

## Taxonomic Status of *Caligus polycanathi* Gnanamuthu, a Copepod Parasite of Marine Fishes in the Indo-West Pacific

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**Ching-Long Lin and Ju-Shey Ho (1997)** Taxonomic status of *Caligus polycanathi* Gnanamuthu, a copepod parasite of marine fishes in the Indo-West Pacific. *Zoological Studies* 36(4): 340-344. The taxonomic status of *Caligus polycanathi* Gnanamuthu, 1950 is reconsidered based on materials collected from *Canthidermis maculatus* (Bloch) caught off the northeastern coast of Taiwan at 24°56.3'N 122°00.9'E. It is concluded that *C. polycanathi* is a valid species and *C. sensilis* Kabata and Gusev, 1966 is relegated to its synonym.

**Key words:** Caligid, Valid species, Sea louse.

Caligid copepods are commonly known as "sea lice" owing to their habit of clinging to the external body surfaces of their hosts and to their frequent occurrence on commercial sea fishes. Among the families of Copepoda, *Caligus* of the Caligidae is the largest genus comprised of more than 200 species. Due to the destructive habits exhibited by some members of this genus, studies on this group of parasites have recently gained unprecedented attention (Boxshall and Defaye 1993).

In his work on caligid copepods parasitic on fishes of the Gulf of Mexico and Caribbean Sea, Cressey (1991) considered the following 4 species to be synonymous with *Caligus balistae* Steenstrup and Lütken, 1861: *Caligus alatus* Heegaard, 1934; *Caligus polycanathi* Gnanamuthu, 1950; *Caligus canthidermis* Yamaguti and Yamasu, 1959; and *Caligus sensilis* Kabata and Gusev, 1966. However, in his "REMARKS" to the redescription of *C. balistae*, Cressey presented no justification for his proposal to treat these 5 species of *Caligus* as conspecific.

The occurrence of *C. polycanathi* in the waters of Taiwan was first reported by Ho (1966) based on 3 specimens (2 females in their 5th chalimus stage and a mature male) recovered from a leather-jacket fish, *Aluterus scriptus* (Forster), by H. C. Yang in

Keelung and deposited at the Smithsonian Institution in Washington, D.C. No subsequent record has been documented from Taiwan.

Recently, 3 specimens of the triggerfish, *Canthidermis maculatus* (Bloch), taken off the northeastern coast of Taiwan by Dr. Shinn-Pyng Yeh (National Pingtung Polytechnic Institute) were found to be infested with 29 individuals of *C. polycanathi* in various stages. Examination of this more complete collection of specimens revealed certain features of the parasite that were not noted by Ho (1966). Therefore, in addition to providing supplemental information to Ho's (1966) study of *C. polycanathi* of Taiwan, we take this opportunity to reconsider Cressey's (1991) treatment of this species.

### MATERIALS AND METHODS

The specimens (12 chalimus larvae and 17 adults) of *Caligus polycanathi* removed from 3 triggerfish, *Canthidermis maculatus* (Bloch), caught off the northeastern coast of Taiwan (at 24°56.3'N 122°00.9'E) on 22 August 1991 were preserved in 70% alcohol. The preserved specimens were soaked in 85% lactic acid for about an hour before measure-

