

# A NEW SPECIES OF *Halicyclops* (Copepoda, Cyclopoida, Halicyclopinae) FROM AN ESTUARINE SYSTEM OF THE CARIBBEAN COAST OF COLOMBIA

## Una nueva especie de *Halicyclops* (Copepoda, Cyclopoida, Halicyclopinae) de un sistema estuarino de la Costa Caribe de Colombia

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### ABSTRACT

Plankton samples obtained from the Ciénaga Grande de Santa Marta, an extensive estuarine system in northern Colombia, yielded adult male and female specimens of an undescribed halicyclopine cyclopoid copepod of the genus *Halicyclops*. Cyclopoid copepods are frequently found in freshwater and transitional habitats. Members of the subfamily Halicyclopinae are chiefly brackish water forms with a few freshwater species. The new species described herein is assignable to the group of species “F” of *Halicyclops* (*sensu* Pesce, 2018) with a 2333 exopodal spine formula. Currently, this group contains five species and one subspecies. *Halicyclops gutierrezzi* sp. n. can be distinguished from its known congeners by the absence of an anal operculum, the relative length of setae of the female and male P5, the relative length of the inner setae of P4EXP3, and details of the male antennule. This is the fifth species of *Halicyclops* recorded from Colombia and the first one of *Halicyclops* group “F” described from the Caribbean region. With the addition of *H. gutierrezzi* sp. n., the number of species of the genus known from the Neotropics increased to 20. A key to the species of the genus recorded in Colombia is also provided.

**Keywords:** Microcrustaceans, Mangroves, microcrustaceans, shallow water, taxonomy, zooplankton.

### RESUMEN

Muestras de plancton obtenidas de la Ciénaga Grande de Santa Marta, un extenso sistema estuarino en el norte de Colombia, produjeron especímenes machos y hembras de una especie no descrita del género *Halicyclops*. Los copépodos de la familia Cyclopidae son dominantes en los hábitats de agua dulce y transicionales. Los miembros de la subfamilia Halicyclopinae son predominantemente de hábitats salobres, con algunas especies de agua dulce. La nueva especie aquí descrita es asignable al grupo de especies denominado “F” de *Halicyclops* (*sensu* Pesce, 2018) con una fórmula de espinas exopodales (P1–4) = 2333. Actualmente, este grupo contiene cinco especies y una subespecie. *Halicyclops gutierrezzi* sp. n. puede distinguirse de sus congéneres conocidos por la ausencia de un verdadero opérculo anal, la longitud relativa de las setas de la P5 de la hembra y del macho, la longitud relativa de las setas internas de P4EXP3 y por detalles de la anténula del macho. Esta es la quinta especie de *Halicyclops* registrada en Colombia y la primera del grupo “F” de *Halicyclops* descrita en la cuenca del Caribe. Con la adición de *H. gutierrezzi* sp. n., aumentó a 20 el número de especies del género que se conocen en la región Neotropical. Se proporciona una clave para la identificación de las especies del género registradas en Colombia.

**Palabras clave:** Microcrustáceos, mangles, agua poca profunda, taxonomía, zooplancton.

## INTRODUCTION

The cyclopoid copepod Subfamily Halicyclopinæ Kiefer, 1927 currently comprises six genera: *Halicyclops* Norman, 1903, *Neocyclops* Gurney, 1927; Petkovski, 1986, *Troglocyclops* Rocha and Iliffe, 1994, *Colpocyclops* Monchenko, 1977, *Sergiosmirnovia* Monchenko, 2007, and *Prehendocyclops* Rocha, Iliffe, Reid and Suárez-Morales, 2000. *Halicyclops* is the most diverse halicyclopine genus; it contains over 101 valid species (Walter and Boxshall, 2017) with a worldwide distribution (Boxshall and Defaye, 2008; Pesce, 2018). In the Americas, 33 species have been recorded, and up to 19 have been known to occur in the Caribbean region (Reid, 1990; Fiers, 1995; Rocha *et al.*, 1998). The highly diverse Brazilian coast is known to harbor at least ten different species (Rocha, 1983a, Rocha, 1983b; Rocha, 1984; Lotufo and Rocha, 1993). Only four species are known from the United States Gulf Coast (Rocha and Hakenkamp, 1993), five species from Central America, and the Caribbean (Herbst, 1987; Reid, 1990; Fiers, 1995), including a record of *H. exiguus* Kiefer, 1934 from Costa Rica (Collado *et al.*, 1984, Morales-Ramírez *et al.*, 2014) and three from anchialine caves in Bermuda (Rocha and Iliffe, 1993).

