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HEMICYCLOPS THALASSIUS NOV. SPEC. (COPEPODA, CYCLOPOIDA) FROM MAR DEL PLATA, WITH REVISIONARY NOTES ON THE FAMILY CLAUSIDIIDAE

by

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Introduction

The discovery of a new species of *Hemicyclops*, found pelagically in Argentine coastal waters, has made it necessary for us to summarize the descriptions of the species of *Hemicyclops* Boeck, 1872. In the course of our investigation, the results of which are laid down is this paper, it became necessary to construct a new key for the identification of the genera of Clausidiidae, which will be presented below. We have thought it advisable to state very briefly the position of the genera, basing ourselves mainly on the recent review of this family by Bocquet & Stock (1957). We refrain, at the present stage, from presenting diagnoses of all genera. Many species are commensals or parasites of Invertebrates and the number of known species has considerably increased during the last years, a process which seems far from having come to an end at the present moment. The conceptions of generic units, therefore, are very likely to be unstable for some time to come.

Clausidiidae Embleton, 1901

The family name Clausidiidae has been suggested by Embleton (1901, 213) to replace the older name Hersiliidae Canu (1888: 792), the preoccupied name of the type genus, *Hersilia* Philippi (1839: 128), being replaced by *Clausidium* Kossmann (1874: 11).

In this family we have, besides the type genus *Clausidium* Kossmann, admitted the following genera: *Conchyliurus* Bocquet & Stock (1957: 215), *Giardella* Canu (1888a: 409), *Hemicyclops* Boeck (1872: 42), *Hersiliodes* Canu (1888a: 417), *Hippomolgus* G. O. Sars (1917: 147), *Leptinogaster* Pelseneer (1929: 37), *Myzomolgus* Bocquet & Stock (1957a: 411), and *Pseudopsyllus* T. Scott (1902: 471). There are, moreover, three genera of very uncertain status, viz., *Goidelia* Embleton (1901: 211), *Paurocope* Brady (1899: 46), and *Saphirella* T. Scott (1894: 126). The generic name *Hersiliopsis* has been used by Blake in the combination *Hersiliopsis welshi* Blake (1925: 315). No descriptions or figures have ever been published of this genus or species; both must therefore be considered nomina nuda.

Clausidium Kossmann, 1874

Synonyms: *Hersilia* Philippi, 1839 (preoccupied by *Hersilia* Audouin, 1826: 114), and *Pseudohersilia* Strand (1914: 163; type: *Hersilia* (*Clausidium*) *vancouverensis* Haddon).

Type, by monotypy: *Hersilia apodiformis* Philippi (1839: 128, pl. 4 fig. 9-11) (= *Clausidium testudo* Kossmann, 1874: 291, pl. 6).

Further species:

Clausidium californiense C. B. Wilson (1935: 785, pl. 29 fig. 56-68);
Binoculus caudatus Say (1818: 437);
Clausidium chelatum Pillai (1959: 4, 62, fig. 3-4);
Clausidium dissimile C. B. Wilson (1921: 427, pl. 94-95);
Clausidium searsi C. B. Wilson (1937: 208, fig. 7-17);
Clausidium senegalense Humes (1957: 485, fig. 1-23);
Clausidium tenax Humes (1949: 93, pl. 1-3);
Clausidium travancorense Pillai (1959: 57, fig. 1, 2), and
Hersilia (*Clausidium*) *vancouverensis* Haddon (1912: 84, pl. 2).

Conchyliurus Bocquet & Stock, 1957

Type, by monotypy: *Conchyliurus solensis* Bocquet & Stock (1957: 218, fig. 4-5).

Further species:

Conchyliurus bombasticus Reddiah (1961: 300, fig. 1-3);
Conchyliurus cardii cardii Gooding (1957: 213, fig. 6);
Conchyliurus cardii tapetis Bocquet & Stock (1958: 317, fig. 1d, 2a, e, 3c, 4f-h, 5d-e, g).
Conchyliurus gracilis Reddiah (1961: 306, fig. 4-6);
Conchyliurus fragilis Pillai (1963: 238, fig. 16-34);
Conchyliurus lobatus Humes & Cressey (1958: 926, fig. 40-47);
Conchyliurus maximus Reddiah (1961a: 138, fig. 1-3);
Conchyliurus quintus Tanaka (1961: 258, pl. 27 fig. 7-9, pl. 28 fig. 1-8, pl. 29 fig. 1-7), and
Conchyliurus torosus Humes & Cressey (1958: 921, fig. 1-39).

Table 1. Spinal and setal formulae of the various genera of Clausidiidae (spines in roman, setae in arabic numerals)

	leg 1						leg 2					
	endopodite			exopodite			endopodite			exopodite		
	1	2	3	1	2	3	1	2	3	1	2	3
Clausidium				0+I	0+I	3+IV	1	2+0	4+II	0+I	1+I	5+III
Conchyliurus	1+0	1+0	4+II	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
Giardella	1+0	1+0	5+I	0+I	1+I	4+IV						
Hemicyclops	1+0	1+0	4/5+I	0+I	1+I	4+IV 6+II 7+I	1+0	2+0	3+III	0+I	1+I	5+IV 6+III 7+II
Hersiliodes	1+0	1+0	4+II	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
Hippomolgus	1+0	1+0	3+III	0+I	1+I	4+IV						
Myzomolgus	1+0	1+0	5+I	0+I	1+I	4+I	1+0	1+0	5+I	0+I	0+I	5+I
Leptinogaster	1+0	1+0	5+I	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
Pseudopsyllus	1+0	1+0	4+I	0+I	1+I	4+IV						

	leg 3						leg 4					
	endopodite			exopodite			endopodite			exopodite		
	1	2	3	1	2	3	1	2	3	1	2	3
Clausidium	1	2+0	6	0+I	1+I	5+III	1	1+0	3+II	0+I	1+I	5+III
Conchyliurus	1+0	2+0	3+III	0+I	1+I	5+IV	1+0	2+0	2+III	0+I	1+I	5+IV
Giardella							1+0	1+0	IV	0+I	1+I	5+III
Hemicyclops	1+0	2+0	3+III 2+IV	0+I	1+I	5+IV *) 6+III 7+II	1+0	2+0*)	1/3+III/V	0+I	1+I	5/7+II/IV
Hersiliodes	1+0	2+0	2+IV	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III
Hippomolgus	1+0	2+0	2+IV	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III
Myzomolgus	1+0	1+0	5+I	0+I	0+I	5+I	1+0	1+0	2+II	0+I	1+I	5+I
Leptinogaster	1+0	2+0	3+III	0+I	1+I	5+IV	1+0	1+0	1+IV 2+III	0+I	1+I	5+III 3+III
Pseudopsyllus							1+0	2+0	3	0+I	1+I	5+III

*) *Hemicyclops carinifer* Humes has 5 setae and 3 spines on the third exopodal segment of leg 3 and a single seta on the second endopodal segment of leg 4.