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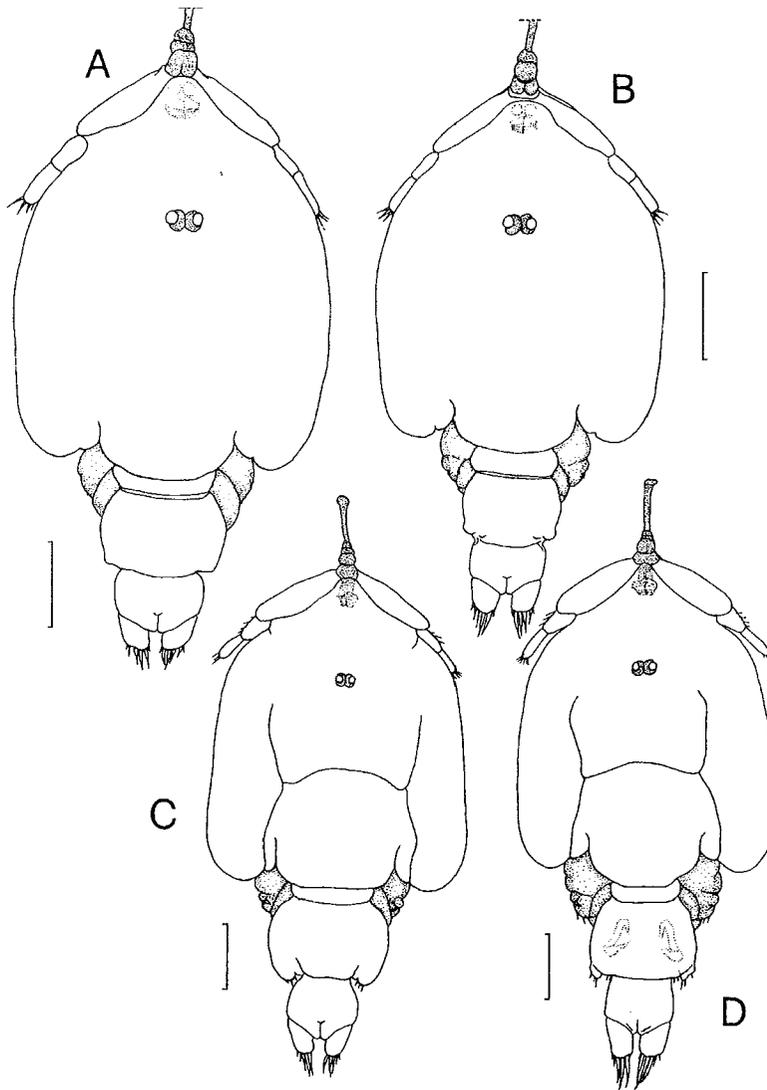
ments were taken and dissections performed for microscopic studies of the body parts and appendages. The wooden-slide method devised by Humes and Gooding (1964) was adopted for our dissection of the specimens and examination of the dissected parts and appendages. All drawings were made with the aid of a camera lucida.

## RESULTS

Among the 29 specimens obtained from the triggerfish are 12 chalimus larvae and 17 mature adults. Of these 12 larvae, 4 are in the 3rd chalimus stage, consisting of 2 females (Fig. 1A) and 2 males (Fig.

1B), and another 8 are in the 4th (last) chalimus stage, consisting of 6 females (Fig. 1C) and 2 males (Fig. 1D). Identification of the chalimus stages and their sexes is based on the criteria set forth by Lin et al. (1997) in their work on the developmental stages of *Caligus multispinosus* Shen.

Our examination of the newly collected material reveals that the specimen called "chalimus female" by Ho (1966) is in essence a nonovigerous adult female, because 12 of the 13 adult females in the new collection carry the frontal filament, even in those that are ovigerous (Fig. 2A). The number of nodes on the frontal filament (Fig. 2B) indicates clearly that the specimen has molted 4 times and reached the adult stage. The dorsal surface of the adult body is



**Fig. 1.** Chalimus stages of *Caligus polycanthi* Gnanamuthu. A: chalimus III female; B: chalimus III male; C: chalimus IV female; D: chalimus IV male. Scale bars: 0.2 mm in A, B; 0.3 mm in C, D.

profusely covered with minute papillae bearing sensilla (Fig. 2C). The maxilliped (Fig. 2D) has a prominent basal protrusion on the outer surface of the corpus.

As in the adult females, each of the 4 adult males also carries a frontal filament (Fig. 3A). The postmaxillary process (Fig. 3B) has a blunt tip (as opposed to a sharply pointed process in the female). The maxilliped (Fig. 3C) differs from that of the female in bearing a double knobbed myxa on the corpus and 2 small setae at the terminal portion of the shaft. Both degenerate legs 5 and 6 (Fig. 3D) are represented by a lobe armed with 3 setae as opposed to 1 and 2 setae, respectively, in the female. The 3 terminal setae on the male caudal ramus (Fig. 3E) are relatively longer than those found on the female.

The postmaxillary processes and the sternal nodules (located behind the intercoxal plate of leg 1) appearing in adults of both sexes are considered by Ho (1966) as some of the most characteristic features of *C. polycanthi*.

## DISCUSSION

The frontal filament is a characteristic structure

of chalimus larvae of caligid copepods. When the last chalimus stage, viz. chalimus IV, molts into the adult, the sea louse breaks off from it, becomes free moving, and leaves the filament attached to the host tissue (Lin et al. 1997). However, the specimens of *C. polycanthi* collected from the waters of Taiwan appear to differ from this norm. In both collections examined by Ho (1966) and by the present authors, the adults secrete another trickle of adhesive substance from the frontal organ to retain the frontal filament. In other words, the frontal filament is not discarded at the last molt and some of the females even retain it until the time of bearing eggs.

