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**A NEW SPECIES OF *HEMICYCLOPS* (CRUSTACEA, COPEPODA,
POECILOSTOMATOIDA, CLAUSIDIIDAE) ASSOCIATED WITH
HERMIT CRABS IN CURAÇAO**

by

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ABSTRACT

STOCK, J.H. 1992. A new species of *Hemicyclops* (Crustacea, Copepoda, Poecilostomatoida, Clausidiidae) associated with hermit crabs in Curaçao. *Stud. Nat. Hist. Caribbean Region* 71, Amsterdam 1992: 69-78.

Hemicyclops geminatus n. sp. is described from the upper infralittoral zone of Curaçao (Antilles). It is a regular associate of three species of hermit crabs: *Calcinus tibicen*, *Paguristes grayi*, and *Dardanus venosus*. The new taxon appears to be a twin species of *Hemicyclops columnaris* HUMES, 1984, an associate of a stony coral off the Pacific coast of Panamá.

Key words: *Hemicyclops geminatus* n. sp., Copepoda, hermit crabs, Curaçao.

INTRODUCTION

At present the genus *Hemicyclops* Boeck, 1873 (poecilostomatous Copepoda of the family Clausidiidae) counts 29 species. In a review of the genus, VERVOORT & RAMIREZ (1966) consider 23 species as valid, thus neither 22 (HUMES 1984; BOXSHALL & HUMES 1987), nor 27 (Ho & KIM 1990), nor 25 (Ho & KIM 1991). Moreover, VERVOORT & RAMIREZ list a number of dubious taxa, based on juveniles or imperfectly described. Since this review, the following species have been added to the genus: *H. perinsignis* Humes, 1973, *H.*

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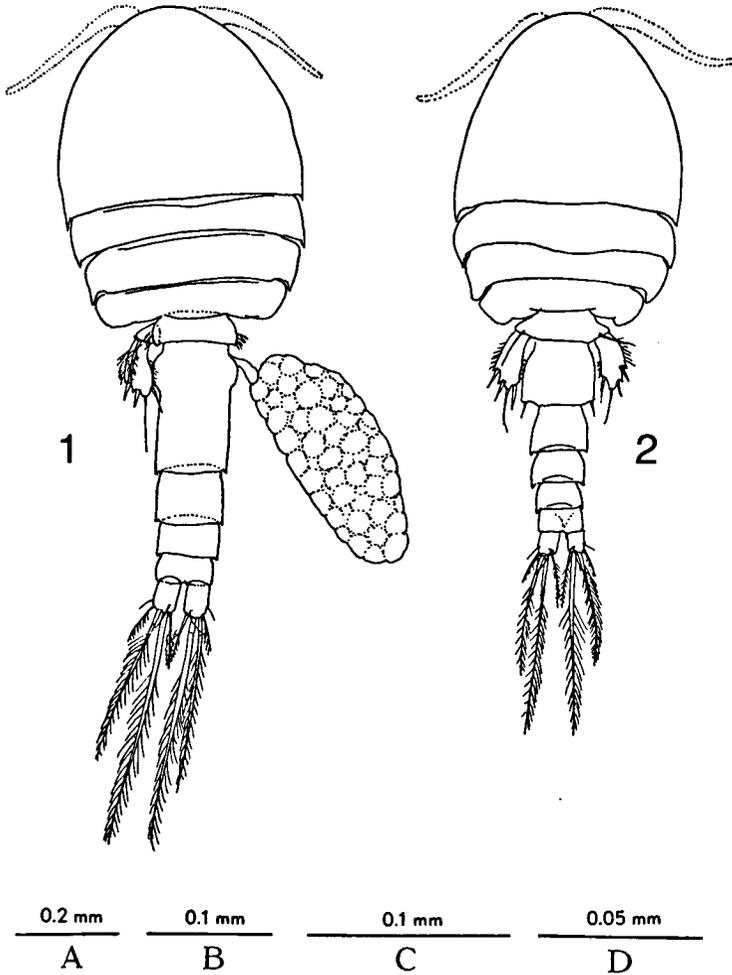
columnaris Humes, 1984, *H. mortoni* Boxshall & Humes, 1987, *H. ctenidis* Ho & Kim, 1990, *H. gomsoensis* Ho & Kim, 1991, and *H. saxatilis* Ho & Kim, 1991. These species have been recovered from various invertebrates, or have been found in burrows of various invertebrates and are possibly associated with the polychaete or crustacean occupants. HUMES (1984:38) lists the known hosts, consisting of Porifera, Anthozoa, Bivalvia, Polychaeta, and Crustacea. Later papers added Scleractinia and Echiura as hosts. The variety of groups acting as host, and the few adaptations to an associated mode of life of the copepods, indicate that members of the genus *Hemicyclops* might be rather loosely associated to various invertebrates. The new species recorded in the present paper from Curaçao forms in so far an exception, in that it is regularly found inside the shells of various hermit crabs (Anomura: Coenobitoidea and Paguroidea) and never free-living or on any other invertebrate host. This is the first record of a species of *Hemicyclops* living in association with hermit crabs, although certain other copepods, in particular *Sunaristes* (Harpacticoida) are regularly found in shells inhabited by such crabs.

