと、幅の狭い掌部を持ちその表面が不規則な小顆粒で覆われるタイプとがあり、後者の特徴は、TERAO (1913)・MIYAKE (1978) におけるテナガツノヤドカリ *D. nitidimanus* の記載と良く一致した。またこれらの中間タイプも、多く見い出された。成体のサイズと、鉗脚のタイプとに関連があると思われたが、今後の課題となった。

Plate VI. The male major chelae of *D. nitidimanus*

Fig. 1. The chela of a crab from the Oyano flat (shield length=4.80 mm)

Fig. 2. The chela of a crab from the Oyano flat (s.l.=5.25 mm)

Fig. 3. The chela of a crab from the Hondo flat (s.l.=3.25 mm)

Fig. 4. The chela of a crab from the Higashihama flat (s.l.=2.75 mm)

Fig. 5. The chela of a crab from the Higashihama flat (s.l.=2.80 mm)

Fig. 6. The chela of a crab from the Hondo flat (s.l.=3.05 mm)

Horizontal bars under the figures indicate 2.5 mm.