ZOEAL STAGES OF \textit{HEPTACARPUS FUTILIROSTRIS} (DECAPODA, CARIDEA, HIPPOLYTIDAE) REARED IN THE LABORATORY

BY

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ABSTRACT

Nine zoeal stages of \textit{Heptacarpus futilirostris} are described from laboratory-reared material. The fourth and fifth abdominal somites with paired dorsolateral spines readily distinguish the zoeal stages of \textit{H. futilirostris} from those of other species of \textit{Heptacarpus} (\textit{H. geniculatus}, \textit{H. pandaloides}, and \textit{H. rectirostris}) for which larvae are known from the West Pacific. Zoeal characters indicate that \textit{Heptacarpus} has close affinities with \textit{Eualus}, \textit{Spirontocaris}, \textit{Lebbeus}, and \textit{Thor}.

RÉSUMÉ

Neuf stades zoés ont été décrits chez \textit{Heptacarpus futilirostris} à partir de matériel élevé au laboratoire. Les quatrième et cinquième somites possèdent une paire d’épines dorsales permettant de différencier aisément les stades zoé de \textit{H. futilirostris} de ceux des autres espèces de \textit{Heptacarpus} (\textit{H. geniculatus}, \textit{H. pandaloides} et \textit{H. rectirostris}) dont les larves sont connues dans le Pacifique-Ouest. Les caractères des zoés indiquent que \textit{Heptacarpus} présente des affinités étroites avec \textit{Eualus}, \textit{Spirontocaris}, \textit{Lebbeus} et \textit{Thor}.

INTRODUCTION

Based on adult characters of 40 genera originally placed in the Hippolytidae, Chace (1997) regarded the family as reasonably homogeneous, except for \textit{Leon-tocaris}. However, various attempts have been made to split up the Hippolytidae into several families or subfamilies, based either on classical analysis of larval characters (Gurney, 1924, 1937, 1942), or on cladistic analysis of adult characters (Christoffersen, 1987, 1990). The genus \textit{Heptacarpus} has long been placed in the Hippolytidae. As a result of cladistic analysis, however, Christoffersen (1987,
1990) grouped *Heptacarpus* together with *Birulia, Lebbeus, Paralebbeus, Spirostocaris, Thor*, and *Thoralus* in his new family Thoridae. He placed the genus *Eualus* in “Thoridae incertae sedis” (Christoffersen, 1987).

There are larval descriptions of four species of *Heptacarpus* from the West Pacific: *H. futilirostris* (Bate, 1888), *H. geniculatus* (Stimpson, 1860), *H. pandaloides* (Stimpson, 1860), and *H. rectirostris* (Stimpson, 1860) (cf. Yokoya, 1957; Kurata, 1968b, c; Yamashita & Hayashi, 1979, 1980; Yang & Ko, 2002). The larval development of *H. futilirostris* was described earlier by Kurata (1968b), but those descriptions are restricted to brief comments and illustrations.

In the present study, therefore, the nine zoeal stages of *H. futilirostris* are described in detail. Larvae of *H. futilirostris* are compared with those of *H. geniculatus, H. pandaloides*, and *H. rectirostris* for which larvae are also known from the West Pacific area. To recognize morphological differences that might warrant the systematic status of a family Thoridae, the first zoea of *Heptacarpus* is compared with that of other known hippolytids.

**MATERIALS AND METHODS**

On 24 May 1998, ovigerous females of *Heptacarpus futilirostris* were collected from an oyster raft culture in Sangju, Korea (34°43′00″N 127°59′30″E). On 28 May 1998, more than 250 larvae hatched from one female. Larvae were reared at a constant water temperature of 20°C, using the methods described by Yang & Ko (2004), and fed daily with freshly hatched *Artemia* nauplii. Larvae of each developmental stage were fixed and preserved in 7% neutral formalin. Dissected appendages were examined using a Nikon FX II microscope, and drawings were made with the help of a camera lucida. Measurements and setal counts of appendages are based on 10 specimens for each stage. The setal armature on the appendages is described from the proximal to the distal segments. Body length (BL) and carapace length (CL) were measured from the postorbital margin to the telson, excluding posterior processes, and from the postorbital margin to the posteromedial border of the carapace, respectively. The chromatophore pattern was determined by observation on live larvae.

**RESULTS**

Nine zoeal stages and one megalopa were obtained. The megalopa of *Heptacarpus futilirostris* was attained 27 days after hatching. However, the megalopa could not be described and figured, since only three specimens were obtained. The first zoea is described in detail. For subsequent stages, only the main differences from the previous stage are provided.