In Colombia the records of this genus are scarce, up to now only four species have been recorded in the country, all of them from the northern sector of Colombia, along the Caribbean coast: *H. venezuelaensis* Lindberg, 1954, *H. exiguus* Kiefer, 1934, *H. gaviriai* Suárez-Morales and Fuentes-Reinés, 2014, and *H. hurlberti* (Fuentes-Reinés *et al.*, 2013; Suárez-Morales and Fuentes-Reinés, 2014; Fuentes-Reinés and Suárez-Morales, 2015; Fuentes-Reinés and Suárez-Morales, 2018).

During a survey of the plankton community of the Ciénaga Grande de Santa Marta, Colombian coast of the Caribbean, female and male specimens of an undescribed species of *Halicyclops* were collected. In this work, we describe this new species and compare it with its closest congeners. A key to the known species of Pesce's (2018) group "F" is also provided.

## MATERIALS AND METHODS

Plankton samples were taken monthly from the Ciénaga Grande de Santa Marta, Colombia (10° 52' 11.25" N and 74° 19' 31.64" W) from July 2018, mainly in the littoral areas with vegetation (mangrove) but also from open water. The water salinity was measured with a WTW 3111<sup>®</sup> conductivity meter. Water samples were collected using a 25 L bucket at both vegetation areas and shallow open water. Samples were filtered with a zooplankton net (45 µm) and then preserved in 70 % ethanol. Copepods were sorted from the original samples and then processed for taxonomical identification. Dissected specimens and appendages were mounted in glycerine and sealed with Canada balsam. Drawings of the mounted appendages were prepared with a drawing tube adapted to an E-200 Nikon compound microscope.

The specimens were measured in lateral a position, from the anterior end of the rostral area to the posterior margin of the caudal rami. The specimens examined were deposited at the Museo de Colecciones Biológicas at the Universidad del Atlántico (UARC), Colombia. Morphological terminology follows Huys and Boxshall (1991). The following abbreviations are used in the description: P1–P6 = first to sixth swimming legs, EXP = exopod, ENP = endopod.

## RESULTS

### Taxonomy

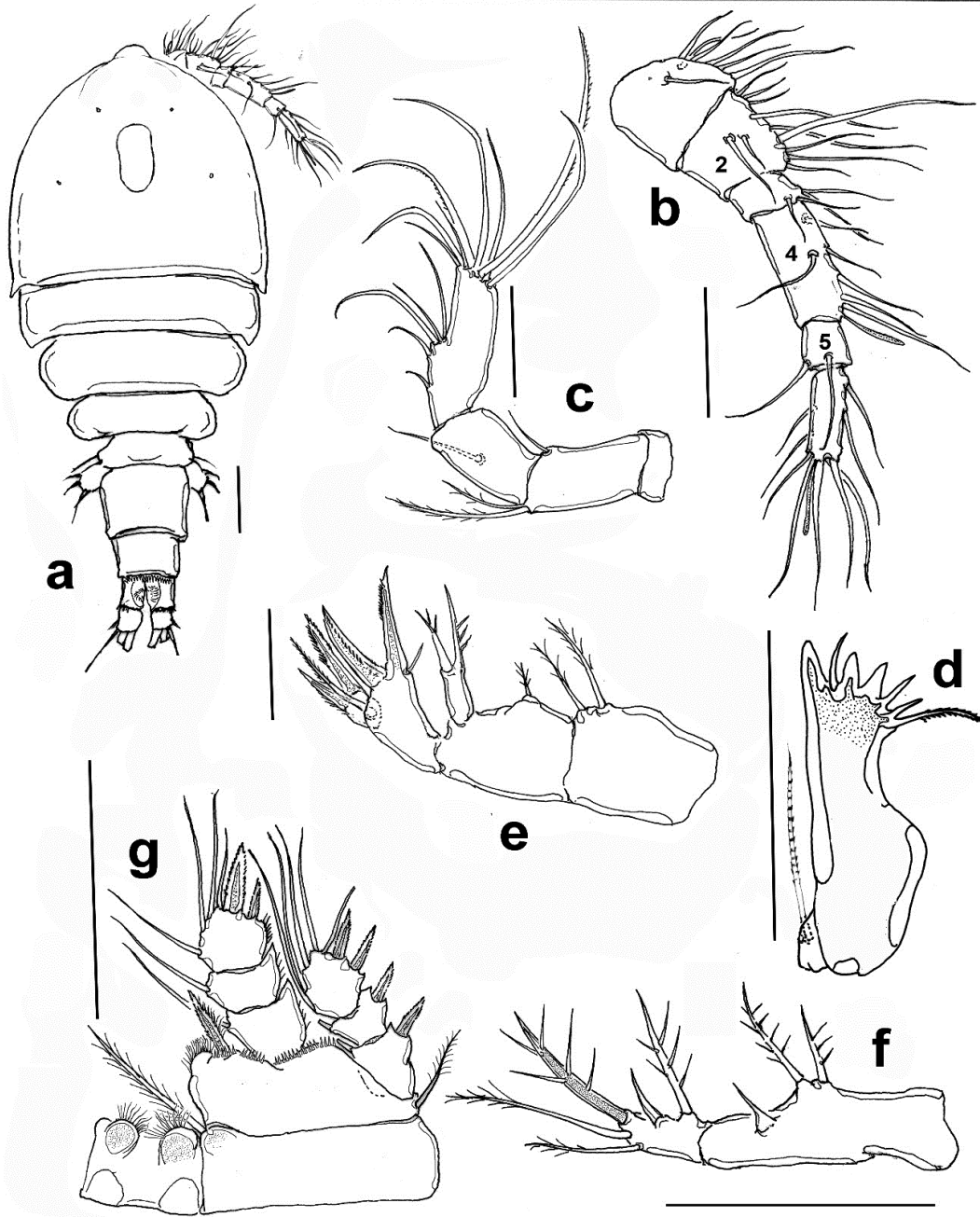
Order Cyclopoida Burmeister, 1834  
 Family Cyclopidae Dana, 1846  
 Subfamily Halicyclopinæ Kiefer, 1927  
 Genus *Halicyclops* Norman, 1903  
*Halicyclops gutierrezzi* sp. n.  
 Figures 1-4