Hemicyclops geminatus n. sp.

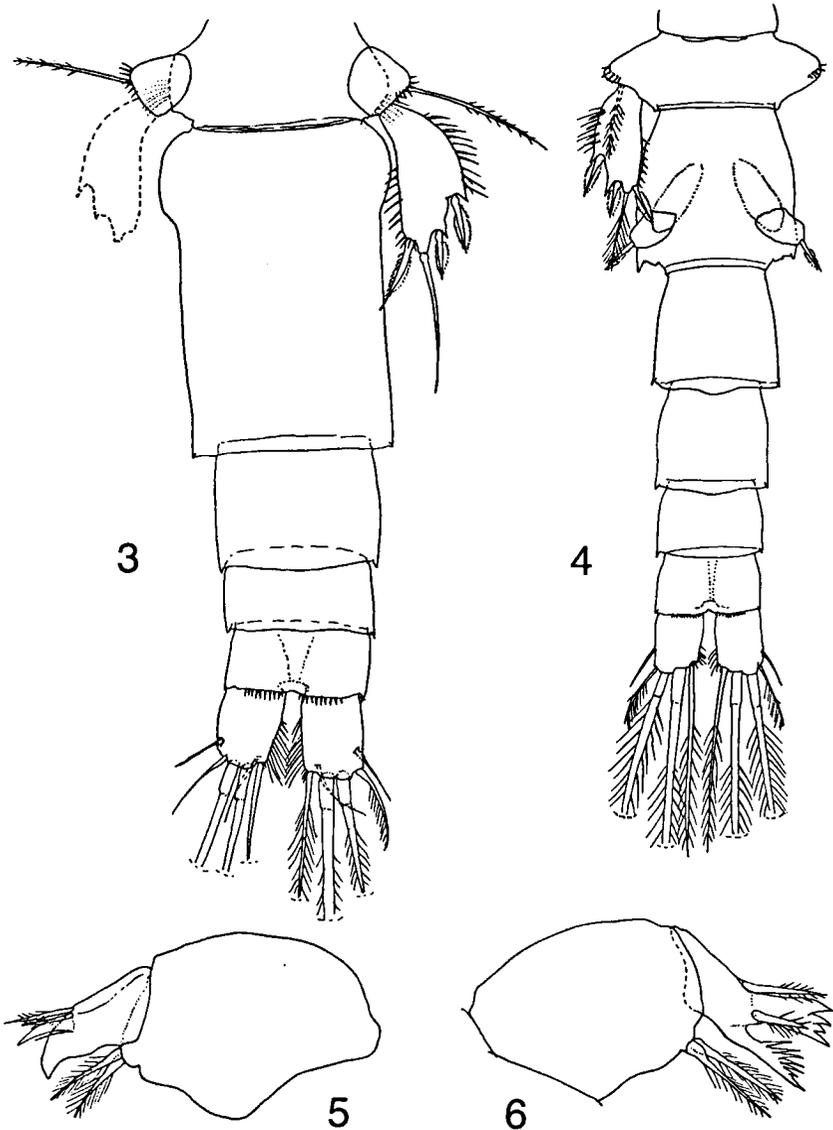
Material (all from Curaçao, Netherlands Antilles, all from hermit crabs):

