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# *Dodecaceria carolinae* n. sp. (Polychaeta: Cirratulidae), a shallow-water species from the northwestern Caribbean Sea

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SUMMARY: The cirratulid genus *Dodecaceria* Örsted, 1843 is well characterized by having palps inserted dorsally or laterally and branchial filaments restricted to some anterior chaetigers. The genus has species recorded from many marine environments worldwide and species are differentiated mainly by the number of branchial filaments. In this contribution, *D. carolinae* n. sp. is described based upon extensive materials collected in the northwestern Caribbean Sea. This species is distinguished by having 12 pairs of branchiae in two distinctive sizes, the first three four times longer than the remaining ones, and by having spoon-shaped hooks from notopodia 14-19 and from neuropodia 13-18. An analysis of the intra-specific variability, together with a table of diagnostic features and a key to all known species, is also included.

*Keywords*: Yucatan Peninsula, calcareous substrates, taxonomy, boring, Annelida.

RESUMEN: *Dodecaceria carolinae* n. sp. (Polychaeta: Cirratulidae), una especie de aguas someras del mar Caribe noroccidental. – El género *Dodecaceria* Örsted, 1843 de la familia Cirratulidae, se caracteriza por la presencia de palpos insertados dorsal o lateralmente, y filamentos branquiales restringidos a lo largo de pocos setígeros anteriores. El género tiene especies registradas en muchos ambientes marinos mundiales y las especies se diferencian usando el número de filamentos branquiales principalmente. En esta contribución, *D. carolinae* n. sp., se describe en base a abundante material recolectado en el mar Caribe noroccidental. Esta especie se distingue por tener 12 pares de branquias en dos tamaños distintivos, las tres primeras cuatro veces más largas que las restantes, y porque sus ganchos con forma de cuchara están presentes desde el notopodio 14-19 y el neuropodio 13-18. Se incluye también un análisis de la variabilidad intraespecífica, junto con una tabla comparativa de los atributos diagnósticos y una clave para todas las especies conocidas.

*Palabras clave*: península de Yucatán, sustratos calcáreos, taxonomía, perforador, anélido.

## INTRODUCTION

The Cirratulidae is a well-characterized polychaete family with a conical or anteriorly rounded prostomium lacking appendages and a peristomium fused with at least two segments. The parapodia are biramous, with papillar chaetal lobes and simple chaetae including capillaries and spines or hooks. Branchiae are paired, slender filaments arising from the dorsal surface of each segment and usually extending over most of the body (Fauchald, 1977). Species belonging to the rock-boring genus *Dodecaceria* Örsted, 1843 have been documented from all over the world. This genus was defined by the presence of one pair of grooved palps, arising dorsally or laterally, with branchiae roughly of the same size and restricted to a few or several anterior chaetigers, and chaetae always including spoon-shaped hooks. In view of our results, however, this definition must be emended to include also the possible presence of branchiae of two distinctive sizes (see below).

The delineation of *Dodecaceria* species has been rather problematic, especially since the brief, confus-

ing description of the type species, *D. concharum*, based on specimens collected between Fredrikshavn and Skagen, Denmark. The name *Dodecaceria* refers to its 12 anterior filaments, which corresponds to the 5-6 pairs of branchiae (and palps) but, other than indicating the presence of ventral hooks, no further details were provided. Based upon this vague description, *D. concharum* has been reported as a widely distributed species.

One of the explanations for this now surprising distribution might stem from the detailed studies by Caullery and Mesnil (1898). They found five reproductive forms divided into three different stages, which were regarded as belonging to the same species: A) Atoky sedentary, B) Epitoky black, and C) Epitoky sedentary. Fauvel (1927) accepted this apparent reproductive polymorphism and set the synonymy for all the NW European species under a single name. Interestingly, Martin (1933) regarded this reproductive variability as an indication of the existence of a species complex, rather than a single polymorphic one. Dehorne (1933) went a step further by naming form B as *D. caulleryi* (George and Petersen, 1991). The subsequent development of the studies was reviewed by Petersen (1999). Thus, *D. concharum* corresponds to form B and includes *D. caulleryi,* while *D. ater* (de Quatrefagues, 1866) corresponds to forms A and C.