Table 2. Spinal and setal formulae of the various species of *Hemicyclops* (spines in roman, setae in arabic numerals)

	leg 1						leg 2					
	endopodite			exopodite			endopodite			exopodite		
	1	2	3	1	2	3	1	2	3	1	2	3
aberdonensis	1+0	1+0	5+I	0+I	1+I	4+IV						
acanthosquillae	1+0	1+0	5+I	0+I	1+I	7+I	1+0	2+0	3+III	0+I	1+I	7+II
adhaerens	1+0	1+0	5+I	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
amplicaudatus	1+0	1+0	5+I	0+I	1+I	7+I	1+0	2+0	3+III	0+I	1+I	7+II
arenicolae	1+0	1+0	5+I	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
australis	1+0	1+0	5+I	0+I	1+I	6+II	1+0	2+0	3+III	0+I	1+I	5+IV
axiophilus	1+0	1+0	5+I	0+I	1+I	7+I	1+0	2+0	3+III	0+I	1+I	7+II
bacescui	1+0	1+0	5+I	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
biflagellatus	1+0	1+0	5+I	0+I	1+I	6+II	1+0	2+0	3+III	0+I	1+I	7+II
carinifer	1+0	1+0	5+I	0+I	1+I	5+III	1+0	2+0	3+III	0+I	1+I	6+III
cylindraceus	1+0	1+0	5+I	0+I	1+I	6+II	1+0	2+0	3+III	0+I	1+I	6+III
dilatatus	1+0	1+0	5+I	0+I	1+I	6+II	1+0	2+0	3+III	0+I	1+I	7+II
diremptus	1+0	1+0	5+I	0+I	1+I	7+I	1+0	2+0	3+III	0+I	1+I	7+II
elongatus	1+0	1+0	5+I	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
indicus	1+0	1+0	5+I	0+I	1+I	6+II	1+0	2+0	3+III	0+I	1+I	5+IV
intermedius	1+0	1+0	5+I	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
kombensis	1+0	1+0	5+I	0+I	1+I	7+I	1+0	2+0	3+III	0+I	1+I	7+II
leggii	1+0	1+0	4+I	0+I	1+I	4+IV						
livingstoni	1+0	1+0	5+I	0+I	1+I	6+II						
purpureus	1+0	1+0	5+I	0+I	1+I	6+II	1+0	2+0	3+III	0+I	1+I	5+IV
subadhaerens	1+0	1+0	5+I	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
thalassius	1+0	1+0	5+I	0+I	1+I	4+IV	1+0	2+0	3+III	0+I	1+I	5+IV
thysanotus	1+0	1+0	5+I	0+I	1+I	6+II	1+0	2+0	3+III	0+I	1+I	5+IV
visendus	1+0	1+[illegible]	5+I	0+I	1+I	6+II	1+0	2+[illegible]	3+III	0+I	1+I	7+II

	leg 3						leg 4					
	endopodite			exopodite			endopodite			exopodite		
	1	2	3	1	2	3	1	2	3	1	2	3
aberdonensis							1+0	2+0	3+IV	0+I	1+I	5+IV
acanthosquillae	1+0	2+0	3+III	0+I	1+I	6+III	1+0	2+0	2+III	0+I	1+I	7+I
adhaerens	1+0	2+0	2+IV	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III
amplicaudatus	1+0	2+0	3+III	0+I	1+I	6+III	1+0	2+0	2+III	0+I	1+I	7+I
arenicolae	1+0	2+0	2+IV	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III
australis	1+0	2+0	2+IV	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III
axiophilus	1+0	2+0	3+III	0+I	1+I	6+III	1+0	2+0	2+III	0+I	1+I	7+I
bacescui	1+0	2+0	3+III	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III
biflagellatus	1+0	2+0	3+III	0+I	1+I	6+III	1+0	2+0	2+III	0+I	1+I	7+I
carinifer	1+0	2+0	2+IV	0+I	1+I	5+III	1+0	2+0	1+III	0+I	1+I	5+III
cylindraceus	1+0	2+0	3+III	0+I	1+I	6+III	1+0	2+0	2+III	0+I	1+I	6+II
dilatatus	1+0	2+0	3+III	0+I	1+I	7+II	1+0	2+0	2+III	0+I	1+I	5+III
diremptus	1+0	2+0	3+III	0+I	1+I	6+III	1+0	2+0	2+III	0+I	1+I	7+I
elongatus	1+0	2+0	2+IV	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III
indicus	1+0	2+0	3+III	0+I	1+I	5+IV	1+0	2+0	3+III	0+I	1+I	5+IV
intermedius	1+0	2+0	2+IV	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III
kombensis	1+0	2+0	3+III	0+I	1+I	6+III	1+0	2+0	2+III	0+I	1+I	7+I
leggii							1+0	2+0	1+IV	0+I	1+I	5+III
livingstoni							1+0	2+0	3+III	0+I	1+I	5+III
purpureus							1+0	2+0	2+III	0+I	1+I	5+III
subadhaerens	1+0	2+0	2+IV	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III
thalassius	1+0	2+0	3+III	0+I	1+I	5+IV	1+0	2+0	V	0+I	1+I	5+III
thysanotus	1+0	2+0	3+III	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	7+II
visendus	1+0	2+0	3+III	0+I	1+I	5+IV	1+0	2+0	1+IV	0+I	1+I	5+III

Giardella Canu, 1888

Type, by monotypy: *Giardella callianassae* Canu (1888a: 410, pl. 28).

Hemicyclops Boeck, 1872

Synonyms: *Tococheres* Pelseneer (1929: 36; type: *Tococheres cylindraceus* Pelseneer, 1929); *Pontocyclops* Şerban (1956: 169; type: *Pontocyclops bacescui* Serban, 1956: 169, fig. 1-8).

Type, by monotypy: *Hemicyclops purpureus* Boeck (1872: 42) (= *Lichomolgus littoralis* T. Scott, 1892: 260, pl. 10 fig. 1-9).

Further species:

Lichomolgus aberdonensis T. & A. Scott (1892: 149, pl. 6);

Hemicyclops acanthosquillae Humes (1965: 181, pl. 32 fig. 223-227, pl. 33-36);

Lichomolgus adhaerens Williams (1907: 75, pl. 2) (= *Hemicyclops americanus* C. B. Wilson, 1932: 44, pl. 5 fig. a-h);

Hemicyclops amplicaudatus Humes (1965: 163, pl. 7 fig. 41-46, pl. 8-10, pl. 11 fig. 71-72);

Hemicyclops arenicolae Gooding (1960: 188, figs. 9-10);

Hemicyclops australis Nicholls (1944: 49, fig. 20-21);

Hemicyclops axiophilus Humes (1965: 160, pl. 1-6, pl. 7 fig. 39-40);

Pontocyclops bacescui Şerban (1956: 169, fig. 1-8);

Hemicyclops biflagellatus Humes (1965: 177, pl. 27-31, pl. 32 fig. 221-222);

Hemicyclops carinifer Humes (1965: 166, pl. 11 fig. 73-81, pl. 12-15, pl. 16 fig. 109-115);

Tococheres cylindraceus Pelseneer (1929: 34, fig. 1);

Hemicyclops diremptus Humes (1965: 170, pl. 16 fig. 116-117, pl. 17-20, pl. 21 fig. 147-152);

Hemicyclops elongatus C. B. Wilson (1937: 206, fig. 1-6);

Hemicyclops intermedius Ummerkutty (1962: 36, fig. 6);

Hemicyclops kombensis Humes (1965: 174, pl. 21 fig. 153-154, pl. 22-26);

Hersiliodes leggii Thompson & A. Scott (1903: 283, pl. 17 fig. 12-21);

Hersiliodes livingstoni T. Scott (1894: 118, pl. 13 fig. 31-38);

Hemicyclops subadhaerens Gooding (1960: 181, figs. 5-7);

Hersiliodes tamilensis Thompson & A. Scott (1903: 283, pl. 17 fig. 22-25);

Hemicyclops thysanotus C. B. Wilson (1935: 783, pl. 28 fig. 41-52) (= *Hemicyclops callianassae* C. B. Wilson, 1935: 782, pl. 27 fig. 25-35; *Hemicyclops pugettensis* Light & Hartman, 1937: 181, fig. 12-20, pl. 12 fig. 5-6), and

Hemicyclops visendus Humes, Cressey & Gooding (1958: 398, fig. 1-26).