**Material examined.** Adult female holotype (UARC333M), and adult male allotype (UARC1157-1164), both partially dissected. Ciénaga Grande de Santa Marta, littoral plankton sample, coll. Juan M. Fuentes-Reinés. Paratypes: three adult females, undissected, ethanol-preserved, vial (UARC334M), plus one dissected female and male, each mounted on slides (UARC344-UARC352M, UARC1165-UARC1172).

**Type locality.** Ciénaga Grande de Santa Marta, Magdalena, northern Colombia (10° 52' 11.25" N; 74° 19' 31.64" W).

**Description of female.** Body robust, cephalothorax widest at first pedigerous somite in dorsal view (Fig. 1a, rostrum subtriangular, wide-based, with rounded apex (Fig. 4a). Body length, excluding caudal setae: 588–616 µm (average = 594 µm, n = 7). Labrum represented by widely rounded plate ornamented with marginal rows of spinules at both sides of medial teeth (Fig. 4b).

Cephalosome with relatively small, an oblong integumental window on dorsomedial position (Fig. 1a). Genital double-somite subquadrate, with an arc-shaped row of five integumental pores plus single medial one on the ventral surface (Fig. 2b, arrowed). Genital double-somite as long as wide with small rounded integumental window on each side of posterior half (Fig. 2a); margins of double-somite straight, smooth, lacking processes. Ventral surface of genital double-somite and succeeding two urosomites (Fig. 2a) with finely denticulate hyaline frill on posterior margins; seminal receptacle with short, slightly curved arms and medial pore (Fig. 2b). Ventral surface of anal somite with pair of "π" symbol-shaped cuticular scars on anterolateral position (arrows in Fig. 2c) and a row of spinules along with insertion of caudal rami (Fig. 2c). Dorsal posterior margin of the fourth



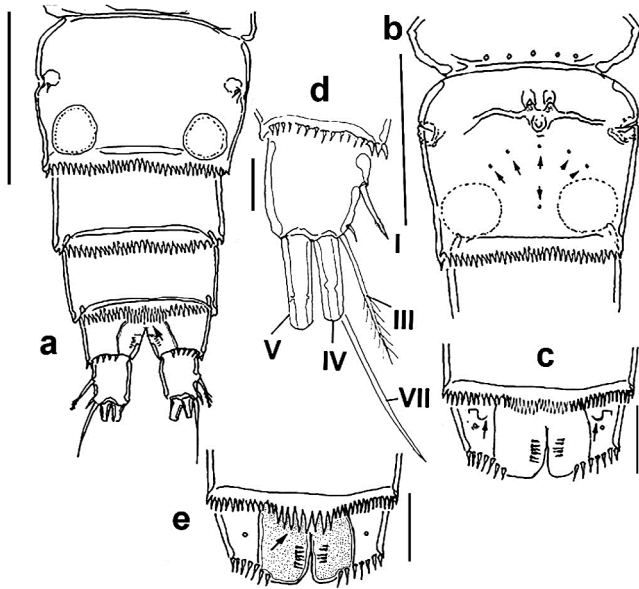
**Figure 1.** *Halicyclops gutierrezzi* sp. n., adult paratype female from northern Colombia. **a.** habitus, **b.** antennule, **c.** antenna, ventral, **d.** mandible, **e.** Maxilla, **f.** maxilliped, **g.** P1. Scale bars: a-g= 50  $\mu$ m.