The prevalent taxonomic scenario for *Dodecaceria* involves using the number of branchial pairs, together with the starting chaetiger for the presence of the spoon-shaped hooks in both neuropodia and notopodia (Knox, 1971). However, no evaluation of the intraspecific variability for any of the known species has been reported to date.

Many studies deal with Caribbean polychaetes, but few focus on cirratulids (Jiménez-Cueto and Suárez, 1993; Díaz-Díaz and Liñero-Arana, 2004; Díaz-Díaz and Salazar-Vallejo, 2009). This is noteworthy because members of the family are regarded as pollution indicators (Jumars, 1975; Rivero *et al.,* 2005) or toxin accumulators (Gibbs *et al*., 1983). Furthermore, studies on bioerosion are also scarce (Bak, 1994; Perry, 1998). *Dodecaceria* species are well-known boring organisms (Carrasco, 1977a; Fischer *et al.,* 2000), but the excavating mechanism (acid release, mechanical erosion by chaetae, or a combination of both) (Evans, 1969; Vinn, 2009) and their ecological importance or impact on calcareous substrates have not been clearly stated. However, they are often reported as being more abundant in areas with high turbidity that are heavily polluted or frequently disturbed by regular trawling (Peyrot-Clausade *et al.,* 1995; Hutchings and Peyrot-Clausade, 2002; Osorno *et al*., 2005; Hutchings *et al.,* 2005).

Two species have been described for the Grand Caribbean region: *Dodecaceria inhamata* (Hoagland, 1919) from Bermuda and *D. diceria* Hartman, 1951 from off southwestern Florida. *Dodecaceria concharum* Örsted, 1843, *D. coralii* (Leidy, 1855), *D. laddi* Hartman, 1954 and *D. pulchra* Day, 1955 have also been reported for the region, but these reports may correspond to misidentifications and the list deserves more detailed work.

In this paper, a new species is described from the NW Caribbean region and the generic diagnosis is consequently emended. Moreover, an evaluation of the intra-specific variability of morphologic or diagnostic features (including the shape and relative size of branchial filaments, the number of chaetigers and the starting chaetiger—and range of presence—for the spoon-shaped hooks), together with a comparative table of diagnostic features and a key to all known species of the genus, are also included.

## MATERIALS AND METHODS

The samples were collected along the northern coast of the Yucatan Peninsula, in areas with many different types of calcareous substrates including coralline rocks. Rocks were broken with a hammer and chisel, and polychaetes were removed with forceps. The worms were anesthetized using osmotic–shock or by placing them in an ice chest with some ice. Specimens were then fixed in a 10% formalin–sea water solution, soaked in tap water for 24 h, and preserved in 70% ethanol.

All specimens were studied under light microscopy. For each location, 30 worms were selected to measure body length (both as relative length up to chaetiger 10, $L_{10}$, and total body length) and width with a micrometer. The possible existence of significant relationships between total body length and $L_{10}$ or total number of chaetigers was assessed. Diagnostic features include the number of branchial filaments, together with their length relative to body width, the total number of chaetigers, and the range of chaetigers from that of first appearance of hooks to that where capillaries reappear in both noto- and neuropodia. The photographs of palps, branchiae, parapodia and whole specimens were taken with a digital camera.

Holotype and additional materials were deposited in ECOSUR, and paratypes were deposited in the following museums:

BMNH: The Natural History Museum, London. CAS: California Academy of Sciences, San Francisco. ECOSUR: Colección de Referencia, El Colegio de la Frontera Sur, Chetumal. LACM-AHF: Museum of Natural History, Los Angeles County, Allan Hancock Foundation Polychaete Collection. MNHN: Museum National d'Histoire Naturelle, Paris. USNM: National Museum of Natural History, Smithsonian Institution, Washington, DC. ZMB: Zoologisches Museum, Berlin. IRFA, Institut de Recherche Fondamentale et Appliqueé, Université Catholique de l'Ouest, Angers. MNCN: Museo Nacional de Ciencias Naturales, Madrid. MNCNP: Museo de Ciencias Naturales de La Plata, Argentina. NMW: National Museum of Wales.

