

A redescription of the ascidicolid copepod *Haplostoma canui*

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Résumé : La femelle de *Haplostoma canui*, copépode hébergé par l'ascidie composée *Polyclinum aurantium*, est redécrite sur la base de spécimens recueillis à Roscoff. Quelques caractères morphologiques observés sur ces individus ne sont pas en accord avec ceux publiés dans la description originale. Les différences sont détaillées dans un tableau, et les spécialisations de *H. canui* sont discutées.

Abstract : The female of *Haplostoma canui*, a copepod associate of the compound ascidian *Polyclinum aurantium*, is redescribed on the basis of specimens collected at Roscoff. Some morphological features of these are at variance with those reported in the original description. The differences are summarized in a table, and the specializations of *H. canui* are also discussed.

INTRODUCTION

Among 12 described species of the genus *Haplostoma* (see Ooishi & Illg, 1977 ; Ooishi, 1991), *H. canui* Chatton & Harant, 1924 is the only one in which the endopods of legs 1-4 of the female are poorly developed and lack distal protrusions. In all others the endopods do have such protrusions to various degrees. In two other species of *Haplostoma* (unpublished), a similar reduction of leg endopods has been observed. In these two species, the terminal, subterminal, and lateral spines of the exopods of legs 1-4 are all bifurcate ; in addition the exopods lack a lateral seta. In *H. canui*, however, according to the original description, only the terminal spine is bifurcate, and all other spines are simple ; a lateral seta was said to be absent on the exopods. This disagreement concerning the morphology of spines on leg exopods of *H. canui* suggested that this species should be studied again.

In the present study, it is shown that the armature of the exopods of legs 1-4 of *H. canui* consists exclusively of bifurcate spines, which is also the case in the two undescribed species. There are similar small discrepancies with respect to the armature of other appendages and the apparatus at the oviducal aperture. All of the features involved are important for distinguishing *H. canui* from the remaining 11 described species, and for comparison, in the future, with the other two yet undescribed species.

MATERIAL AND METHODS

Sampling and treatment of living copepods from the ascidian host, *Polyclinum aurantium* Milne-Edwards (Aplousobranchia : Polyclinidae), were undertaken at Station

Biologique, Roscoff (48°43'N, 3°58'W), France, from August 2 to September 28, 1992. About 15 ascidian colonies of various sizes (about 1 x 1 cm to 2 x 5 cm) were collected from the lower levels of the shore. From the common test of one of these colonies (collected on Aug. 26, 1992), three females were removed by dissection. After photographing, these specimens were fixed in 95 % ethanol, and stored in 70 % ethanol. Two of them (specimens A, B) were used for preparation of drawings. All illustrations (Figs 1-3), based on specimens cleared in lactic acid, were made with the aid of a drawing tube attached to a microscope. An intact specimen was deposited in Muséum National d'Histoire Naturelle, Paris under no. MNHN-Cp1045.

Order Cyclopoida Burmeister, 1835

Family Ascidicolidae Thorell, 1859

Subfamily Haplostomatinae Chatton & Harant, 1924

Genus *Haplostoma* (Canu, 1886)

Haplostoma canui Chatton & Harant, 1924

(Figs 1-4)

Haplostoma canui : Chatton & Harant, 1924b : 413-415, fig. 1 (type locality, Pempoul, France, from *Polyclinum aurantium*)

Haplostoma canui : Harant, 1931 : 371 (list).

Haplostoma canui : Gotto, 1960 : 227.

Haplostoma canui : Monniot, 1962 : 573-574.

Haplostoma canui : Ooishi & Illg, 1977 : 21-22.

Haplostoma canui : Ooishi, 1991: 63 (list).

Haplostoma canui : Gotto, 1993 : 64-65.

Redescription of female (based on two specimens) : Body (Figs 1 a-c, 4 a-c) vermiform, with slight dorsal curvature, bearing a pair of egg sacs, these shorter than body. Each egg sac containing relatively large embryos. Total length, including caudal rami, about 1.37 mm, with proportional lengths for cephalosome, metasome, and urosome about 1:5:1.