- 1 ♀ ov. (holotype), 1 ♂ (allotype), 53 ♀♀, ♂♂, and copepodids (paratypes). Sample 73-1; from *Calcinus tibicen* (Herbst); Piscadera Bay, in front of Caribbean Marine Biological Institute (Carmabi); depth c. 40 cm; Nov. 13-14, 1973 (Zoölogisch Museum, Amsterdam, cat. no. ZMA Co. 102.888).
- 1 ♀ ov. Sample 73-49; from *Calcinus tibicen*; Santa Marta Inner Bay, near landing of Coral Cliff Hotel; depth 10 cm; Dec. 16, 1973 (ZMA Co. 102.889).
- 1 ♂. Sample 73-53; from *Calcinus tibicen*; c. 500 m W. of Piscadera Bay; reef; 5-6 m; Dec. 18, 1973 (ZMA Co. 102.890).
- 1 copepodid. Sample 74-140, from *Calcinus tibicen*; Piscadera Bay, in front of Carmabi; depth 50 cm; Mar. 18, 1974 (ZMA Co. 102.891).
- 4 ♀♀ ov., 1 ♀, 1 copepodid. Sample 73-64; from *Paguristes grayi* Benedict; Jan Thiel Bay, near swimming pool; depth c. 1 m; Dec. 22, 1973 (ZMA Co. 102.892).
- 3 ♀♀. Sample 74-136; from *Paguristes grayi*; Piscadera Bay, in front of Carmabi; depth c. 2m; Mar. 16, 1974 (ZMA Co. 102.893).
- 2 ♀♀ ov., 1 ♀, 1 ♂, 1 copepodid. Sample 74-141; from *Paguristes grayi*; Piscadera Bay, in front of Carmabi; depth c. 50 cm; Mar. 18, 1974 (ZMA Co. 102.894).
- 5 specimens. Sample 84-500; from *Paguristes grayi*; same locality and depth as previous sample; June 1, 1984 (ZMA Co. 102.895).
- 5 specimens. Sample 73-62; from *Dardanus venosus* (H. Milne Edwards); Piscadera Bay, in front of Carmabi; depth 2-3 m; Dec. 21, 1973 (ZMA Co. 102.896).

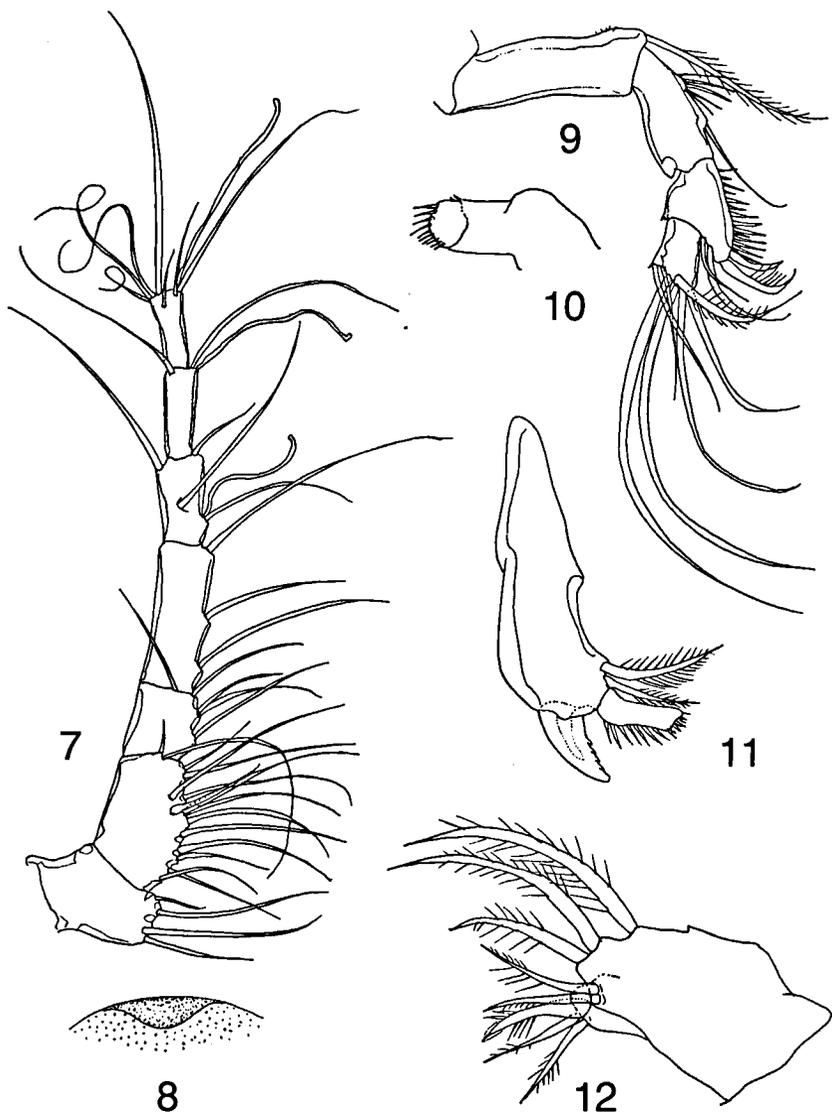
Descriptive notes: Female: Very similar in morphology and meristics to *H. columnaris* Humes, 1984 (see Discussion). Body (Fig. 1) length (not including setae on caudal rami) highly variable, from 1146 to 1411 μm (mean, based on 10 specimens, 1251 μm); greatest width of prosome 445-546 μm (480 μm). Colour of live female: body semi-transparent, whitish; ovaria