ZMUC: Zoological Museum of the University of Copenhagen.

## RESULTS

### Genus *Dodecaceria* Örsted, 1843

*Type species*. *Dodecaceria concharum* Örsted, 1843, by monotypy.

*Diagnosis (emended).* Prostomium conical, blunt. Peristomium long, achaetous. Palps between peristomium and first chaetiger, inserted dorsally or laterally; thicker and subsequally longer than branchiae, with longitudinal ciliate borrow. Branchiae up to 22 pairs, restricted to anterior chaetigers, either monomorphic (gradually decreasing in length) or dimorphic (the anteriormost larger than the following ones). Chaetae including capillaries in both parapodial rami and stout, acicular, always spoon-shaped hooks in noto- and neuropodia.

*Remarks.* The number of branchial filaments, together with their relative size and the number of filaments in the first branchial segment, have been widely employed to sort out the *Dodecaceria* species (Table 1). According to our observations, there are two distinctive patterns regarding the relative size of branchial filaments, which may either be all of about the same size, often slightly decreasing posteriorly, or the anterior pairs distinctly longer than the posterior ones (Fig. 1A, B). Accordingly, they are here regarded as monomorphic or dimorphic, respectively (Table 1), forcing us to emend the generic diagnosis. In the new species, the presence of some short, regenerating branchial filaments in the first few chaetigers seems to occur in specimens also regenerating the whole anterior end, which are exposed to predation when protruding from the galleries excavated in calcareous substrates for feeding (Fig. 1C).

The relative fusion of post-peristomial segments in *Dodecaceria* (de Quatrefages, 1866; McIntosh, 1911) and also in *Cirriformia* (Blake, 1975; Wilson, 1936) may result in two distinctive patterns. Most cirratulid genera (including several *Dodecaceria* species) have a single pair of branchiae per segment (Day, 1967), including the first branchial one. In turn, four species of *Dodecaceria* (*D. capensis* Day, 1961; *D. choromytilicola* Carrasco, 1977a; *D. gallardoi* Carrasco, 1977b and *D. opulens* Gravier, 1908) appear to have two pairs of branchiae on in the first branchial segment, which also carries the palps. This presumably occurs by fusion of the first two segments, which may be so complete that they cannot be distinguished in dorsal view, as, for example, in *D. carolinae* n. sp., where the branchiae are inserted in slightly different planes than palps and are better observed in lateral view (Fig. 1D). Moreover, these four species apparently have a more pronounced parapodial progression.

### ***Dodecaceria carolinae*** n. sp.
(Figs. 1 and 2; Table 2)

*Dodecaceria* near *concharum* Hartman 1951: 94 (*non* Örsted, 1843).
*?Dodecaceria coralii* Vinn, 2009: 154-155 Fig 1D (*non* (Leidy, 1855)).

*Type material*: Holotype. ECOSUR 0101, Punta San Felipe, Río Lagartos, Yucatán, México. 2.5 m (21°35'9.99"N, 88°13'55.43"W), 16/06/2009. Paratypes BMNH (2), CAS (2), LACM–AHF (2), MNHN (2), USNM (2), ZMB (2), IRFA (2), MNCM (2), MNCMP (2), NMW (2), ZMUC (2). Punta San Felipe, Río Lagartos, Yucatán, México. 2.5 m (21°35'9.99"N, 88°13'55.43"W), 16/06/2009.

*Type locality.* Punta San Felipe, Río Lagartos, Yucatan, in shallow-water calcareous substrates.

*Additional material:* Rocas, Río Lagartos, Yucatán, México**.** 2.5 m, (21°37'50.11" N, 88° 9'5.69" W), 15/06/2009, 15 specimens. Punta Santa Fe, Río Lagartos, Yucatán, México. (21°35'9.99" N, 88°13'55.43" W), 2.5 m, 16/06/2009, 30 specimens.