Cephalosome as wide as long (0.19 mm). Dorsal cephalic sclerite (Fig. 1 d) subtriangular, with many unsclerotized areas of various sizes ; each area with a minute hair. Rostrum (Fig. 1 e, f) ovoid, marginally sclerotized except for rounded distal margin, this slightly protruded ventrally. Outer surface of rostrum ornamented with two minute hairs near middle and two small, apparently bifurcate, tubercles in distal one-third. Cephalosome appendages (Fig. 2 a, b) consisting of antennules, antennae, mandibles, and maxillipeds ; maxillules and maxillae absent, as in most species of the genus *Haplostoma*.

Metasome (about 1 mm long) divided into four sections dorsally by integumental indentations ; fourth section protruded posterolaterally into subconical lobes (all species of the genus with variously developed lobes of this type). Second and third sections (each about

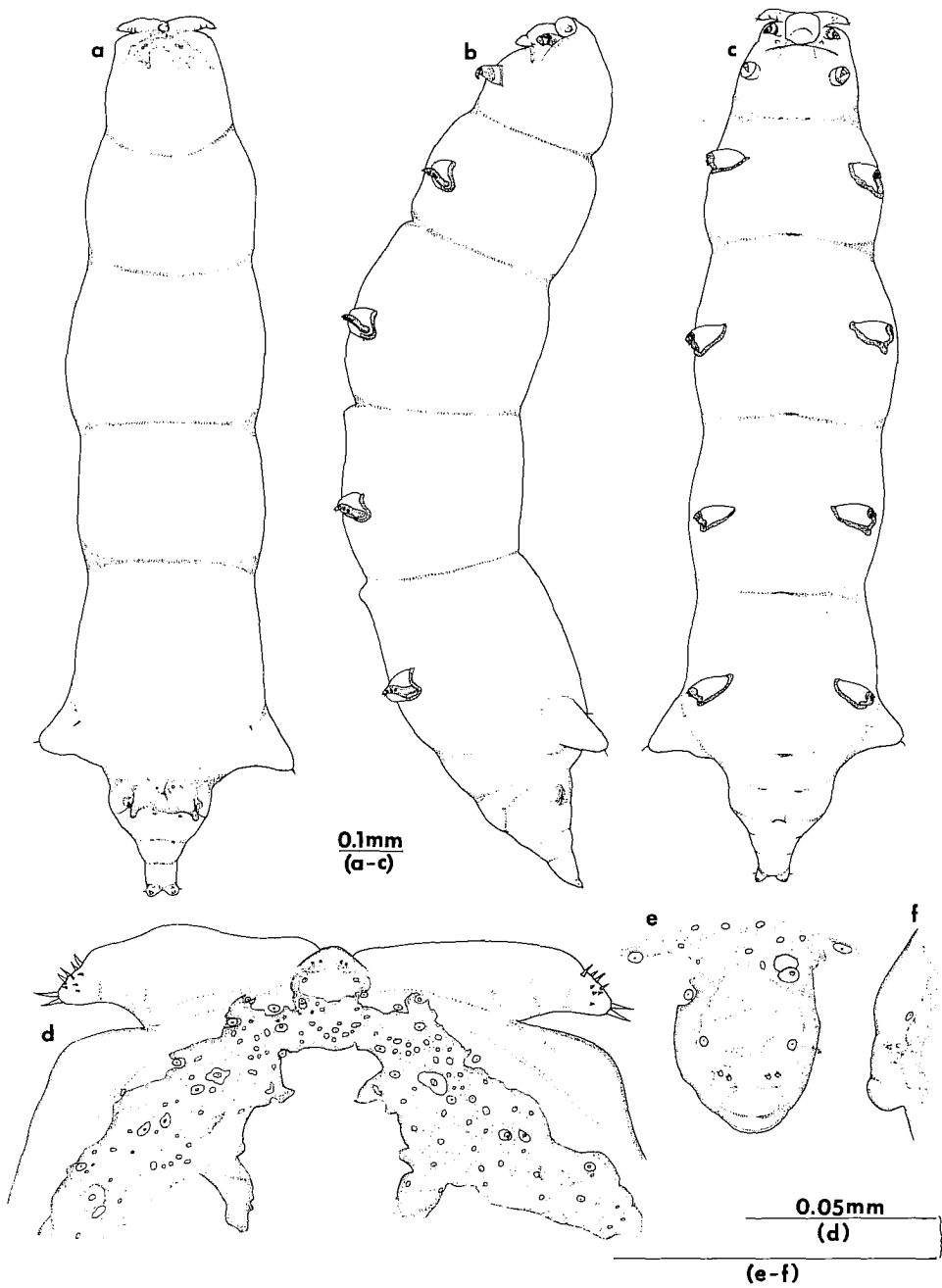


Fig. 1 : *Haplostoma canui* Chatton & Harant, female (specimen A) : a, body form, dorsal view ; b, same specimen, lateral view ; c, same specimen, ventral view ; d, cephalosome, dorsal view ; e, rostrum, anterior view ; f, rostrum, lateral view.