When Ho (1966) relegated Yamaguti and Yamasu's (1959) *C. canthidermis* to synonymy with *C. polycanthi*, he stated that the synonymy was proposed based on the conclusion that these 2 species share certain unique characteristics of the genus. Those characteristic features, displayed in both sexes, are (1) the postmaxillary process (see Fig. 3B), (2) the sternal nodules behind the 1st intercoxal plate, and (3) the 3 setae on the exopod of leg 1 with cilia on their inner sides and a membrane on their outer sides. Ho's taxonomic treatment of *C. canthidermis* was upheld by Margolis et al. (1975) and Pillai (1985).

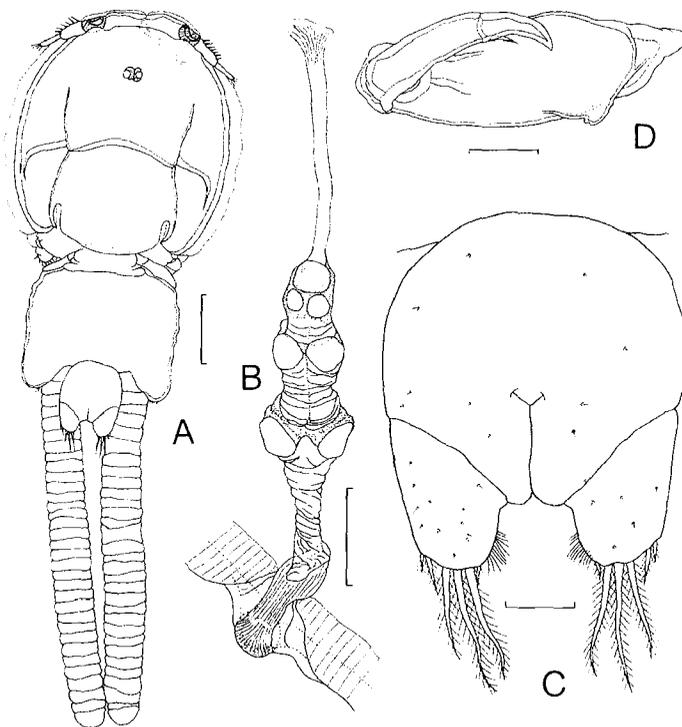


Fig. 2. Adult female *Caligus polycanthi* Gnanamuthu. A: habitus, dorsal; B: frontal filament; C: abdomen and caudal rami; D: maxilliped. Scale bars: 0.5 mm in A; 0.1 mm in B, C, D.

According to Cressey's (1991) redescription of *C. balistae*, which is the best description of the species published so far, this species does not share the above-mentioned 3 unique features with *C. polycanathi*. Therefore, we disagree with Cressey's placement of *C. polycanathi* into synonymy with *C. balistae*. According to Pillai (1985), the possession of a postmaxillary process is not unique to *C. polycanathi*; it is also found in *C. ambliogenitalis* Pillai, 1961 and *C. planktonis* Pillai, 1979. However, neither one of these 2 species possesses the other 2 features listed above for *C. polycanathi*. Thus, these 3 features combined appear to be good characteristics that distinguish *C. polycanathi* from its more than 250 congeners.

In their work on parasitic copepods of fishes kept in the collection of the Zoological Institute of Russia in St. Petersburg, Kabata and Gusev (1966) described a new species of *Caligus*, *C. sensilis*, from a puffer (*Sphoeroides inermis*) caught east of the Volcano Island in the northeastern Pacific. This new species was considered by them to be closely related to a small group of *Caligus* consisting of *C. balistae*, *C. polycanathi*, and *C. biaculeatus* Brian,

1914. The authors noted that these 4 species had the following 4 characteristics in common: (1) a short abdomen, (2) similar genital segment, (3) similar postmaxillary process, and (4) 2 sclerotized knobs behind the intercoxal plate of leg 1. However, it should be pointed out that items (3) and (4) are found neither in the original description of *C. balistae* by Steenstrup and Lütken (1861), nor in the subsequent redescription by Wilson (1905) or by Cressey (1991). Furthermore, in Cressey's (1991) redescription of *C. biaculeatus*, these 2 features are not presented as well. Thus, only *C. polycanathi* can be said to have structures in common with this new species, *C. sensilis*.