urosomite with a hyaline fringe of denticles; medial denticles relatively more extended than the rest of row, forming a weak pseudo-operculum (arrowed in Fig. 2e).

Caudal ramus subquadrate, about 1.1 times as long as wide (Fig. 2d), outer seta III slightly more extended than ramus (1.1 times as long as ramus), apical seta V 1.7 times as long as seta IV, latter caudal seta with heteronomous ornamentation, inner margin spinulated, outer margin furnished with setules. Dorsal, caudal seta (VII) 2.5 times as long as ramus.

Antennule six-segmented, setal formula as follows, s=setae, sp = spine, ae =aesthetasc: 1(8 s), 2(12 s), 3(5 s + sp), 4(7 s), 5(2), 6(10 + ae); fourth segment about 2.8 times as long as wide (Fig. 1b). First segment with row of small spinules.

Antenna four-segmented, with short, unarmed coxa; basis with one plumose and one spinulose seta at the inner corner; short seta representing antennary EXP present. ENP two-segmented. Proximal endopodal segment about half as long as the distal segment, armed with a seta on middle inner margin. Terminal segment of ENP furnished with one



**Figure 2.** *Halicyclops gutierrezzi* sp. n., adult female paratype from northern Colombia. **a.** urosome, ventral, **b.** genital double-somite with pores (arrowed). Ventral view, **c.** anal somite, ventral view, with  $\pi$ -shaped scars (arrows), **d.** caudal ramus with caudal setae I-VII. **e.** anal somite, dorsal view, showing pseudo-operculum (arrow). Scale bars: a, b= 50  $\mu$ m, c, e= 25  $\mu$ m: d= 15  $\mu$ m.

proximal and one subdistal row of spines, armed with five inner setae and seven unequally long apical setae. Length/width ratio of second ENP segment = 3.1 (Fig 1c).

Mandible with well-developed coxal gnathobase, armed with five long teeth, innermost tooth being strongest, accompanied by short seta inserted on the narrow diastema. Dorsal pinnate seta present. Palp reduced, represented by one lightly pinnate seta inserted on small protuberance (Fig. 1d).

Maxillule as usual in the genus, with praecoxal arthrite bearing four strong medial claw-like spines, coxa with two short smooth setae and short medial spine. Palp 2-segmented, first segment armed with one spiniform, one pinnate and one naked inner setae, plus one outer spiniform seta representing EXP. Distal segment representing ENP armed with three naked setae (Fig. 4c).

Maxilla 4-segmented, comprising praecoxa, coxa, basis, and one-segmented endopod. Praecoxa with two endopodal setae. Coxa with a short single seta in proximal half. Basis with two strong unipinnate claw-like basal spines and additional short, slender seta; proximal claw-like element clearly longer than succeeding claw. Palp one-segmented, armed with three robust spines (Fig. 1e).

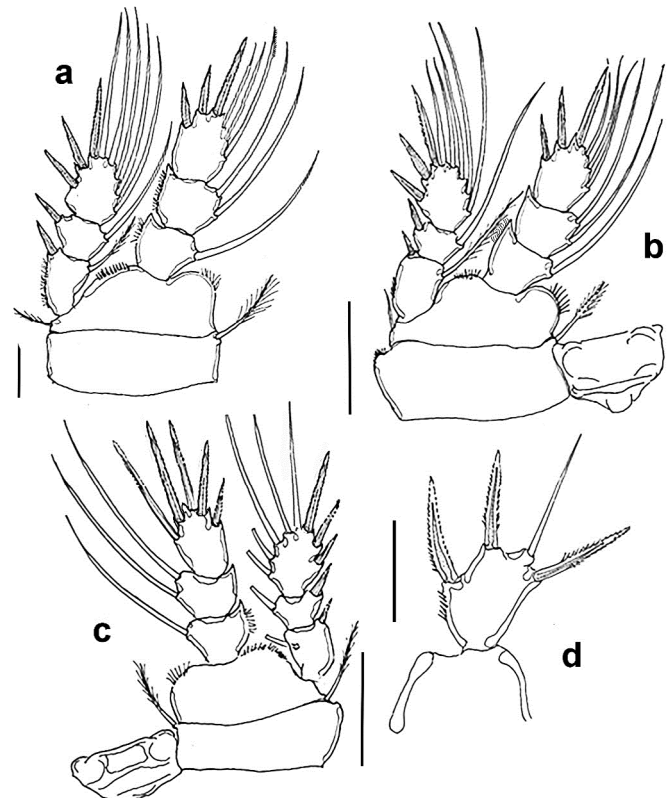
Maxilliped two-segmented, comprising protopod and ENP. Protopod with three spiniform setae, middle one being 1.3 times as long as proximal seta. ENP was bearing five setae comprising two inner, one apical spiniform seta furnished with few strong setules, and two outer subapical slender setae (Fig. 1d).