At the suggestion of Bocquet, Stock & Kleeton (1963: 30) we have incorporated *Tococheres cyclindraceus* Pelseneer, 1929, and *Hersiliodes livingstoni* T. Scott, 1894, in the genus *Hemicyclops,* though we would have been inclined to place both species in a separate genus. We agree with Bocquet, Stock & Kleeton that at present it is almost impossible to delimit sharply from *Hemicyclops* a genus including the two above named species. On the other hand we do feel that *Hemicyclops,* in its present shape, is heterogenous and we hope that the discovery of additional material will make it possible to revise the genus thoroughly.

A new species of *Hemicyclops* will be described at the end of this paper as *Hemicyclops thalassius* nov. spec.; a key to identify the females of *Hemicyclops* will also be found there.

We have been forced to consider the following species of *Hemicyclops* as insufficiently known:

Hersiliodes canuensis Bourne (1890: 379, pl. 25 fig. 1-6). This species is based on a juvenile, probably female specimen, the oral parts of which have been figured; the legs have remained undescribed. Canu (1892: 254, note) has identified this species with *Hersiliodes thompsoni* Canu, 1888 (= *Hemicyclops thomsoni* (Canu), vide infra). In our opinion the general shape of the body and the conspicuous difference in length of the furca strongly point against such a suggestion. It seems much more likely that *H. canuensis* either represents the developmental stage of an undescribed species of *Hemicyclops,* or a stage of *H. purpureus* Boeck. The only point which, in our opinion, weakens the latter supposition is the structure of the antenna in *H. canuensis,* which seems to possess a well shaped process on the third segment, carrying a strong spine as a continuation of a row of spinules of gradually increasing size along the internal margin of that segment. Unfortunately Bourne's description gives no measurements of his two specimens.

Hemicyclops dilatatus Shen & Bai (1956: 202, 227, pl. 8 fig. 59-64). This species is also based on an immature female, probably the fifth copepodite. This appears quite clearly from an inspection of Shen & Bai's plate 7 fig. 59. They have compared their species with *Hemicyclops australis* Nicholls, with which it has many points in common, and with *Hemicyclops purpureus* Boeck, from which it differs greatly. Unfortunately no measurements can be taken from Shen & Bai's paper: the oral parts are only partly described and figured. We are inclined to consider this species to be synonymous with *H. australis.*

Hemicyclops indicus Sewell (1949: 69, fig. 16) in our opinion is based on a juvenile specimen. The genital complex and the maxillipede are still incompletely developed; there is only one spiniform seta on segment 3 of the antenna and one seta on the first segment of the maxilla. This species differs from other *Hemicyclops* in the setation of the legs; it cannot be identified with any of the known adult females. Sewell (1949: 71) also mentions the male (♀ 1.07 mm; ♂ 1.48 mm), without describing it in detail.

Cyclops puffini I. C. Thompson (1888: 65, pl. 1 fig. 1-9) is evidently a *Hemicyclops* though unrecognizable as a species. The description is based on a very young specimen, probably a second or third copepodite stage, the length given is 1/20 inch (= 1.27 mm). Thompson's figures are very indistinct, but some of the appendages of this species have been redescribed and figured by Canu (1888a: 423, pl. 30 fig. 9-14). The species is characterized by a strongly developed swelling of the third segment of the antenna, carrying two strong spines and two setae. The species cannot yet be identified with any of the known adults and should stand, at least for the present, as a doubtful species.

Hersiliodes thompsoni Canu (1888a: 422, pl. 30 fig. 1-8) has been described from two female specimens. Nothing in Canu's drawings or description suggests that he was dealing with immature specimens, even the genital complex of the female figured (Canu, 1888a, pl. 30 fig. 1) seems to be that of a mature female. Yet Canu (188a: 422) described the specimens as "jeunes". This, and the absence of figures or descriptions of the legs, induced us to consider this species insufficiently known. It comes exceedingly close to both *H. thysanotus* C. B. Wilson and *H. bacescui* (Şerban). From the former it differs in the shape of the genital somite and leg 5, from the latter in the longer and apparently nude furcal rami; small differences may also be present in the shape of leg 5.

Hemicyclops sp., described by Pillai (1963: 243, fig. 48-60), is the fully described male of some apparently new species of *Hemicyclops*. It cannot be identified with any of the males known at present; it does show affinities with *H. bacescui* (Şerban), the male of which is unknown.

Hersiliodes Canu, 1888

Type, by subsequent designation (Bocquet & Stock, 1957: 215): *Antaria latericia* Grube (1869: 122, pl. 2 fig. 3 a-c) (= *Hersiliodes pelseneeri* Canu, 1888a: 418, pl. 29).

Hippomolgus G. O. Sars, 1917

Type, by monotypy: *Hippomolgus furcifer* G. O. Sars (1917: 148, pl. 82).

Further species:

Hersiliodes dubia Thompson & A. Scott (1903: 284, pl. 3 fig. 18-27).

Leptinogaster Pelseneer, 1929

Synonyms: — *Strongylopleura* Pelseneer (1929: 39; type: *Strongylopleura histrio* Pelseneer, 1929); *Myocheres* M. S. Wilson (1950: 298; type: *Lichomolgus major* Williams, 1907).
Type, by monotypy: *Leptinogaster pholadis* Pelseneer (1929: 37, fig. 2).

Further species:

Myocheres dentata Humes & Cressey (1958: 933, fig. 84-98);
Strongylopleura histrio Pelseneer (1929: 39, fig. 3);
Myocheres inflata Allen (1956: 60, pl. 1-3);
Lichomolgus major Williams (1907: 77, pl. 3) (= *Myicola spinosa* Pearse, 1947: 5, fig. 26-31);
Myocheres scobina Humes & Cressey (1958: 928, fig. 48-83), and *Leptinogaster* sp., Bocquet & Stock, 1958a: 85, fig. 6.

Myzomolgus Bocquet & Stock, 1957

Type, by monotypy: *Myzomolgus stupendus* Bocquet & Stock (1957a: 412, fig. 1-3).

Pseudopsyllus T. Scott, 1902

Type, by monotypy: *Pseudopsyllus elongatus* T. Scott, 1902 [1]).

The uncertain genera are briefly discussed below.

Goidelia Embleton, 1901

Type, by monotypy: *Goidelia japonica* Embleton (1901: 211, pl. 21-22).

This genus differs from the usually accepted genera of Clausidiidae by the structure of antennules, antennae and oral parts. The setation and spinulation of legs 1 to 4 is insufficiently known. The fifth legs, in both sexes, are 3-segmented; the structure of the maxillipedes in the male is quite different from the type usually met with in Clausidiidae. This genus, observed parasitically in the rectum of the Japanese Echiurid *Echiurus unicinctus* von Drasche (= *Urechis unicinctus* (von Drasche)) is badly in need of a critical revision.

Paurocope Brady, 1899

Type, by monotypy: *Paurocope robusta* Brady (1899: 46, pl. 13 fig. 1-9).