As the species name indicates, *C. sensilis* is so named by Kabata and Gusev (1966) due to the presence of minute papillae bearing "sensory hairs". Although no such structure was mentioned for *C. polycanathi* (Gnanamuthu 1950, Shiino 1959, Ho 1966), our examination of the newly obtained materials clearly shows the dorsal surface of the body has scattered minute papillae carrying spinules (see Fig. 2C). Accordingly, Kabata and Gusev's *C. sensilis* is proposed to be relegated to synonymy with

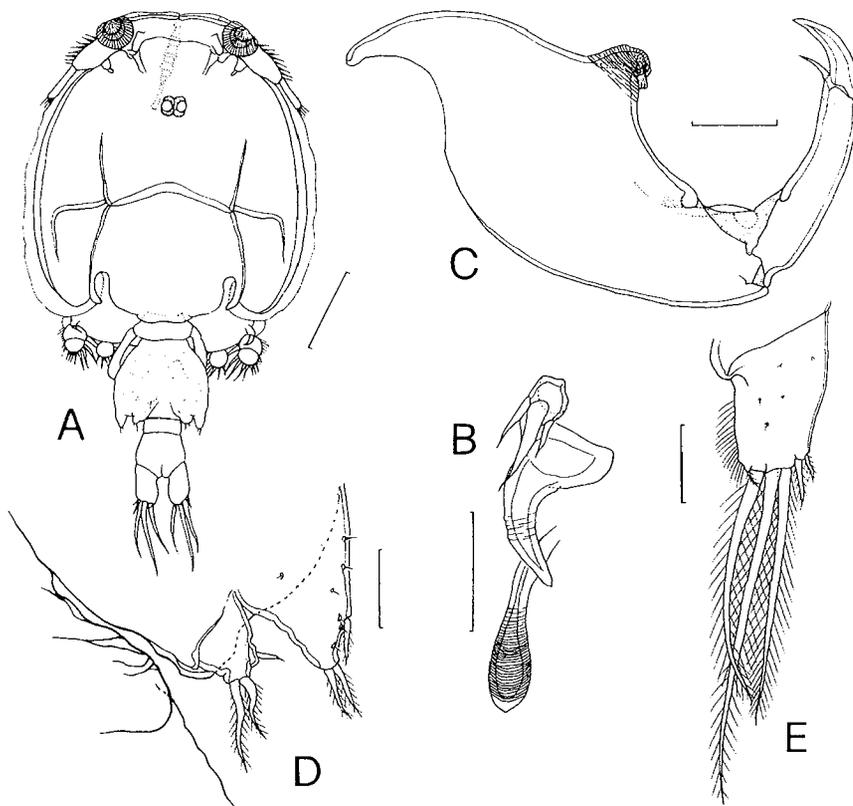


Fig. 3. Adult male *Caligus polycanathi* Gnanamuthu. A: habitus, dorsal; B: maxillule and postmaxillary process; C: maxilliped; D: legs 5 and 6; E: caudal ramus. Scale bars: 0.5 mm in A; 0.1 mm in B, C, E; 0.05 mm in D.

*C. polycanthi* herein.

With this resurrection of *C. polycanthi* and treatment of *C. canthidermis* and *C. sensilis* as its junior synonyms, it becomes clear that *C. balistae* is confined to the tropical Western North Atlantic Ocean, contrary to Cressey's (1991) claim that it is circumglobal in distribution. *Caligus polycanthi* is distributed in the Indian and Western North Pacific Oceans.

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## 寄生在印度西太平洋地區之海水魚體表上一種橈腳類

### *Caligus polycanthi* Gnanamuthu 在分類學上之身份

林清龍<sup>1</sup> 何汝諧<sup>2</sup>

依據在臺灣的東北海域位於 24°56.3'N 122°00.9'E 處，從疣鱗魮 (*Canthidermis maculatus*) 體表上所採到的 *Caligus polycanthi* Gnanamuthu, 1950 蟲體標本，重新考慮它在分類學上的身份。研究結果認為 *C. polycanthi* 應為一有效種，而 *Caligus sensilis* Kabata and Gusev, 1966 則歸屬於它的同種異名。

**關鍵詞：**魚虱類，有效種，海水魚虱。

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