*Description.* Holotype complete. Body dark brown, cylindrical, tapering towards both body ends, posterior region narrower, depressed; 40 mm long, 1 mm wide, 126 chaetigers (Fig. 1A). Prostomium rounded, expanded, smooth. Nuchal organs as two dorsal, short slits, placed towards posterior margin. Peristomium multi-annulated, with 6-7 dorsal rings. Palps laterally inserted (Fig 1B, D), 5 mm long. First segment achaetous, completely fused to peristomium. Branchiae dimorphic, from "peristomium" to chaetiger 11, one pair per segment; chaetigers 1-3 with filaments four times longer than posterior ones. Branchial insertion gradually displacing dorsally from first to last branchial chaetigers. Chaetigers annulated dorsally, 3-4 rings per segment.

Anterior chaetigers with serrated capillaries in both parapodial rami, longer in notopodia than neuropodia, five per notopodium, three per neuropodium (Fig. 2A). Only spoon-shaped hooks on notopodia 16 to 34. Neuropodia 15-16 with three capillaries and three spoon-shaped hooks, then only three hooks up to notopodia 34. From chaetiger 35, both rami have three hooks and three capillaries. Far posterior chaetigers with capillaries only. All capillaries serrated in both parapodial rami (Fig. 2B) except for the smooth ones in chaetigers 55-80.

Spoon-shaped hooks in chaetigers 35-54 curved, distal depression deep, twice longer than wide, with variable basal tooth, rounded and smooth depression margins (Fig. 2C); then slightly curved, almost straight, with sharp point, distal depression shallow, basal tooth reduced, barely noticeable and depression margins smooth up to chaetiger 79 (Fig. 2D). Subsequent hooks resembling the anterior ones. Pygidium blunt, anus dorso-terminal, anal cirri absent (Fig. 1E).

*Intra-specific variability* (Table 2). The specimens had an average length of 28.31 mm (SD±7.36 mm) and a maximum width of 1 mm, while the average number of chaetigers was 106.45 (SD±15.30). Body shape is variable, but usually the anterior chaetigers are wider than the rest of the body, often tapered although in

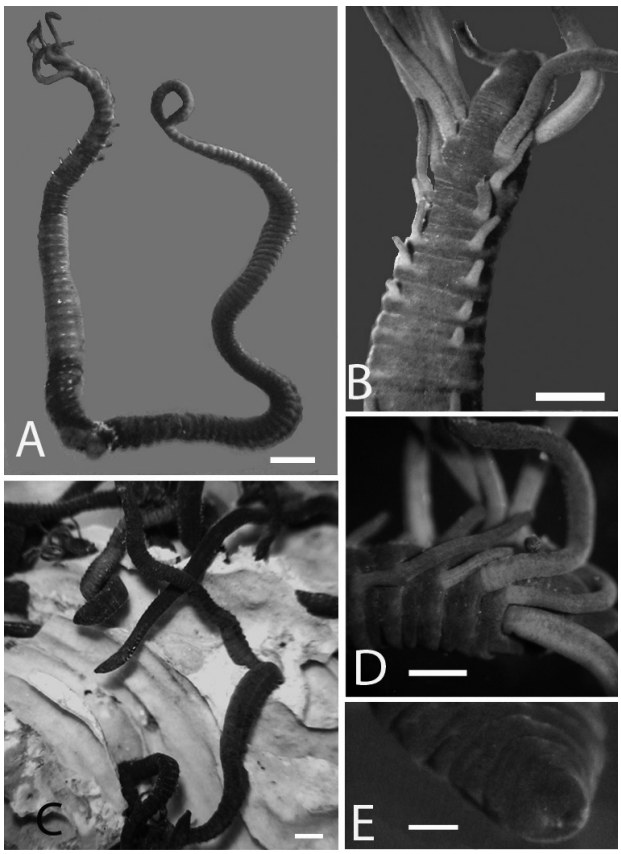


FIG. 1. – *Dodecaceria carolinae* n. sp.: A, holotype preserved complete organism; B, paratype preserved specimen: anterior end in dorsal view, showing regenerating palps and branchiae; C, fragment of a living coral showing the exposed polychaetes after breaking; D, paratype anterior end in lateral view, showing palps and branchial filaments; E, paratype pygidium in ventral view. Scale bars: A-C = 1.0 mm; D = 500 μm; E = 250 μm.

some specimens the body is rather cylindrical. The colour in vivo was dark green, becoming dark, even black with some yellow chaetigers once preserved. Some specimens have a pale anterior region and a dark posterior one. The posterior region is often depressed.