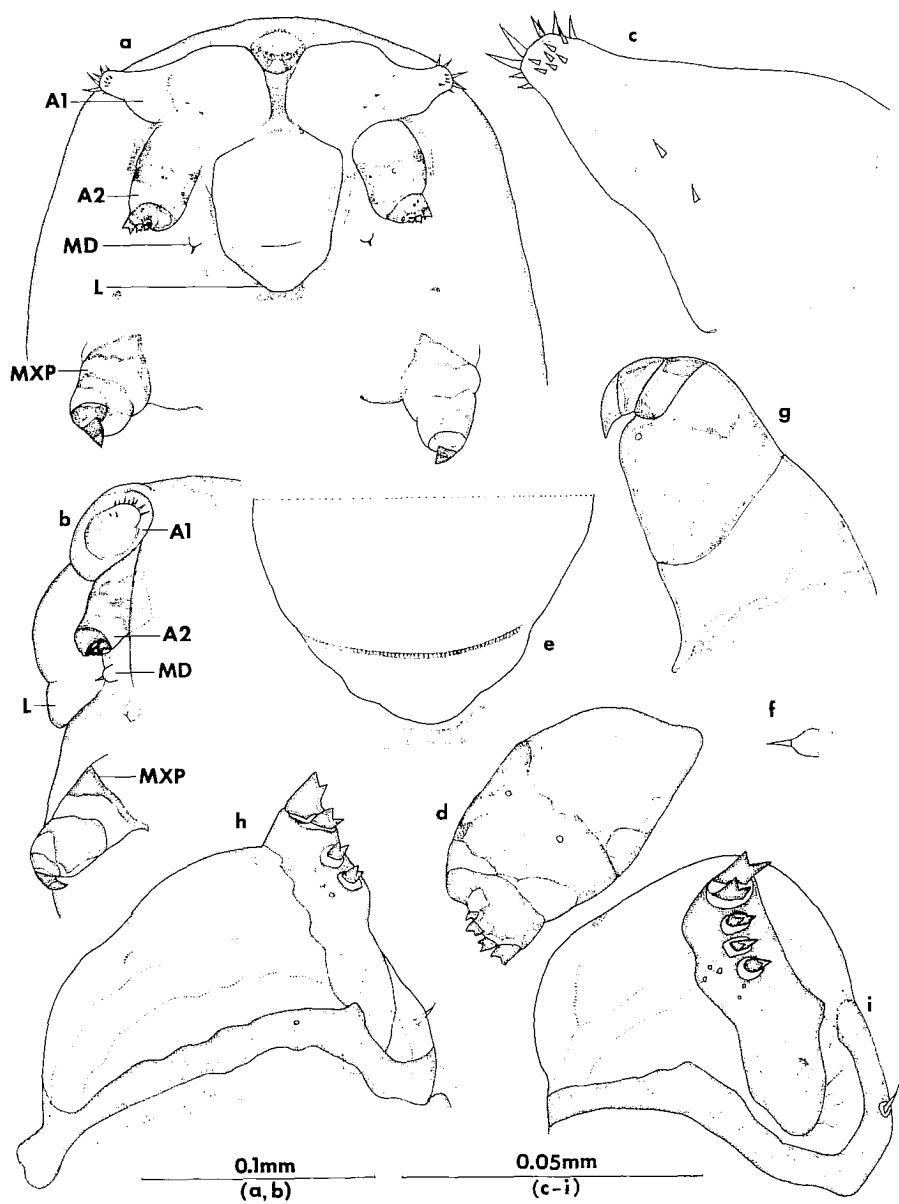


Fig. 2: *Haplostoma canui* Chatton & Harant, female (a-h, specimen A ; i, specimen B) : a, cephalosome, ventral view ; b, cephalosome, lateral view ; c, right antennule, anterior view ; d, left antenna, anterior view ; e, labrum, anterior view, showing row of teeth arranged under labrum at edge of mouth ; f, left mandible, lateral view ; g, left maxilliped, posterolateral view ; h, right leg I, specimen A, anterior view ; i, right leg I, specimen B, anterolateral view. A1, antennule ; A2, antenna ; L, labrum ; MD, mandible ; MXP, maxilliped.

0.22 x 0.3 mm) slightly longer and wider than first, and fourth section longest (about 0.34 mm long) and widest (about 0.4 mm at region with posterolateral lobes). First to third sections corresponding to first three metasomal segments, and fourth section a composite of fourth and fifth metasomal segments. However, short fifth metasomal segment recognizable on ventral side between a midventral sclerite anterior to it and a pair of midventral sclerites posterior to it (Fig. 1 c). Anterior four pedigers bearing symmetrical, modified legs (endopods reduced). These legs relatively large, each pair without intercoxal plate. Fifth leg represented by setae on each posterolateral lobe of fourth metasomal section.

Urosome (about 0.18 mm long, including caudal ramus) goblet-shaped and divided into four segments ; first segment corresponding to genital region and last segment corresponding to anal somite. Longitudinal muscle strands visible internally between segments (Fig. 3 c). In genital region (about 0.06 x 0.15 mm) oviducal apertures dorsolateral and copulatory pore midventral. Anal somite cylindrical, as long as wide (about 0.04 mm), bearing small caudal rami, these directed posterodorsally and without distinct articulation in their anterior portion.

Body pale rose or yellowish white, opaque. Eye orange, and gut yellowish orange. Eggs in oviducts and embryos in egg sacs pale rose white, opaque.