P1-P4 exopod and endopod three-segmented (Figs. 1g, 3a-c), armed as in Table 1. Intercoxal sclerite of P1 hairy on the rounded protuberances on posterior margin; basis with a row of long spinules along distolateral margin on the anterior side. Inner basipodal spine stout, reaching 1/3 of the second endopodal segment of P1 (Fig. 1g). EXP/inner spines of P1 basis ratio = 2.21. P2-P4 coxa and intercoxal sclerite smooth, P2-P3 like each other (Figs. 3a, b). P4ENP3 about 1.4 times as long as wide with three pinnate spines and two inner lateral setae, inner apical spine 1.28 times as long as segment and 1.4 times as long as the outer apical spine. Inner lateral spine 1.6 times as long as segment (Fig. 3c).

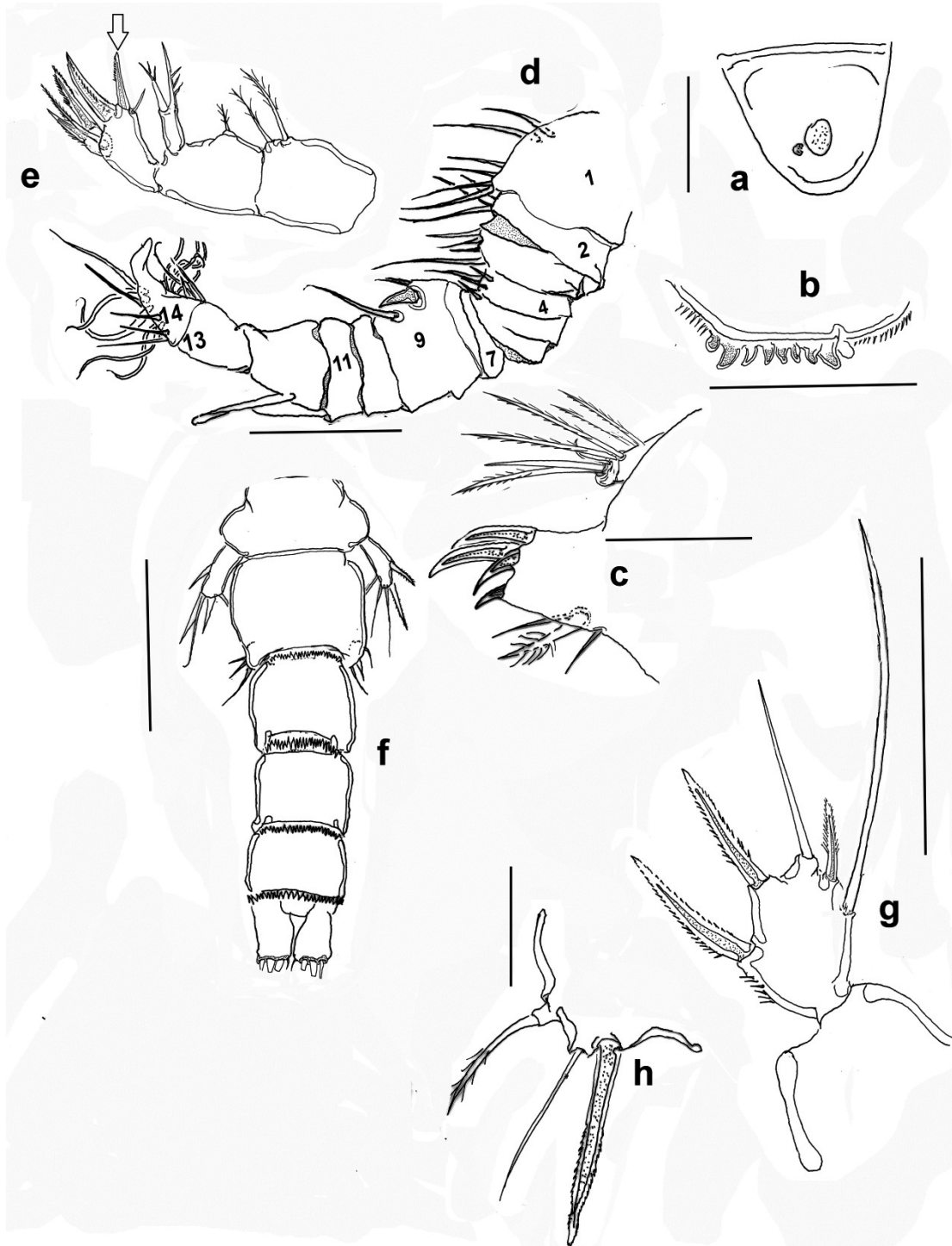
P5 EXP segment subrectangular (Fig. 3d), about 1.53 times as long as wide, armed with three spines, outer and