All specimens had 12 pairs of branchiae, although in some specimens they were only noticed thanks to the presence of scars. When the whole set was present, a variability in relative length and proportion was observed, but 75% of the specimens had the first three branchial pairs longer than the remaining ones, while the others had up to six longer pairs. This variation was not size-dependent, since the latter measured 21 to 66 mm in length, but rather corresponds to differences in regeneration after predation or cropping of the long branchial filaments (see diagnosis remarks).

Spoon-shaped hooks may first appear from neuropodia 13 to 18, and usually one later in notopodia (i.e. 14-19). However, they never start after notopodia 19. The next chaetigers have only hooks until, on average, chaetiger 38.67 (SD±5.93), where 1-3 capillaries occur interspersed with three hooks. Finally, in posterior chaetigers, the hooks are completely replaced by 3-5 capillaries in both parapodial lobes.

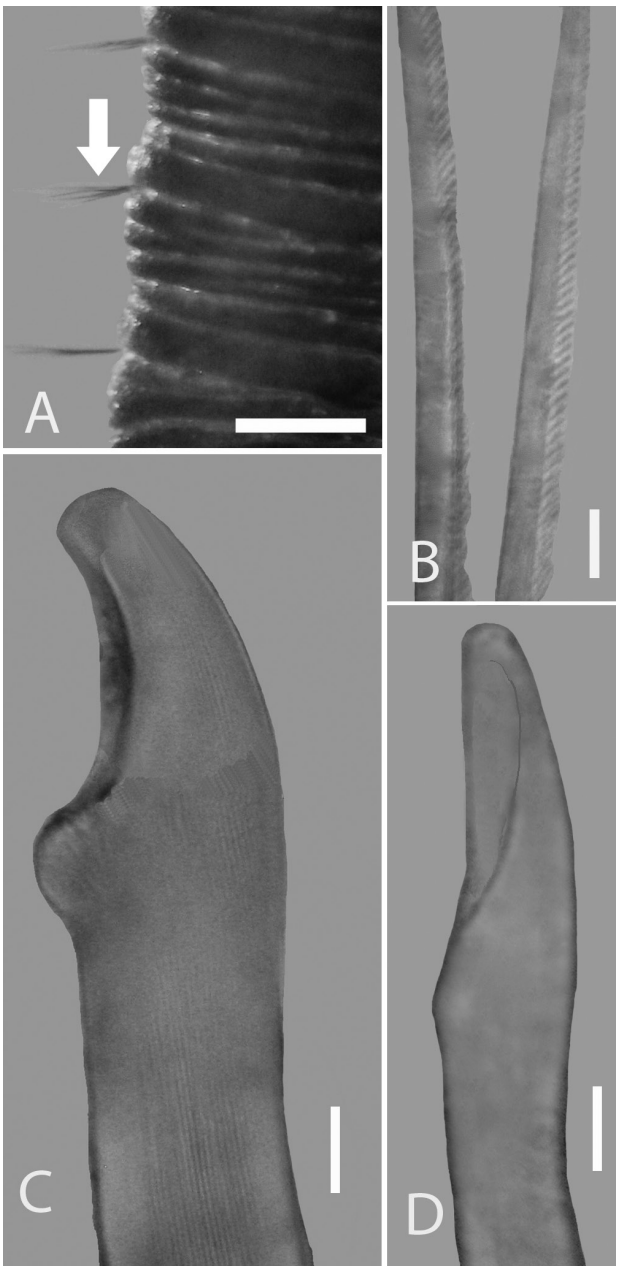


FIG. 2. – *Dodecaceria carolinae* n. sp.: A, first notopodia showing capillaries (arrow indicates de anterior region); B, two notopodial serrated capillaries; C, spoon-shaped hook from an anterior chaetiger, showing the distal depression; D, spoon-shaped hook from mid-body chaetigers, showing the smooth edge. Scale bars: A = 500 μm; B = 25 μm; C, D = 20 μm.