This genus, very incompletely described by Brady, has recently been discussed by Nicholls (1944: 51) and Sewell (1949: 66). Though their

1) Bocquet & Stock (1957: 213) have used the generic name *Jeanella* T. Scott, 1894, for this genus, on the assumption that *Pseudopsyllus* T. Scott, 1902, was preoccupied. This, however, is a mistake; *Jeanella* has been suggested by T. Scott (1904: 259) to replace the preoccupied generic name *Platypsyllus* T. Scott (1902: 455, pl. 25 fig. 15-16).

conclusions are not of the same tenor both authors agree in the following essential points:

1. *Paurocope robusta* is based on juvenile specimens that, though they cannot be directly recognized as the developmental stages of a certain species, show very distinct affinities with the Clausidiidae.

2. There are certain inconsistencies in Brady's figures that may either be the result of a regrettable though usual inaccurrancy of Brady's drawings, or point to certain distinct features of *Paurocope robusta*.

In absence of type material it is impossible to make further deductions, so that *Paurocope*, at least for the present, must stand as an uncertain genus. *P. robusta* has been collected in Otago Harbour and off Gisborne, both localities in New Zealand. The length is given as 0.88 mm.

Saphirella T. Scott, 1894

Type, by monotypy: *Saphirella abyssicola* T. Scott (1894: 126, pl. 13 fig. 57-58, pl. 14 fig. 5-10).

Further species:

Saphirella enigmaticus Krishnaswamy (1952: 333, fig. 5);
Saphirella indica Sewell (1924: 800, pl. 59 fig. 1);
Saphirella nicobarica Sewell (1949: 66, fig. 15);
Saphirella orientalis Smirnov (manuscript name used by Brodsky, 1941: 162);
Saphirella tropica Farran (1936: 139, fig. 30);
Saphirella sp., Brodsky (1948: 91, pl. 32 fig. 7-8);
Saphirella sp., Gurney (1944: 826, fig. 1-6);
Saphirella sp., Vilela (1965: 14, pl. 3 fig. 2).

The genus *Saphirella* is exclusively composed of juveniles (copepodite stages) of Clausidiidae, probably principally, but not exclusively, of the genus *Hemicyclops*. Unfortunately the life history of none of the species of *Hemicyclops* is completely known, so that we are only very poorly informed about changes in shape and setation of antennules, antennae, oral parts and legs during development. Nicholls (1944: 50) has made it clear that *Saphirella tropica* is a copepodite (probably the first stage) of a species of *Hemicyclops*. Corresponding stages have been described in *Giardella callianassae* by Canu (1888a: 417, pl. 28 fig. 15-24, the first copepodite) and in *Hersiliodes latericia* by the same author (Canu, 1888a: 421, pl. 29 fig. 14-21, second copepodite, as *Hersiliodes Pelseneeri*). *Hemicyclops puffini* is exclusively based on such a second copepodite stage (Canu, 1888a: 423, pl. 30 fig. 9-14). A satisfactory distribution of the species of *Saphirella* over other genera of Clausidiidae cannot be achieved at present, so that the genus must be retained.

Key to the genera of Clausidiidae, principally based on females 2).

1. Some of the appendages (legs or antennae) with sucking discs 2
— Sucking discs absent 3
2. Sucking disc present on third antennal segment. Endopodite of leg 1 normally developed, 3-segmented. Second endopodal segments of legs 2 to 4 with a single internal seta. Third exopodal segment of legs 1 to 4 with a single spine at external margin . . . . *Myzomolgus* Bocquet & Stock
— Sucking discs exclusively found on the legs. Endopodite of leg 1 modified, with 2 large sucking discs. Small sucking discs on endopodites of legs 2 to 4. Second endopodal segment of legs 2 and 3 with 2, of leg 4 with 1 internal seta. Third exopodal segment of legs 1 to 4 with 4 spines at external margin . *Clausidium* Kossmann
3. Antennae 6-segmented, usually short. Aesthetascs, if present, on segments 4 to 6 4
— Antennae 7-segmented, usually slender and long. Aesthetascs, if present, on segments 5 to 7 7
4. Maxillipedes absent . . . . *Leptinogaster* Pelseneer
— Maxillipedes present 5
5. Third endopodal segment of leg 4 with a total of 3 setae; third endopodal segment of leg 1 with 5 appendages . . . . *Pseudopsyllus* T. Scott
— Third endopodal segment of leg 4 with a total of 5 or 6 appendages; third endopodal segment of leg 1 with 6 appendages 6
6. Maxilla 2-segmented, basal segment slightly swollen, apical segment a strongly developed claw with some additional small setae and spinules . . . . *Conchyliurus* Bocquet & Stock
— Maxilla 2-segmented, basal segment swollen, apical segment with at least 2 strong spines and a seta 7
7. Maxillipede prehensile, with large terminal claw and setae on segments 1 and 2. Antennules normally developed . . . . *Hersiliodes* Canu
— Maxillipede reduced, with a short terminal spine, not prehensile, without setae on segments 1 and 2. Antennules very short, hirsute by the presence of many short setae . . . . *Hippomolgus* G. O. Sars
8. Plate of mandible apically with large, triangular tooth and 2 denticulated plates . . . . *Giardella* Canu
— Plate of mandible with large triangular tooth, a denticulate plate and 1 or 2 setae . . . . *Hemicyclops* Boeck

Hemicyclops thalassius nov. spec. (fig. 1-5)

Material. — 12 adult females and 12 adult males from Mar del Plata, Atlantic coast of Argentina, 37°58'.5 - 38°11' S 56°58'.5 - 57°34'.8 W, 24-29 April 1962 and 27 May 1964; surface temperature 14.00°-16.84° C, salinity 33.57-33.96 ‰. Holotype is a female of 858 μ, allotype a male of 742 μ; both have been deposited in the Rijksmuseum van Natuurlijke Historie, Leiden, along with 6 female and 6 male paratypes. A set of 2 male and 2 female paratypes have been deposited in each of the following museums:

2) *Pseudopsyllus* T. Scott, 1902, has been included, though no females of this genus have ever been described.

