

Naupliar Development among the Tisbidae (Copepoda: Harpacticidae) with a Phylogenetic Analysis and Naupliar Description of *Tisbe thailandensis* from Thailand

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Hans-U Dahms, Supawadee Chullasorn, Nikolaos V. Schizas, Pawana Kangtia, Wongpiya Anansatitporn, and Wan-Xi Yang (2009) Naupliar development among the Tisbidae (Copepoda: Harpacticidae) with a phylogenetic analysis and naupliar description of *Tisbe thailandensis* from Thailand. *Zoological Studies* 48(6): 780-796. Oviparous females of a recently described species *Tisbe thailandensis* were collected from the seaweed *Enteromorpha clathrata* on the eastern coast of Thailand and cultured in the laboratory. Six naupliar stages are described, and a key to the identification of the stages is provided. An unweighted analysis of the character matrix yielded a single most parsimonious tree with a length of 27, a consistency index of 0.778, a retention index of 0.786, and a rescaled consistency index of 0.611. There were 15 parsimoniously informative characters. The resulting cladogram, using nauplii from the harpacticoid genus *Tachidius* (Giesbrecht, 1881) for the outgroup comparison, supports the hypothesis that *T. gracilis* is the sister taxon of *T. cucumariae* (both of which belong to the *T. gracilis* group), and that *T. battagliai* is the sister taxon of *T. holothuriae* (both of which belong to the *T. holothuriae* group), with *Tisbe thailandensis* adjoining the *T. gracilis* group on an undivided branch. Naupliar comparisons of copepodid morphology provided the greatest number of phylogenetically useful additional characters since copepodids essentially foreshadow the adult condition. Limits of the utility of naupliar characters for phylogenetic inference studies were apparent, as well as their potential and importance for future work in zoological systematics. It was shown that phylogenetic relationships of tisbids are difficult to evaluate on a morphological basis alone, because of the comparatively small morphological differences among them. However, more specific morphological characters can be found, provided studies are detailed enough and different stages of a sufficient number of species are known to allow meaningful comparisons.
<http://zoolstud.sinica.edu.tw/Journals/48.6/780.pdf>

Key words: Phylogenetic systematics, Naupliar characters, Ontogeny, Morphology, Tisbidae.

The harpacticoid copepod taxon, *Tisbe*, occurs worldwide especially in shallow marine waters and contains about 60 described species (Bodin 1997, Boxshall and Halsey 2004). Species of *Tisbe* are easy to collect, maintain, and rear in the laboratory, and they have short life cycles

compared to other Harpacticoida (Dahms and Qian 2004). For these reasons, *Tisbe* has served as a model taxon for a variety of morphological, ecological, and genetic studies (Dahms and Schminke 1995). There are few copepod genera that have been investigated as thoroughly as

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