Antennule (Fig. 2 c) a subconical lobe, segmentation not visible. Basal half well expanded, and distal sixth narrowed, about one-fifth as wide as proximal portion. Armature consisting of 17 setae, these short and smooth ; two stout setae at tip, 13 smaller setae subterminally, and two similarly small setae midway on ventral margin.

Antenna (Fig. 2 d) consisting of three segments, rigid. Segmental composition partly noticeable only because of sclerotization on each segment. Basal two segments taken together expanded and somewhat cylindrical ; second slightly shorter than first. Third segment much narrower and shorter than second, its lateral margin mostly fused with distal margin of second. Armature consisting of four graduated bifurcate spines along distal two-thirds of medial margin ; terminal spine largest, about twice as large as smallest proximal spine.

Labrum (Fig. 2 e) protruded posteriorly as a subtriangular lobe, its margin smooth. Mouth bearing a transverse row of minute teeth, these noticeable under labrum.

Mandible (Fig. 2 f) a small conical lobe, with one simple terminal seta.

Maxilliped (Fig. 2 g) consisting of large two-segmented protopod, without setae, and small endopod terminating in curved spine. Claw divided into two articles.

Legs 1-4 (Fig. 2 h) similar in structure, size, and armature in specimen A. Basis represented by oval sclerite, this with one short, smooth seta posterolaterally. Endopod fused laterally with most of medial margin of exopod, its distal margin smooth, curved as it slopes from lateral to medial, without protrusion. Exopod three-fifths as long as width of basis. Distal one-third of sclerotized lateral margin armed with four bifurcate spines ; lateral seta absent. Terminal spine nearly 1.5 times as large as subterminal spine, set closely to it. Subterminal spine slightly larger than either of the two lateral spines. However, in specimen B (body length about 1.5 mm), exopod of leg 1 with one additional lateral spine, thus bearing a total of five spines (Fig. 2 i) ; legs 2-4 each bearing four spines, as in specimen A.