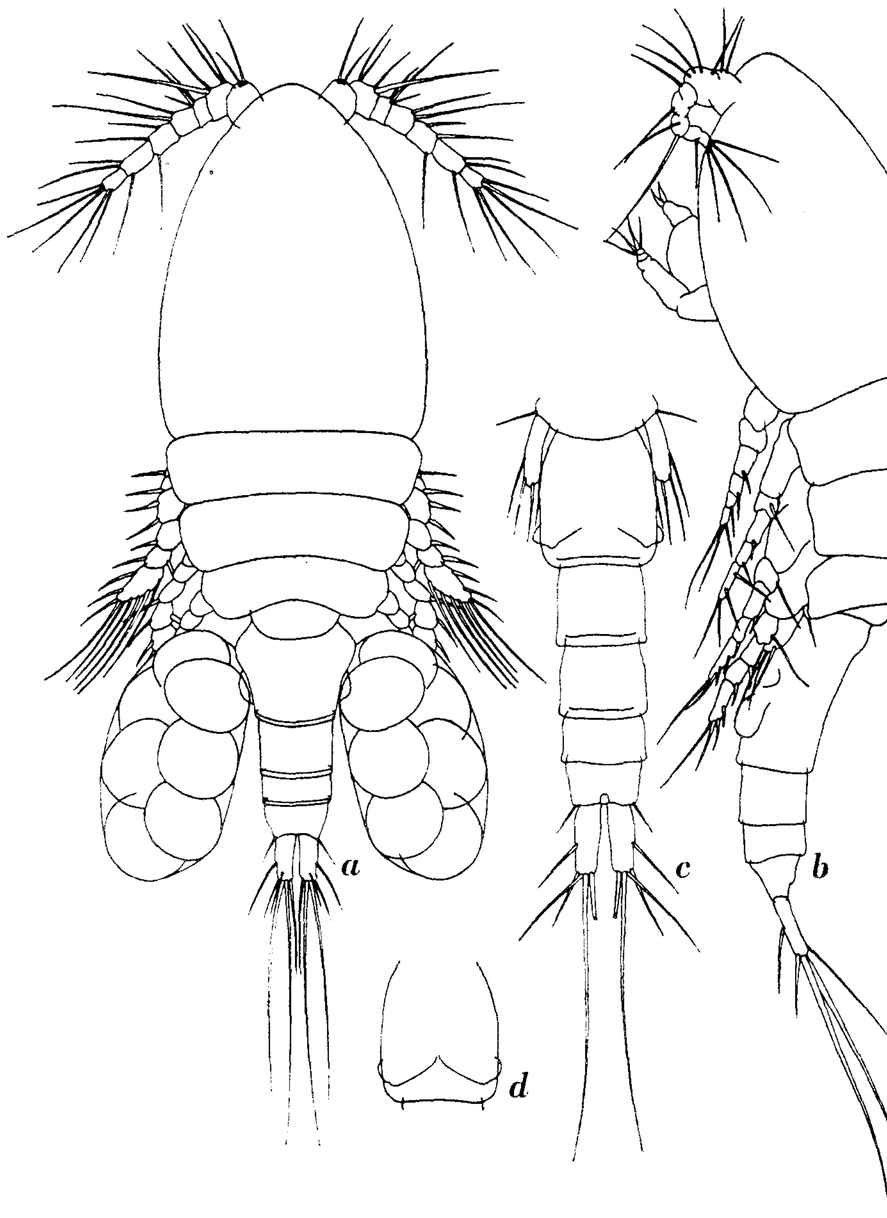

Fig. 1. *Hemicyclops thalassius* nov. spec., Mar del Plata, a, b, ad. ♀, paratype; c, d, ad. ♂, paratype. a, whole animal, dorsal view; b, whole animal, lateral view from left side; c, abdomen, dorsal view; d, genital somite, ventral view. a, b, × 100; c, d, × 195.

the British Museum (Natural History), London, the U.S., National Museum (Smithsonian Institution), Washington, D.C., U.S.A., and the Museum of Natural Sciences, La Plata, Argentina.

Description of the female. — Total length 810-973 μ (average 851 μ). The description and the figures are based on a female paratype of 810 μ with the following measurements: greatest diameter of the body is 283.5 μ; the cephalothorax is 513 μ long, the abdomen (into which the fifth thoracic somite has been included) is 297 μ long. The length and breadth measurements of the various somites are: 431 and 286 μ for the cephalic somite (including the somite of the first pair of legs), 61 and 259 μ for the somite of the second pair of legs, 66 and 231 μ for the somite of the third pair of legs, 39 and 198 μ for the somite of the fourth pair of legs, 44 and 99 μ for the somite of the fifth pair of legs, 110 and 121 μ for the genital complex, 50 and 77 μ for the first post-genital somite, 33 and 66 μ for the second post-genital somite, and 30 and 55 μ for the anal somite.

The general shape of the body (fig. 1a, b) is very slender; the anterior part (cephalothorax) is elongated oval; the abdomen is fairly short. The head and the somite of the first pair of legs are fused to form the cephalic somite; this is a fairly long part of the cephalothorax, gradually tapering anteriorly and smoothly rounded in front. There is no trace of a rostrum, neither in dorsal nor in lateral view, but a slightly thickened "lip" is visible on the frontal part of the ventral wall of the cephalon. No rostral hairs have been observed. The tergal parts of the somites of the second, third and fourth pairs of legs in dorsal view appear to be rounded; the coxae and bases of the second to fourth pairs of legs are invisible from above.

The somite of the fifth pair of legs is visible dorsally as a small, rounded somite behind the somite of the fourth pair of legs; it is smaller than both that somite and the genital complex.

The genital somite is 110 μ long and 121 μ wide; no line of fusion is visible dorsally or laterally. The lateral walls have distinct swellings in their anterior part, visible in dorsal view of the complex as rounded protuberances (fig. 2b). In addition a pair of rounded genital flaps is distinctly visible both in dorsal and lateral view. The anal complex and the two post-genital somites have a narrow hyaline posterior border. No anal flap has been observed on the anal somite.

Each furcal ramus is 50 μ long and basally 22 μ wide. There are 5 marginal setae, the position of which is shown in fig. 2c, in addition each ramus has a fine appendicular (dorsal) seta and a spiniform external seta near the articulation with the anal somite. The setae 2 and 3 (fig. 2d) are thickened and lengthened (longest furcal seta 220 μ); seta 5 inserts halfway along the external margin.

The egg sacs are attached to the genital complex under the rounded lateral swellings. They are about as long as the abdomen and contain 6 to 8 large, globular eggs (fig. 1a).