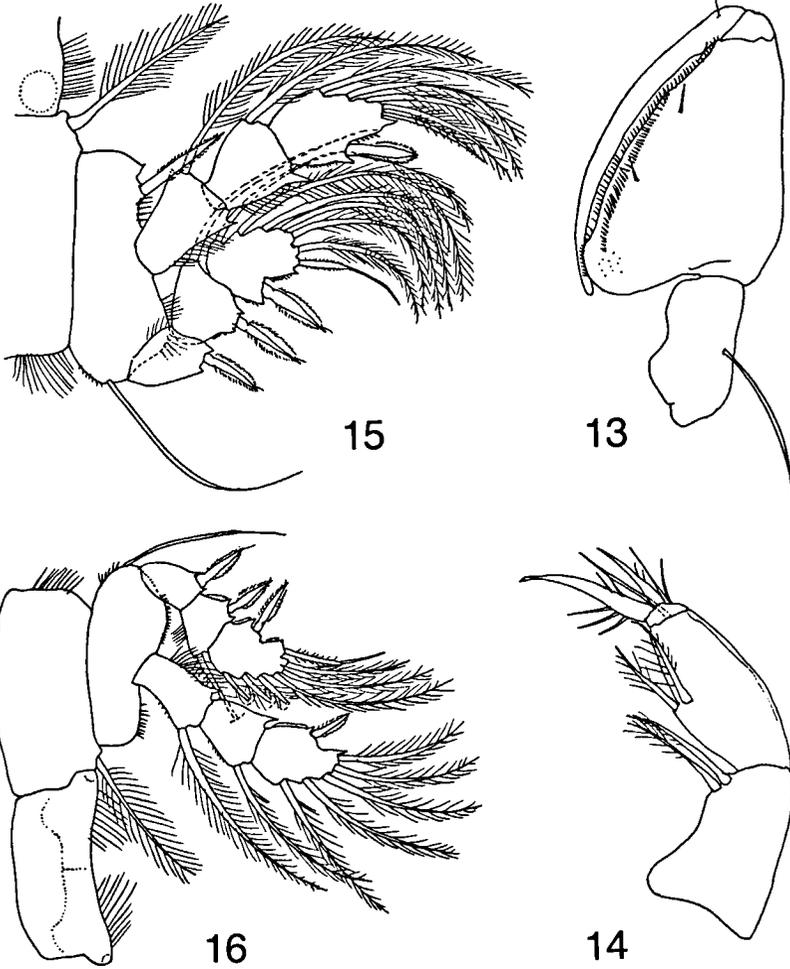
FIGURES 1-2. *Hemicyclops geminatus* n. sp., paratypes. 1, female, dorsal (scale A); 2, male, dorsal (A).