The correlation between total body length and $L_{10}$ ($R^2$=0.2148) and number of chaetigers ($R^2$=0.4694) is low and non-significant, which might be due to the presence of specimens with regenerating anterior ends or to differences in the intensity of body contraction during preservation.

Females: Usually longer than males (average length 35 mm), having a paler pigmentation and being easily recognized by the widening of the mid-body chaetigers. They have 1-2 rounded pits along cha-

TABLE 1. – Species of *Dodecaceria* from the world with specific characteristics (in alphabetical order). (For reproductive patterns in Dodecaceria species see Petersen, 1999).

| Species | Length of type material | Pairs of branchiae | Palps insertion | First branchiae | Branchiae relative size | First chaetiger with hooks | Type locality |
|---|---|---|---|---|---|---|---|
| *D. ater* (de Quatrefages, 1866) | Unknown | 5-6 | Lateral | 1 pair | Monomorphic | 5 | Brehat Island, France |
| *D. berkeleyorum* Knox, 1971 | 15 mm | 3-4 | Lateral | 1 pair | Monomorphic | Neuro: 10 | New Zealand |
| *D. capensis* Day, 1961 | 15 mm | 4 | Lateral | 2 pairs | Monomorphic | Noto: 10-13<br>Neuro: 8-11 | False Bay, South Africa |
| *D. carolinae* n. sp. | 40 mm | 12 | Lateral | 1 pair | Dimorphic | Noto: 14-19<br>Neuro: 13-18 | Yucatán Península México |
| *D. choromyticola* Carrasco, 1977a | 50 mm | 13 | Lateral | 2 pairs | Dimorphic | 11 | Putemun, Coliumo Bay, Chile |
| *D. concharum* Örsted, 1843 | 60 mm | 4-8 | Dorsal | 1 pair | Monomorphic | 7 or 8 | Skagen, Denmark |
| *D. coralii* (Leidy, 1855) | 31.75 mm | 7 | Lateral | 1 pair | Monomorphic | 11 | Rhode Island, New Jersey, USA. |
| *D. diceria* Hartman, 1951 | 12 to 15 mm | 1 | Lateral | 1 pair | | 11 | Florida, USA |
| *D. fewkesi* Berkeley and Berkeley, 1954 | 22 mm | 4-5 | Lateral | 1 pair | Monomorphic | Neuro: 9-12 | California, USA |
| *D. fimbriata** (Verrill, 1880) | 25 mm | 3-6 | Dorsal | 1 pair | Dimorphic | Last 20 chaetigers | Bay of Fundy, Canada |
| *D. fistulicola* Ehlers, 1901 | 1.15 mm | 5-7 | Lateral | 1 pair | Dimorphic | Noto: 11-14<br>Neuro: 9-12 | Chile |
| *D. gallardoi* Carrasco, 1977b | 3.5 mm | 3 | Lateral | 2 pairs | Monomorphic | 6 | Concepción Bay, Chile |
| *D. inhamata* (Hoagland, 1919) | 14 mm (incomplete) | 5 | Lateral | 1 pair | Monomorphic | 13-14 | Bermuda |
| *D. joubini* Gravier, 1906 | 18 mm (incomplete) | 6 | Lateral | 1 pair | Dimorphic | 7 or 8 | Gulf of Tadjuorah, Red Sea |
| *D. laddi* Hartman, 1954 | 5-10 mm | 2 | Lateral | 1 pair | Monomorphic | 8 | Marshall Island |
| *D. meridiana* Elías and Rivero, 2009 | 13.95 mm | 7-18 | Lateral | 1 pair | Dimorphic | 8 | Mar del Plata, Argentina |
| *D. multifiligera* Hartmann-Schröder, 1962 | 7.5 mm | 22 | Dorsal | 1 pair | Monomorphic | 6 | Chile |
| *D. opulens* Gravier, 1908 | 60 mm | 7-14 | Lateral | 2 pairs | Dimorphic | 8 | Peru |
| *D. pulchra* Day, 1955 | 22 mm | 4-5 | Lateral | 1 pair | Monomorphic | Noto: 11-12<br>Neuro: 9-10 | South Africa |
| *D. saxicola* (Grube, 1855) | 9.9 mm | 4 | Dorsal | 1 pair | Monomorphic | 10 | Villa Franca, Italy |
| *D. sextentaculata* (delle Chiaje, 1828) | Unknown | 5 | Dorsal | 1 pair | Monomorphic | Unknown | Naples, Italy |