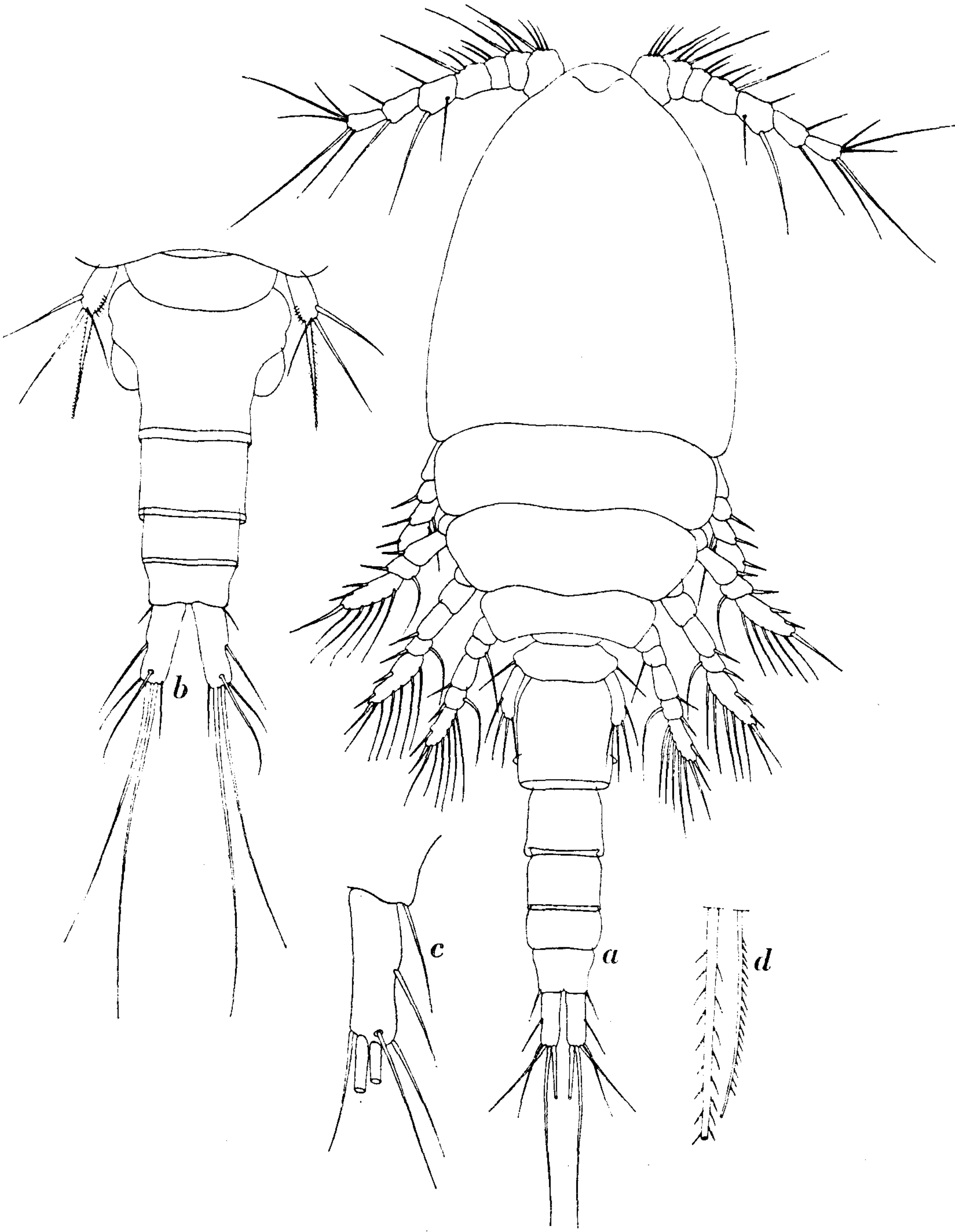

Fig. 2. *Hemicyclops thalassius* nov. spec., Mar del Plata. a, ad. ♂, paratype; b-d, ad. ♀, paratype. a, whole animal, dorsal view; b, abdomen, dorsal view; c, right furcal ramus, dorsal view; d, detail of setae 2 and 3 of furca. a, b, × 175; c, d, × 315.

Fig. 3. *Hemicyclops thalassius* nov. spec., Mar del Plata, ad. ♀, paratype. a, ventral aspect of oral appendages of left side; b, antennule; c, antenna; d, mandible; e, maxillule; f, maxilla; g, maxillipede; h, labrum, labium and paragnaths. a, c-h, × 375; b, × 220.

The antennula (fig. 3b) is 7-segmented; the various segments have the following proportional lengths: segment $\frac{1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7}{16 \quad 17 \quad 9 \quad 12 \quad 17 \quad 14 \quad 15} = 100$. In the living animal they reach slightly beyond the middle of the cephalic somite. The following numbers of setae have been counted: 4 setae on segment 1, 12 on segment 2, 4 on segment 3, 3 on segment 4, 4 on segment 5, 2 on segment 6, 7 on segment 7. Aesthetascs occur on the segments 5 to 7, one being found on each segment. The first segment of the antennula has a longitudinal row of fine spinules.

The antenna is 4-segmented: the segmentation between the third and fourth segments is very indistinct (fig. 3c). Segments 1 and 2 have about the same length; segment 1 with two rows of fine, spiniform hairs along the external margin and a coronula of 4 spines and a spinulose seta at the distal corner of the internal margin. The external margin of segment 2 is smooth, but the internal margin has a coronula of fine spinules, followed by a setiform spine; the upper half of the internal margin has 9 big spines. The third segment has a coronula of large spinules at the external margin; the internal margin has two longitudinal rows of spinules, numbering 6 and 3 respectively; the internal distal angle is strongly produced, though not reaching the level of the apex of segment 4; it bears 3 curved spines, increasing in length apically, and a seta. The median spine is barbed. Segment 4 is more or less squarish; apically it has 5 marginal setae and 2 appendicular setae, one of which is spinulose. In addition there is a small spine or seta at the extreme external angle.

The mandible (fig. 3d) is much reduced and has no palp. It consists of an elongated part, carrying as cutting elements a large, highly sclerotized triangular tooth, a toothed, triangular blade and two haired setae.

The maxillula, as far as could be made out, is a two-lobed structure, carrying on its lobes 5 and 3 setae respectively. Some of the setae, the position of which appears from figure 3e, are spinulose.

The maxilla (fig. 3f) is composed of two segments. The first segment, a large, swollen structure, has two setae along the internal margin, one of which is plumose, the other spinulose. The second segment apparently has resulted from the fusion of at least two segments; apically it carries a large tooth with indistinctly bifurcate apex. There is a strong spine halfway the internal margin of the second segment, which carries a small additional spinule. Furthermore there are two slender spines near the base of the apical spine on the internal border and one spine at that base on the external border. The condition of the apical spine could not be favourably observed, owing to the position of the appendage in our preparations, but a bifurcation is apparent.

The maxillipede (fig. 3g) is 3-segmented; segments 1 and 2 have about the same length. There are 2 spinulose spines or setae almost at the distal end of the internal margin; the second segment has two such spines slightly below the middle of the internal margin. The apical segment may have resulted from the fusion of two small segments. It carries two long, curved spines, one of which is spinulose, and 3 fine and short setae.

The shape of labrum and labium appears best from figure 3h; there are rows of fine hairs and spinules near the middle of the labrum and a row of 9 big spinules along the edge of the labium. The paragnaths are oval structures with a haired internal margin (fig. 3h).

The legs 1 to 4 (fig. 4a-d) are biramous and have 3-segmented exo- and endopodites. The spinal and setal formula is as follows (spines in roman, setae in arabic numerals):

	Endopodite			Exopodite		
	1	2	3	1	2	3
leg 1	1 + 0	1 + 0	5 + I	0 + I	1 + I	6 + II
leg 2	1 + 0	2 + 0	3 + III	0 + I	1 + I	6 + III
leg 3	1 + 0	2 + 0	3 + III	0 + I	1 + I	6 + III
leg 4	1 + 0	2 + 0	V	0 + I	1 + I	5 + III

The external marginal spines of the exopodite of leg 1 have a fine subapical flagellum. All external marginal spines of the exopodites have finely serrated edges. At the apex of the third exopodal segment of the legs 1 and 2 it is difficult to discriminate between spines and setae.

Leg 1 has a distinct spine at the distal corner of the internal basal margin.

The third endopodal segment of leg 4 has 5 distinct spinal elements.

Further details of the legs can be taken from fig. 4 a-d.

The intermediate segment of leg 5 is nearly completely fused with the somite; only a very weak line of fusion is visible. The external corner of the intermediate segment has a nude seta; there are no further spinules. The terminal segment is more or less spatulate, with a rounded, spinulose external margin and an almost straight, spinulose internal margin. There are 3 marginal spines, the position of which appears best from figure 4e, the innermost spine is spinulose. In addition there is a fine, long seta at the external basal corner of the aforementioned spine.