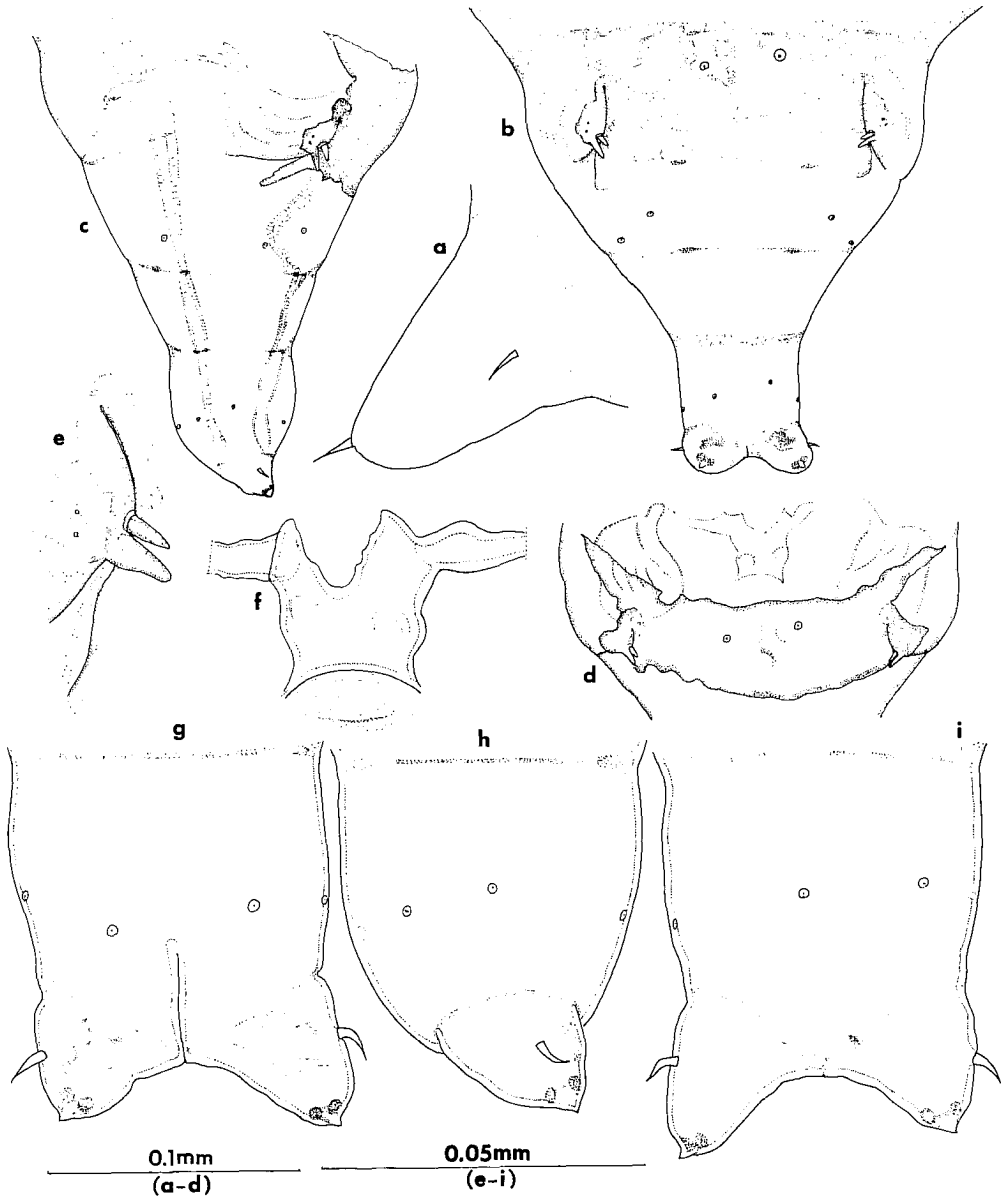


Fig. 3 : *Haplostoma cantii* Chatton & Harant, female (specimen A) : a, left leg 5, dorsal view ; b, urosome, dorsal view ; c, urosome, lateral view ; d, genitalia, dorsal view, showing connection of copulatory pore with seminal receptacle, receptacle ducts, genital antra and oviducal apertures ; e, apparatus at left oviducal aperture, dorsal view ; f, copulatory pore, seminal receptacle with receptacle ducts (part), ventral view ; g, anal somite with caudal rami, dorsal view ; h, anal somite with left caudal ramus, lateral view ; i, anal somite with caudal rami, ventral view.

Leg 5 (Fig. 3 a) represented by two small simple setae on subconical protrusion (longer than wide) of fourth metasomal section ; one seta located proximally on dorsal side, and one seta at rounded apical margin.

In genital region (Fig. 3 b-d), dorsal cuticle between oviducal apertures sclerotized, and with two hairs. Apparatus at oviducal aperture (Fig. 3 e) consisting of flaplike fold armed with seven conical spines (two in outer row, five in inner row). Largest distal spine in outer row about 1.3 times as long as proximal spine in the same row (neither sharply pointed), and nearly five times as large as subequal small spines in inner row. Copulatory pore (Fig. 3 f) opening into large seminal receptacle, this connecting with saclike genital antra via receptacle ducts (Fig. 3 c, d).