*This species looks like an epitoke of *D. coralli* due to the presence of dark tips in the branchiae, as stated in the original description. However it was synonymized with *D. concharum* (George and Petersen, 1991).

TABLE 2. – Measurements of the diagnostic characters in *Dodecaceria carolinae* n. sp. (n = 30)

| | Total length (mm) | Width (mm) | $L_{10}$ (mm) | Number of chaetigers | First chaetiger with neurohooks | First chaetiger with notohooks | First chaetiger where capillaries reappear |
|---|---|---|---|---|---|---|---|
| Minimum | 14 | 1 | 2 | 84 | 13 | 14 | 26 |
| Maximum | 66 | 1 | 5 | 156 | 18 | 19 | 50 |
| Average | 28.31 | 1 | 2.95 | 106.45 | 15.79 | 17.11 | 38.67 |
| Standard Deviation | 7.60 | 0 | 0.40 | 15.30 | 1.14 | 1.40 | 5.93 |

etigers 55-86, and the coelom is completely full of oocytes, which apparently belong to the solitary type (Eckelbarger, 1983) and measured 45-55 μm in diameter. No epitokal transformation or chaetal modification was observed.

*Habitat.* This species was found along the Yucatan Peninsula, in subtidal limestone and corals (*Porites* and *Pavona*). The worms bore galleries and build tubes, with both ends protruding from a single opening (Fig. 1C) and no clear gallery pattern. In limestone, the galleries have an equal diameter and form parallel homogenous tubes. In living coral, the patterns differ somewhat, being U-shaped or curved, but also non-homogenous. Each tube may harbor 1-3 worms.

*Methyl green straining pattern.* There is no evident pattern, staining is solid and homogeneous throughout the body.

*Etymology.* The specific name honours the unrestricted care of Mrs. Carolina Camacho, mother of JMAC. Without her support and courage he could not have reached any of his goals.

*Remarks*. *Dodecaceria carolinae* n. sp. resembles other species having 10 or more pairs of branchiae, such as *D. choromytilicola* Carrasco, 1977a, *D. opulens* Gravier, 1908 and *D. meridiana* Elías and Rivero, 2009, but differs from the first two in having a single pair of branchiae in the first segment (two in these species). As for *D. meridiana*, the type specimen was

13.95 mm long (42 mm long in *D. carolinae* n. sp.). This difference might alter any comparisons, such as those based upon the number of chaetae, since a higher chaetal number might be expected for larger specimens. However, *D. meridiana* has 7-8 notochaetae and 6-7 neurochaetae in the anterior chaetigers (5 and 3 in *D. carolinae* n. sp., respectively), so the smaller species is in fact the most chaetose. Moreover, *D. meridiana* has the first 8-10 branchial pairs markedly longer than the remaining ones (first 3 to 6 in *D. carolinae* n. sp.).

*Dodecaceria carolinae* n. sp. also differs from other species registered for the Grand Caribbean region. Thus, *D. inhamata* (Hoagland, 1919) from Bermuda has 5 branchial pairs, and *D. diceria* Hartman, 1951 from off Florida (117 fathoms deep) has a single branchial pair.

Furthermore, Hartman (1951) reported an incomplete specimen (8 mm long, 1.3 mm wide, with 29 chaetigers) collected in Alligator Harbor, Franklin, Florida as *D.* near *concharum* Örsted, 1843. The specimen resembled *D. carolinae* n.sp. in being dark green and having eight long and four short branchial filaments. Moreover, the hooks appeared three chaetigers after the branchial filaments (i.e. by chaetiger 15) and, consequently, it is here regarded as conspecific.