Description of the male. — Total length 740-820 μ (average 755 μ). The description and the figures are based on a paratype of 689 μ with the following measurements: the greatest diameter of the body is 240 μ, the cephalothorax is 391 μ long, the abdomen (into which the fifth thoracic somite has been included) is 286 μ long. The length and breadth measurements of the various somites are: 248 and 209 μ for the cephalic somite (including the somite of the first pair of legs), 55 and 182 μ for the somite of the second pair of legs, 50 and 127 μ for the somite of the third pair of legs, 39 and 116 μ for the somite of the fourth pair of legs, 39 and 77 μ for the somite of the fifth pair of legs, 77 and 63 μ for the genital somite, 39 and 55 μ for the first post-genital somite, 36 and 50 μ for the second post-

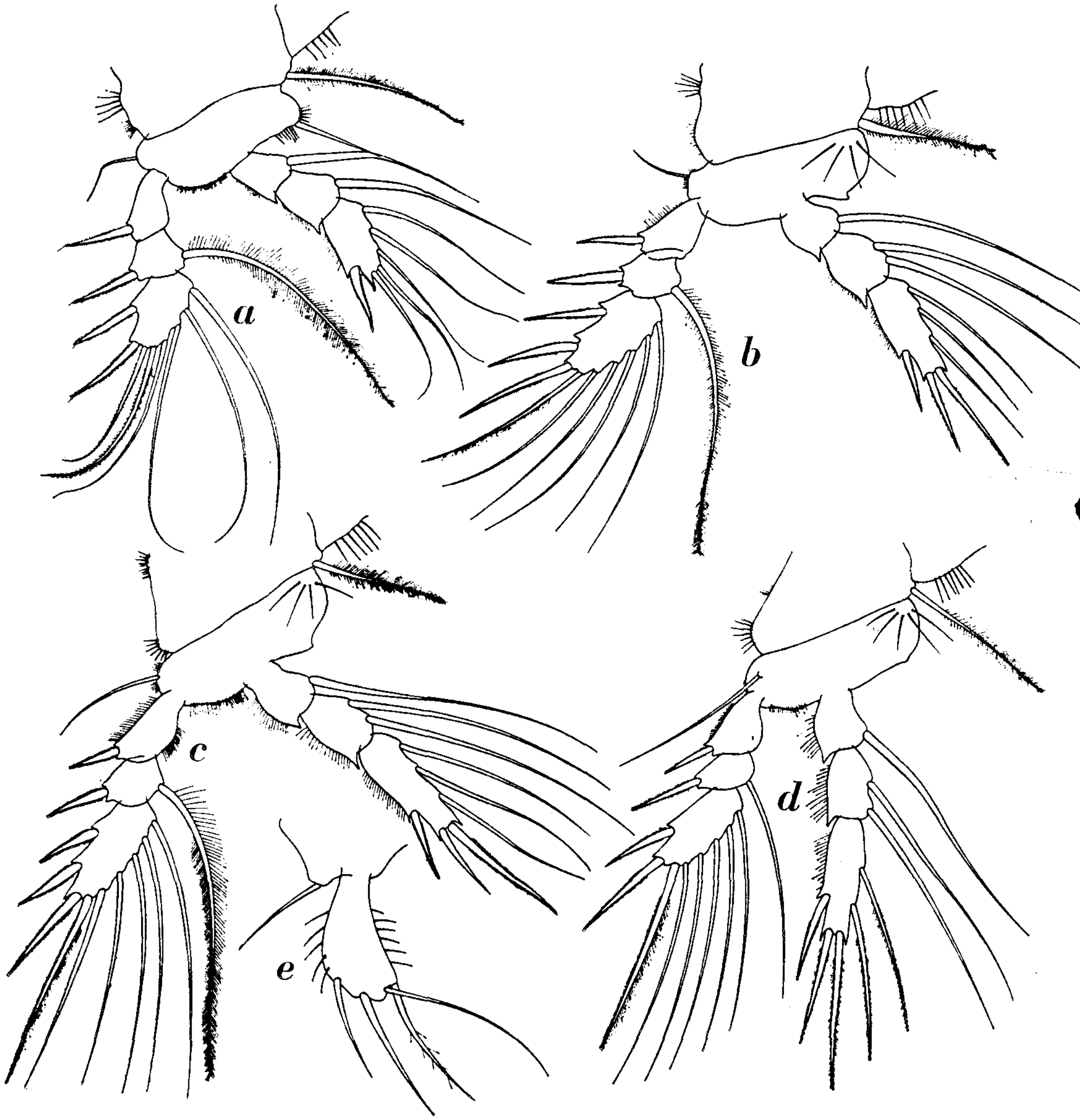

Fig. 4. *Hemicyclops thalassius* nov. spec., Mar del Plata, ad. ♀, paratype. a, leg 1; b, leg 2; c, leg 3; d, leg 4; e, leg 5. a-d, × 220; e, × 250.

genital somite, 28 and 47 μ for the third post-genital somite, and 29 and 44 μ for the anal somite.

The general shape of the body is almost exactly as in the female, but smaller in all details (fig. 2a). The general outline of the cephalothorax is as in the female, but the thickened "lip" at the ventral frontal part of the head is visible in dorsal view through the thin tegument of the head. The somite of the fifth pair of legs is distinctly and completely visible from above; by fusion of the somite with the intermediate segment of leg 5 it has distinct "shoulders". The genital somite is distinctly longer than broad, with slightly vaulted sides (fig. 1c). Ventrally it has a pair of distinct genital flaps, the shape and position of which appears from figure 1d. No hyaline borders have been observed along the distal margins of the genital somite and of the three post-genital somites. No anal flap has been seen on the anal somite; this somite narrows slightly near the insertion of the furca. The furcal rami are 39 μ long and basally 19 μ wide; the longest furcal seta is 138 μ. The setation of the furca is as in the female.

The segments of the antennule (fig. 5a) have the following proportional lengths: segment $\frac{1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7}{16 \quad 15 \quad 7 \quad 14 \quad 19 \quad 15 \quad 14} = 100$.

The following numbers of setae have been counted: 4 setae on segment 1, 12 on segment 2, 4 on segment 3, 2 on segment 4, 2 on segment 5, 2 on segment 6 and 5 on segment 7. Aesthetascs occur on segments 5 to 7, one on each segment.

The antenna (fig. 5c) is slightly smaller than that of the female, the spinules along the internal margin of segment 3 are smaller, but the 3 spines at the apex of the internal corner are very strong.

No differences have been observed in the structure of the oral appendages, with the exception of the maxillipedes, but the apical spine on the second segment of the maxilla is in a better position for observation; the apex is distinctly bifid; one of the parts being acutely pointed, the other curved downwards and rounded (fig. 5d, e).

The maxillipede (fig. 5b) apparently is composed of three segments; the first segment is short and cylindrical; it has a single internal seta. The second segment is strongly swollen and carries two longitudinal rows of fine spinules and a seta. The apical segment, apparently resulting from the fusion of two segments, is a curved claw with smooth margins and a fine, tapering point; it is just as long as the second segment and has a fine seta near its base.

No differences in the setation of legs 1 to 4 have been observed. As mentioned above the intermediate segment of leg 5 is fully fused with the somite; there is a fine seta at the external corner. The free segment is 3 times as long as wide and slightly curved; both margins are smooth. There are three marginal spines, the position of which appears from figure 5g; in addition there is a long spiniform seta. The innermost spine is spinulose.

Of all species of *Hemicyclops* our new species comes closest to *H. bacescui* (Şerban), from which it can, however, be distinguished by the following characteristics:

Fig. 5. *Hemicyclops thalassius* nov. spec., Mar del Plata, ad. ♂, paratype. a, antennule; b, maxillipede; c, antenna; d, ventral aspect of right mandible, maxillule and maxilla; e, tip of maxilla, dorsal view; f, abdomen, lateral aspect from right side; g, leg 5. a, c-e, g, × 525; b, × 500; f, × 100.