Caudal ramus (Fig. 3 g-i) a small conical lobe, slightly longer than wide, without articulation on anal somite. Lateral margin with one seta. Ramus weakly pointed at tip, not developed as claw or spine, and sclerotized near tip and on dorsal surface.

Male : Unknown.

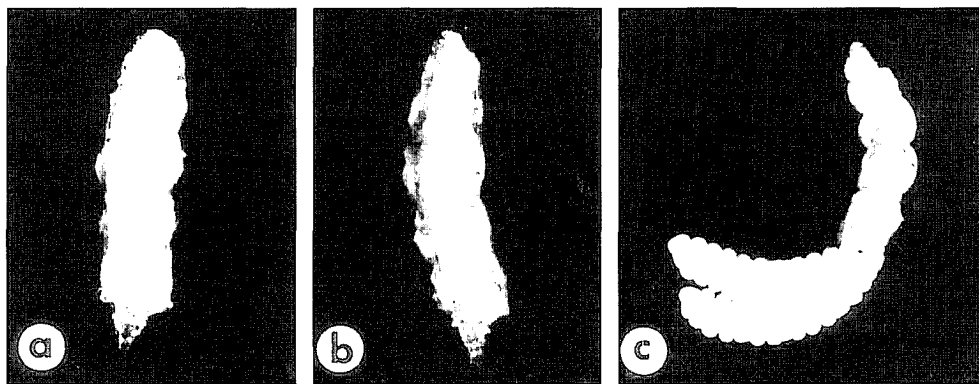


Fig. 4 : *Haplostoma canui* Chatton & Harant, photographs of live female : a, specimen A, egg sacs removed, dorsal view ; b, same specimen, lateral view ; c, specimen B, egg sacs still attached, lateral view.

DISCUSSION

The type locality of *Haplostoma canui* is Pempoul on the French coast of the English Channel. It is about 4.6 km south of Roscoff, where the present material of *Polyclinum aurantium* was collected. This ascidian, at Pempoul, is also the type host of *Haplostomides scotti* described by Chatton & Harant (1924a) ; this copepod belongs to the same subfamily (Haplostomatinae). The occurrence of *H. scotti* in *P. aurantium* at Strangford Lough, Ireland, was reported by Gotto (1952), who later found *Enterocola megalova* Gotto, 1962 (subfamily Enterocolinae) in the same host species at this locality.