**Table 1.** Legs 1-4 setal armature of *Halicyclops gutierrezzi* sp.n. (Roman numerals indicating spines, Arabic numerals representing setae).

	Exopod	Endopod
P1	I-1; I-1; II,1,1,3	0-1;0-1;I,II,3
P2	I-1; I-1;II,1,1,4	0-1;0-2; I,II,3
P3	I-1; I-1;II,1,1,4	0-1;0-2; I,II,3
P4	I-1;I-1;II,1,1,4	0-1;0-2;I,II,2



**Figure 3.** *Halicyclops gutierrezzi* sp. n., adult female paratype from northern Colombia. **a.** leg 2, **b.** leg 3, **c.** leg 4, **d.** leg 5. Scale bars: a-d= 50  $\mu$ m.



**Figure 4.** *Halicyclops gutierrezii* sp. n., adult female paratype from northern Colombia. **a.** rostrum, **b.** labrum, **c.** maxillule. Adult male allotype; **d.** antennule, **e.** maxilla, **f.** urosome, dorsal, **g.** leg 5, **h.** leg 6. Scale bars: a= 10 µm, b, c-h=50 µm.

inner distal spines as long as segment, medial spine shorter than segment, plus one flexible seta about 1.35 times as long as segment; relative length of elements from inner to outer margin as follows 0.71, 1.0, 0.65, 0.71.

Male. Habitus as in female, relatively slender. Body length, excluding caudal setae: 476–504 µm (average = 490 µm;

$n = 3$ ). Both antennules typically geniculate, 14-segmented (Fig. 4d), geniculation between segments 12 and 13, with aesthetasc on segments 1, 4, 9, 11, 13, and 14. Antenna, maxilla, maxillule, mandible, and maxilliped as in female except for proximal basal claw-like element of the maxilla being shorter than the second one (Fig. 4e, shorter claw

arrowed), the opposite pattern occurs in the female in which the proximal claw is longer. (see Fig. 1e). Urosome with six somites as in female but denticle fringes on posteroventral margins of urosomites weaker than in female (Fig. 4f). Caudal rami and P1-P4 as in female. P5 exopod (Fig. 4g) subrectangular, about 1.5 as long as wide, bearing three spines and two setae, relative length of elements from inner to outer margin as: 1.0, 0.33, 0.83, 0.53, 0.4.

P6 (Fig. 4h) represented by small plate armed with three elements: one long inner serrate spine and two slender setae.

**Etymology.** The species is named after Dr. José Manuel Gutiérrez Salcedo for his work on Colombian copepods and his leadership in the formation of new generations of planktologists.

## DISCUSSION

Karanovic (2006) divided the genus *Halicyclops* into two subgenera considering the number of inner setae on the male P5: *Rochacyclops* Karanovic, 2006, with two inner setae and *Halicyclops* s. str., with one inner seta. The new species, *H. gutierrezii* and all known species of this genus in Colombia belong to the latter subgenus.

Additionally, *Halicyclops* species have been separated into eight morphological groups according to their P1–P4 EXP3 spine formula (see Pesce, 2018). Among them, *Halicyclops gutierrezii* sp. n. is clearly a member of group “F” which includes all species with a 2333 spine formula. Currently, this small group contains five species and two subspecies: *H. (H.) canui* Lindberg, 1941; *H. (H.) brevispinosus brevispinosus* Herbst, 1952; *H. (H.) brevispinosus meridionalis* Herbst, 1953; *H. (H.) pusillus* Kiefer, 1956; *H. (H.) tageae* Lotufo and Rocha, (1993), and now *H. (H.) gutierrezii* sp. n. The three former species are poorly described and in need of redescription.