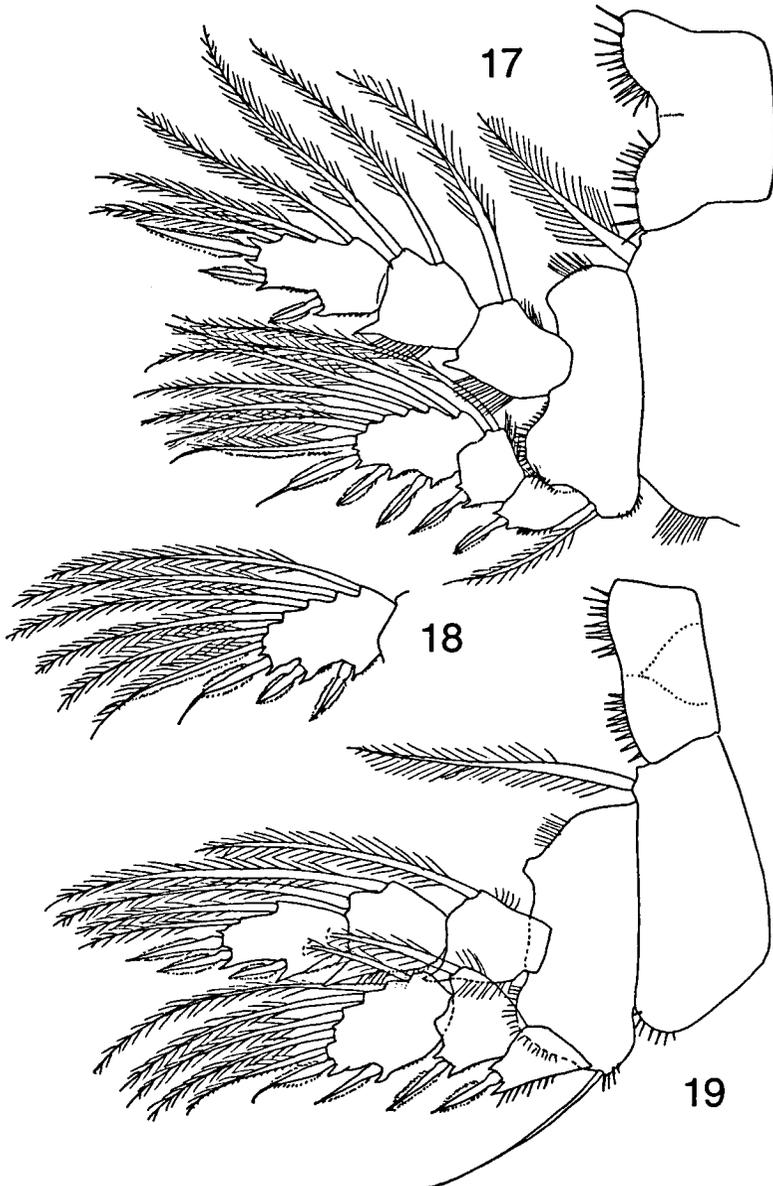
FIGURES 3-6. *Hemicyclops geminatus* n. sp., paratypes. 3, urosome, ♀, ventral (scale B); 4, urosome, ♂, ventral (B); 5, maxilla 2, ♂ (C); 6, maxilla 2, ♀ (C). Scales on first spread of figures.



FIGURES 7-12. *Hemicyclops geminatus* n. sp., ♀ paratype. 7, antenna 1 (scale C); 8, rostrum, ventral (B); 9, antenna 2 (C); 10, paragnath (D); 11, mandible (D); 12, maxilla 1 (D). Scales on first spread of figures.



FIGURES 13-16. *Hemicyclops geminatus* n. sp., paratypes. 13, maxilliped, ♂ (scale C); 14, maxilliped, ♀ (C); 15, leg 1, ♀ (C); 16, leg 1, ♂ (C). Scale on first spread of figures.



FIGURES 17-19. *Hemicyclops geminatus* n. sp., ♀ paratype. 17, leg 2 (scale C); 18, third exopodite segment of leg 3 (C); 19, leg 4 (C). Scale on first spread of figures.

pink; eye bright red; intestine white; ovisacs with various stages of ripening eggs pink to yellowish brown. Ovisacs variable in size and shape, mean of 10 specimens $492 \times 175 \mu\text{m}$.

Rostrum (Fig. 8) as in *H. columnaris* (*H.c.*). Antenna 1 (Fig. 7) 7-segmented; armature formula 4, 15, 5, 3, 4+1A, 2+1A, 7+1A. Length of segments, measures along non-setiferous posterior margin, 14, 39, 29, 54, 36, 38, and 33 μm .

Antenna 2 (Fig. 9) with long plumose seta (overreaching tip of segment 2) on segment 1; spines and claws on segment 3 slightly stronger than in *H.c.*

Mandible (Fig. 11) with 4 distal elements: a strong, finely toothed claw, a truncate element with long spinules, and 2 plumose setae. Paragnath and maxilla 1 (Figs. 10, 12) as in *H.c.* maxilla 2 (Fig. 6) with 2 plumose setae on segment 1, and a 4-dentate claw, a saw-toothed element and 2 plumose setae on segment 2. Maxilliped (Fig. 14) as in *H.c.*

Legs 1 to 4 (Figs. 15, 17, 18 and 19) resembling those of *H.c.*, and with same chaetotaxis formula, but for the length and structure of the laterodistal element of the third exopodite segment. This element is spiniform (i.e. rigid and fringed with minute setules) and as long as the lateral spine(s) in *H.c.*; but in the new species it is of mixed spiniform/setiform nature (i.e. rigid in basal part, which is fringed with minute setules, and thin and flexible in the distal part), and it is distinctly longer than the lateral spine(s). It looks as if this element in the new species is flagellum-tipped. The truly spiniform elements on lateral exopodite margin of P1 have distinct subterminal setule, those of P2 to P4 have not. The 'pinched' shape of lateral margin of exopodite segment 3 of P1 seems to be slightly more distinctly expressed in the new species. Intercoxal plate 1 with fine setules, of P2 to P4 with spinules.