Vinn (2009) studied the fine structure of tubes of some specimens recorded in Chicxulub Puerto, Yucatan, a place close to the type locality of *D. carolinae* n. sp. Since no morphological details for the specimens were provided, it might be included as belonging to this new species; however, these materials should be evaluated.

Further studies are needed to specify the distribution of the new species, which includes the Yucatan Peninsula and might extend to Florida, and to assess its reproduction and the substrate-drilling mechanism.

**Key to species of *Dodecaceria***
(Additional features in Table 1; specimens relative length in millimetres)

1. With two or more pairs of branchiae .....2
– With a single pair of branchiae; palps lateral; hooks from chaetiger 11 (12-15 mm) .....*D. diceria*

2. All branchiae similar in length or gradually decreasing posteriorly (monomorphic branchiae) .....3
– Branchiae of two distinct sizes, posterior ones shorter than anterior ones (dimorphic branchiae) 10

3. First branchial segment with a single pair of branchiae.....4
– First branchial segment with two pairs of branchiae; palps lateral; hooks from notopodia 10-13, and neuropodia 8-11; four pairs of branchiae (15 mm) ..... ..... *D. capensis*

4. Palps lateral (bases non-visible dorsally) .....5
– Palps dorsal (bases visible dorsally).....9

5. Two pairs of branchiae; hooks from chaetiger 8 (5-10 mm).....*D. laddi*
– 3-5 pairs of branchiae .....6
– Seven pairs of branchiae; hooks from chaetiger 11 (31.75 mm) ..... *D coralii*

6. Hooks from chaetiger 5; 5-6 pairs of branchiae (15-35 mm)..... *D. ater*
– Hooks first present from chaetiger 9-10 .....7
– Hooks first present from chaetiger 11 or posterior.. .....8

7. Boring gastropod shells; hooks from neuropodia 10; 3-4 pairs of branchiae (15 mm) ..... .....*D. berkeleyorum*
– Boring rocks; hooks from neuropodia 9-12; 4-5 pairs of branchiae (22 mm) ..... *D. fewkesi*

8. Hooks from notopodia 11-12 and neuropodia 9-10; 4-5 pairs of branchiae (22 mm) ..... *D. pulchra*
– Hooks from chaetiger 13-14; five pairs of branchiae (14 mm incompl.) .....*D. inhamata*

9(4) Hooks from chaetiger 6; 22 pairs of branchiae (7.5 mm).....*D. multifiligera*
– Hooks from chaetiger 7-8; 4-8 pairs of branchiae (60 mm).....*D. concharum*
– Hooks from chaetiger 10; 4 pairs of branchiae (9.9 mm)..... *D. saxicola*[*]

10. First branchial segment with a single pair of branchiae.....11
– First branchial segment with two pairs of branchiae; palps lateral.....14

11. Palps lateral (bases non-visible dorsally) .....12
– Palps dorsal (bases visible dorsally); hooks starting in posterior chaetigers; 3-6 pairs of branchiae (25 mm).....*D. fimbriata*

12. Hooks from chaetiger 7-8 .....13
– Hooks from notopodia 11-14 and neuropodia 9-12; 5-7 pairs of branchiae (1.15 mm) .....*D. fistulicola*
– Hooks from notopodia 14-19 and neuropodia 13-18; 12 pairs of branchiae (40 mm) ..... .....*D. carolinae* n. sp.

13. Six pairs of branchiae; boring corals; hooks from chaetiger 7-8 (18 mm, incompl.) .....*D. joubini*
– 7-18 pairs of branchiae; boring rocks; hooks from chaetiger 8 (13.95 mm)..... *D. meridiana*

14. Hooks from chaetiger 6; three pairs of branchiae (3.5 mm) .....*D. gallardoi*
– Hooks from chaetiger 8; 7-14 pairs of branchiae (60 mm)..... *D. opulens*
– Hooks from chaetiger 11; 13 pairs of branchiae; (50 mm).....*D. choromytilicola*

*Notes*. The first chaetiger having hooks is unknown for *D. sextentaculata* (five pairs of branchiae).

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