*Halicyclops gutierrezii* most closely resembles *H. canui* described from India. Both of them bear long spines and seta in the female P5EXP, but they can be separated by 1) the presence of a strong lateral process in the genital double-somite in *H. canui* (Lindberg, 1941, Fig. 1b); such a process is absent in the new species, with a genital double-somite having straight, smooth lateral margins (Fig. 2a), 2) in *H. gutierrezii* the inner setae of P4ENP3 are longer than the segment (Fig. 3c) whereas in *H. canui*, they are shorter than the bearing segment (Lindberg, 1941, Fig. 1d), 3) the integumental windows on the posterior genital double somite are present in *H. gutierrezii* (Fig. 1a) but absent in *H. canui* (Lindberg, 1941, Fig. 1b). Unfortunately, the male of *H. canui* remains unknown (Lindberg, 1941) and it could not be compared with the male of the new species from Colombia.

*Halicyclops brevispinosus brevispinosus* described from Germany resembles *H. gutierrezii* in several characters: 1) the lack of lateral process on the genital double-somite and the length of the inner setae of P4ENP3, longer than the

segment. *Halicyclops gutierrezii* can be distinguished from *H. b. brevispinosus* by several characters: 1) the inner apical spine of P4ENP3 is longer than the adjacent inner lateral spine in *H. gutierrezii* (Fig. 3c) whereas in *H. b. brevispinosus* the opposite condition occurs (Herbst, 1952, taf. 20 q); 2) in *H. b. brevispinosus* all three spines on the female P5EXP are clearly shorter than the segment (Herbst, 1952, taf. 20r) whereas in *H. gutierrezii* they are either as long as the segment, or longer (Fig. 3d), 3) the two outer spines on the male P5 of *H. b. brevispinosus* (Herbst, 1952, taf. 20s) are shorter than the segment, thus diverging from the longer inner spines of *H. gutierrezii*; both are as long as the EXP (Fig. 4g), 4) the male P6 of *H. b. brevispinosus* has an inner spine that is shorter than the outer seta (Herbst, 1952, taf. 20t) whereas in *H. gutierrezii* the inner spine is longer than outer seta (Fig. 4h).

*Halicyclops brevispinosus meridionalis*, from the North Sea, resembles *H. gutierrezii* in the length/width ratio of the female fourth antennular segment: both species diverge in: 1) length/width ratio of caudal rami; it is subquadrate, about as long as wide in *H. gutierrezii* (Fig. 2d) vs. rectangular (length/width ratio = 1.5 in *H. b. meridionalis* (Herbst, 1953, taf. 31, Abb. p), 2) the lateral inner seta of P4ENP3 surpasses the inner apical spine in *H. gutierrezii* (Fig. 3c), whereas this element is shorter in *H. b. meridionalis* (Herbst, 1953, taf. 13, Abb. r), 3) the spines on female P5EXP are shorter than the segment in *H. b. meridionalis* (Herbst, 1953, taf. 31, Abb. s) whereas in *H. gutierrezii* they are equally long or longer than the P5 segment (Fig. 3d), 4) In the male *H. b. meridionalis* the two outer spines on P5 are relatively shorter (Herbst, 1953, taf. 31, Abb. t) than the corresponding spines of *H. gutierrezii* (Fig. 4g).

*Halicyclops pusillus*, described from Madagascar, resembles *H. gutierrezii* in having the inner setae of P4ENP3 longer than the segment but they can be distinguished by several characters: 1) the length/width ratio of the female fourth antennular segment (about 1.6 in *H. pusillus*) (Kiefer, 1956, Fig. 9) vs. 2.1 in *H. gutierrezii* (Fig. 1b), 2) the spines of the female P5EXP are shorter than the segment in *H. pusillus* (Kiefer, 1956, Fig. 11) whereas they are longer in *H. gutierrezii* (Fig. 3d), 3) the distal inner seta of P4ENP3 overpasses the inner apical spine in *H. gutierrezii* (Fig. 3c) whereas in *H. pusillus* it is shorter (Kiefer, 1956, Fig. 10), 4) the two outer spines and the inner seta of male P5 of *H. gutierrezii* (Fig. 4g) are relatively longer than in *H. pusillus* (Kiefer, 1956, Fig. 13), 5) in *H. pusillus* the male P6 has an inner spine about 2.2 times as long as the outer spine (Kiefer, 1956, Fig. 14) vs. 1.6 in *H. gutierrezii* (Fig. 4h).