H. bacescui	*H. thalassius*
♀ 1520-1810 μ	♀ 810-973 μ
Cephalothorax broad oval; there is a sharp contraction between prosome and urosome.	Cephalothorax elongated oval, the contraction between urosome and prosome is not very distinct.
Genital somite with weak, though distinct line of fusion in its anterior part, not swollen laterally.	Genital complex without line of fusion, anterior part swollen laterally.
Large tooth of maxillar apex deeply bifurcate, with a row of gradually diminishing spinules along main tooth.	Large tooth of maxillar apex bifurcate, both parts smooth.
Rami of furca twice as long as broad, internally haired.	Rami of furca 2.5 times as long as broad, internally nude.
Anal somite ventrally with small teeth along distal border.	Anal somite with distal border smooth.

Key to the females of *Hemicyclops* [3])

1. Segment 1 of antennule with 5 setae. Terminal (fourth segment) of antenna elongated, at least twice as long as wide. Mandible with triangular tooth, a toothed blade, and 1 seta. Large terminal spine of second segment of maxilla simple, not bifurcate. All external marginal spines of exopodites of legs 1-4 with flagellum. Sixth legs present. Genital somite and first post-genital somite always separate; abdomen composed of fifth thoracic somite, genital somite, 3 post-genital somites, anal somite and furca 2

— Segment 1 of antennule with 4 setae. Terminal (fourth) segment of antenna squarish, about as long as wide. Mandible with triangular tooth, toothed blade and 2 setae. Large terminal spine of second segment of maxilla bifurcate, one of the branches may be toothed. External marginal spines of exopodite of leg 1 with flagellum, those of legs 2-4 without flagellum. Sixth legs absent. Genital somite and first post-genital somite may be fused or be separated by a very weak line; abdomen then composed of fifth thoracic somite, genital complex, 2 post-genital somites, anal somite and furca 6

2. Segments 2 and 3 of antenna each with a large, elliptical patch of fine spinules at the inner border. Terminal segment of leg 5 with nude sides *H. arenicolae* Gooding

— Segments 2 and 3 of antenna without patches of small spinules at inner border. Terminal segment of leg 5 with spinules along both margins . . . 3

3. Caudal rami more than four times as long as wide 4

— Caudal rami less than three times as long as wide 5

4. Large species, body more than 2.7 mm long. No keel on ventral body surface in area between maxillipedes and first legs. No projections at base of two outer spines of terminal segment of leg 5 . . . . . . *H. elongatus* C. B. Wilson

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3) *Hemicyclops leggii* (Thompson & A. Scott), of which the male only has been described, is not included.

— Small species, body less than 1.6 mm long. Longitudinal keel present on ventral body surface in area between maxillipedes and first legs. Two outer spines of leg 5 basally with rounded projections . . . . *H. carinifer* Humes

5. Innermost spine and adjacent seta on terminal segment of leg 5 of about equal size. Ventral spine on fourth segment of maxillipede, in addition to terminal setule, with 2 denticules . . . . *H. adhaerens* (Williams)

— Innermost spine on terminal segment of leg 5 shorter than adjacent seta. Ventral spine of fourth segment of maxillipede, in addition to terminal setule, with 3-5 denticules . . . . *H. subadhaerens* Gooding

6. Genital complex greatly widened, wider than long, with strongly swollen, rounded sides. Genital somite and first post-genital somite completely fused. One of the setae on the produced end of the third antennal segment unusually long, recurved and fringed with hairs . . . . *H. amplicaudatus* Humes

— Genital complex not greatly widened; if wider than long, it has a distinct demarcation between genital and first post-genital somites. Produced end of third antennal segment with 1 or 2 short spines and 2 or more normally developed, curved setae 7

7. Caudal rami as long as wide, as long as anal somite 8

— Caudal rami 1.5-4 times as long as wide, longer than anal somite 10

8. Genital somite and first post-genital somite separate; proximal part of genital somite with strongly produced sides . . . *H. tamilensis* (Thompson & A. Scott)

— Genital complex composed of completely fused genital and first post-genital somites; sides of complex not produced but smoothly rounded 9

9. Third expodal segment of leg 1 with 4 setae and 4 spines. Basal segment of maxilla with one seta. Terminal segment of maxillipede with 2 claws and 2 setae. Length 1.9 mm . . . . *H. intermedius* Ummerkutty

— Third exopodal segment of leg 1 with 6 setae and 2 spines. Basal segment of maxilla with 2 setae. Terminal segment of maxillipede with 4 setae and 2 claws. Length 1.15 mm . . . . *H. australis* Nicholls

10. Seta on basal segment of leg 5 greatly lengthened, at least 2.5 times as long as flanking spines 11

— Seta on basal segment of leg 5 normally developed, as long as or 1.5 times as long as flanking spines 12

11. Last segment of maxillipede with large, smooth claw, reaching middle of first maxillipedal segment . . . . *H. cylindraceus* (Pelseneer)

— Claw on terminal segment of maxillipede spinulose, with small spine at its base and not reaching beyond articulation between segments 1 and 2 of maxillipede . . . . *H. livingstoni* (T. Scott)

12. Produced part of third antennal segment moderately developed, scarcely reaching beyond articulation between third and fourth antennal segments, bearing 1 or 2 setiform spines and 2 setae 13

— Produced part of third antennal segment strongly developed, reaching at least the middle of terminal segment and bearing one or more strong, curved spines and 2 or more setae 15

13. Caudal rami nearly 5 times as long as wide. Genital somite and first post-genital somite separate . . . . *H. diremptus* Humes

— Caudal rami 1.5-2 times as long as wide. Genital somite and first post-genital somite either separate or fused 14

14. Genital complex composed of fused genital somite and first post-genital somite, forming an elongated structure, with proximal parts of sides smoothly rounded . . . . *H. purpureus* Boeck

— Genital somite separate from first post-genital somite, much broader than long, with latero-caudally directed, obtuse points. . . *H. aberdonensis* (T. & A. Scott)

15. Convex internal border of second antennal segment with scales; concave internal border of third antennal segment with short, knob-like spinules. Terminal part of third antennal segment greatly produced, reaching far beyond apex of segment 4, bearing 2 recurved, apical spines . . . . . *H. acanthosquillae* Humes
— Inner surfaces of segments 2 and 3 of antenna smooth or with fine spinules; no scales are present. Produced part of segment 3 moderately long, reaching apex of segment 4 16
16. Terminal segment of leg 5 more or less oval, with rounded sides . . 17
— Terminal segment of leg 5 elongate, at least one of its sides straight . . 18
17. Terminal segment of leg 5 broadly oval *H. viscndus* Humes, Cressey & Gooding
— Terminal segment of leg 5 with narrowed basal portion, shaped like a petal . . . . *H. kombensis* Humes
18. Furca 3 times as long as wide . . . . . *H. thysanotus* C. B. Wilson
— Furca 2-2.5 times as long as wide 19
19. Third exopodal segment of leg 1 with 7 setae and 1 spine 20
— Third exopodal segment of leg 1 with 4 setae and 4 more or less distinct spines 21
20. Somite bearing leg 5 with setiform process near articulation with intermediate segment of leg 5. Terminal segment of leg 5 2.5 times as long as wide . . . . *H. biflagellatus* Humes
— No setiform process on the somite bearing leg 5. Terminal segment of leg 5 1.5 times as long as wide . . . . *H. axiophilus* Humes
21. Body slender, without distinct contraction between prosome and urosome. Genital complex with anteriorly smoothly rounded sides Anal somite ventrally with smooth distal margin . . . . *H. thalassius* nov. spec
— Prosome broad, body with sharp contraction between prosome and urosome. Genital complex with faint line of fusion in anterior part, not swollen laterally. Anal somite ventrally with denticules along distal margin . . . *H. bacescui* (Şerban)

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