Leg 5 (Fig. 3) 2-segmented; second segment $85 \times 40 \mu\text{m}$, with 3 spines and a 59 μm long distal seta, almost twice as long as spine and reaching to 75-90% of length of genital segment. No 6th legs.

Genital segment of same shape ('columnar') as in *H.c.* Ventrodistal margin of anal somite with row of some 10 distinct spinules on either side (Fig. 3). Caudal rami variable in length: length/width ratio being greater in larger specimens, smaller in small specimens (both large and small specimens mature, bearing ovisacs). Length 64-82 μm , greatest width 50-54 μm , length/width ratio 1.27-1.52 (mean 1.35, $n = 10$).

Male: Body length 1047 to 1383 μm , greatest width of prosome 408 to 522 μm . Shape of body (Fig. 2) as in *H.c.* Caudal ramus 52x38 μm (length/width ratio 1.39).

Secondary sexual dimorphism in:

- antenna 1 (with 1 seta added on 3rd and 4th segments);
- maxilla 2 (Fig. 5), distally bearing a heavy claw, an auxiliary claw (reaching to tip of main claw) and 3 setae;
- maxilliped (Fig. 13) with narrow first segment (bearing 1 long seta), triangular second segment (with 2 rows of spinules and 2 short setae), small unarmed third segment, and long, curved claw;
- leg 1 (Fig. 16), the basipodite of which is devoid of a medial spine and a medial triangular process;
- leg 6 (Fig. 4), which is a small, unimerous lobe, armed with a distal spine;
- urosome, which counts 4 postgenital somites.

DISCUSSION

The morphology of the hermit crab associates from Curaçao corresponds very closely with that of *Hemicyclops columnaris* Humes, 1984, found in association with the stony coral, *Porites lobata* Dana, in the Taboga group (Pacific coast of Panamá). It appears that *H. columnaris* and *H. geminatus* are twin species in the eastern Pacific and the Caribbean, respectively. A subspecific concept is rarely applied in Copepoda, therefore a full species status is proposed for the Caribbean form.

The differences between the two taxa pertain to the following characters: (1) length/width ratio of caudal ramus (♀) 1.7 in *H. columnaris* (*H.c.*), 1.27-1.52 in *H. geminatus* (*H.g.*); (2) ventrodistal margin of anal somite (♀ , ♂) smooth in *H.c.*, with row of distinct spinules in *H.g.*; (3) distal segment of maxilla 2 (♀) with 4-dentate claw + 3 setiform elements in *H.c.*, with 4-dentate claw + 2 setiform elements + a saw-like element in *H.g.*; (4) exopodite segment 3 of legs 1 to 4 (♀ , ♂) with 1 lateral spine, 1 distal spine, and 6 distal and medial setae in *H.c.*, the lateral and distal spine being of equal length and of similar morphology; this armature consists in the new species of 1 lateral spine, 1 distal 'mixed' element (see Description for details), and 6 distal and medial setae, but the distal 'mixed' element is much longer than the lateral spine and of different morphology; (5) the long distal seta of leg 5 (♀) reaches

to the middle of the genital segment, is shorter than the 2nd segment of leg 5, and is hardly longer than the medial spine in *H.c.*; this seta reaches to 75-90% of the length of the genital segment, is nearly as long as the segment that carries it, and is twice as long as the medial spine in *H.g.*; (6) the two 'heavy' elements of segment 2 of maxilla 2 (σ) are of unequal length in *H.c.*, of equal length in *H.g.*

H. geminatus is a common associate of at least three species of shallow-water hermit crabs in Curaçao: *Calcinus tibicen*, *Paguristes grayi*, and *Dardanus venosus*. Up to five copepods have been recovered from the shell of a single hermit crab.

Etymology. The proposed specific name, *geminatus*, is derived from *geminus* (Latin, meaning twins) and alludes to the presumed twin species relationship between *H. geminatus* and *H. columnaris*.

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