*Halicyclops tageae*, described from Brazil, resembles *H. gutierrezii* in sharing the length and insertion of the inner basal spine of P1. They can be separated by: 1) the length/width ratio of the female fourth antennular segment (about 2.1 in *H. gutierrezii*) (Fig. 1b) vs. 3.3 in *H. tageae* (Lotufo and Rocha, 1993) the number of inner setae in P2ENP2, *H. tageae* bears one inner seta (Lotufo and Rocha, 1993, Fig. 11) vs. two inner setae in *H. gutierrezii* (Fig. 3a), 3) the spines on the female P5EXP are shorter than the segment in *H. tageae*

(Lotufo and Rocha, 1993) whereas in *H. gutierrezii* they are longer or as long as segment (Fig. 3d), 4) the inner distal seta of P4ENP3 is longer than the segment in *H. gutierrezii* (Fig. 3c), whereas in *H. tageae* the same element is shorter (Lotufo and Rocha, 1993) the distal inner seta of P4ENP3 is longer than the inner apical spine in *H. gutierrezii* (Fig. 3c), whereas it is shorter in *H. tageae* (Lotufo and Rocha, 1993, Fig. 13), 6) the posterior margin of the genital double-somite and succeeding urosomites are more strongly denticulate in *H. gutierrezii* (Fig. 2a) than in *H. tageae*, 7) the male P5 of *H. gutierrezii* bears five setal elements (Fig. 4g) vs. four in *H. tageae* (Lotufo and Rocha, 1993). In *H. tageae* the male P6 the inner spine is as long as the outer seta (Lotufo and Rocha, 1993) whereas in *H. gutierrezii* the same spine is about 1.6 times as long as the outer seta (Fig. 4h), 9) the male antennule is 14-segmented in *H. gutierrezii* (Fig. 4b) vs. 13-segmented in *H. tageae* (Lotufo and Rocha, 1993).

### Distribution and ecology

*Halicyclops gutierrezii* sp. n. is currently known from a single locality only, the protected coastal system of Ciénaga Grande de Santa Marta, Colombia. This large lagoon is a shallow water body (depth 0.5-1.5 m), its temperature varies seasonally from 30 to 31.3 °C; pH values during our sampling was 8.9, salinity = 15 PSU and dissolved oxygen = 7.86 mg/L. In the surveyed area *H. gutierrezii* sp. n. was recorded among mangrove.

### CONCLUSIONS

In this contribution, we described the sixth known species of *Halicyclops* belonging to group “F” (see Pesce, 2018). This species can be confused with other congeners of group “F” in the region, but it can be distinguished by some important characters including the length/width ratio of the female caudal ramus, the lack of a lateral processes on the genital double-somite, the relative size of the setal elements of P4ENP3, the number of segments of the male P5, the size and shape of the cephalothorax integumental windows, the details of the male and female P5 setation pattern, the number of inner setae in P2ENP2, and the number of segments of the male antennule. This is the fifth species of the genus recorded in Colombia; this finding also increases the total number of species of *Halicyclops* known in the Caribbean Sea and the Neotropics.

### Key to the species of *Halicyclops* from Colombia

- 1A spine formula (outer spines on P1-P4EXP3) 2-3-3-3 ..... *H. gutierrezii* sp. n.
- 1B spine formula 3-4-4-3 ..... 2
- 2A Genital double-somite with triangular lateral protuberances, ventral surface of urosomites ornamented with denticles..... *H. venezuelaensis* Lindberg, 1954

- 2B Genital double-somite without protuberances, ventral surface of urosomites smooth ..... 3
- 3A Length/width ratio of terminal segment of antennary ENP about 3.0; P4ENP3 with distal inner seta not surpassing tip of inner apical spine, caudal rami as long as wide..... *H. exiguus* Kiefer, 1934
- 3B. Length/width ratio of terminal endopodal segment of antenna lower than 3.0; P4ENP3 with distal inner seta surpassing tip of inner apical spine; caudal rami 1.2 – 1.4 times as long as wide .....4
- 4A Inner basipodal spine of P1 reaching at least midlength of P1ENP2; EXP P5 with the three spines longer than segment; distal inner spine of P4ENP3 clearly thicker than apical spines..... *H. hurlberti* Rocha, 1991
- 4B Spine inserted at inner corner of P1 basis reaching distal margin of ENP2; EXP P5 with the three spines shorter than segment, distal inner spine of P4ENP3 as thick as apical spines ..... *H. gaviirai* Suárez-Morales and Fuentes-Reinés, 2014.

### CONFLICT OF INTEREST

Authors declare that they have no conflict of interest

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