The colony of *P. aurantium* at Roscoff, in which three specimens of *Haplostoma canui* were collected, also harbored *Haplostomides scotti* and an unidentified species of *Enterocola*. In all other *P. aurantium* colonies examined, the copepods were found in various combinations as follows : (1) exclusively *Enterocola* ; (2) *Enterocola* and *Haplostomides* ; (3) *Enterocola*, *Haplostomides* and a species of the family Notodelphyidae. In any case, *Haplostoma canui* was the least common ascidicolid copepod in *P. aurantium*.

Chatton & Harant (1924b) stated that *H. canui* is closely related to *H. brevicauda* Canu, 1886, and they distinguished it from *H. brevicauda* on the basis of the reduction of leg endopods and the indistinctly segmented urosome. *Haplostoma eruca* (Norman, 1869), *H. brevicauda* (Canu, 1886) and *H. banyulensis* (Brément, 1909), all from European seas, and *H. gibberum* (Schellenberg, 1922), from the South Pacific, were the only described species until *H. canui* was reported by Chatton & Harant (1924b). The reduction of leg endopods is undoubtedly characteristic of *H. canui*, separating it from the four species just mentioned. This character has also not been observed in the following seven species, which include one European species (*H. mizoulei* Monniot, 1962) and six North Pacific species (*H. albicatum*, *H. minutum*, *H. dentatum*, *H. setiferum*, *H. ambiguum*, and *H. elegans*) studied by Ooishi & Illg (1977).

Table I compares the present redescription with the original description with respect to the armature of all the appendages, as well as the apparatus at the oviducal aperture. As seen in the table, the diagnosis in the original description must be slightly modified.

In the antennule, two stout apical setae can be distinguished from the remaining 15 smaller setae (13 subterminal, two ventral). Bifurcation of spines on the antenna and also of spines of the exopods of legs 1-4 has not been observed in any described species of the genus. Absence of a lateral seta in the leg exopods is distinctive. The reduced caudal ramus, with a weakly pointed tip and a lateral seta, is also unique. The rostrum and the subconical labrum are described here for the first time. All of these features, in addition to the reduced leg endopods, are characteristic of *H. canui*, and separate it from the other 11 described species of the genus.

As was expected, the characters of legs 1-4 in *H. canui*, just mentioned, are comparable to those of the two undescribed species.

A lateral seta on the basis of legs 1-4 has been found in *H. ambiguum* Ooishi & Illg, 1977, and also in *Haplostomides hawaiiensis* (Ooishi, in press).

In one female of *H. canui* (specimen A), the exopod of leg 1 has four spines ; in the other one (specimen B), it has five spines, and this agrees with the number given by Chatton & Harant (1924b : 414, Fig. 1). Leg 2 of both A and B specimens, however, has only four spines, instead of five as reported by Chatton & Harant. Perhaps the discrepancy is due to variation in spine number within the species.

In the light of the present redescription of *H. canui*, it is necessary to re-examine other species of *Haplostoma*, particularly *H. eruca*, *H. brevicauda*, *H. banyulensis*, and *H. gibberum*.

TABLE I

Comparison of certain features of the armature of all appendages and apparatus at oviducal aperture of *H. canui*, as given in the redescription and in the original description.

	Redescription	Original description
Antennule	17 simple setae (2 long, 15 short)	13 simple setae (3 long, 10 short)
Antenna	4 spines (all 4, bifurcate)	4 spines (1 bifurcate, 3 simple)
Mandible	1 simple seta	1 simple seta
Legs 1-4		
basis	1 simple seta	without seta
endopod	without distal protrusion	without distal protrusion
exopod	without lateral seta on legs 1-4 ; 5 or 4 spines (all bifurcate) on leg 1 ; 4 spines (all bifurcate) on legs 2-4	without lateral seta on legs 1-4 ; 5 spines (1 bifurcate, 4 simple) on legs 1, 2 ; 4 spines (1 bifurcate, 3 simple) on legs 3, 4
Leg 5	2 setae	without setae
Apparatus at oviducal aperture	7 spines (2 in outer row, 5 in inner row)	6 spines (2 in outer row, 4 in inner row)
Caudal ramus	apex pointed ; 1 simple lateral seta	apex with a blunt knob ; 1 simple lateral seta

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