

# *Diochus cleidecostae*, a new species from the Brazilian Amazon and a discussion of the sexual dimorphism on sternum VIII (Coleoptera: Staphylinidae: Staphylininae: Diochini)

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**Abstract.** *Diochus* Erichson is a worldwide rove beetle genus with species found in forest floor litter. Three species of *Diochus* were recently collected in northern Brazil, one of them considered as new and herein described. Within *Diochus* nanus-group, *D. cleidecostae* sp. nov. differs from *D. apicipennis* Cameron, *D. nanus* Erichson and *D. perplexus* Cameron by the aedeagus with clearing trifurcate apex of parameres; and differs from *D. parvulus* Kraatz by the three apical long setae of parameres distributed on ventral and dorsal lobes. A previous key to the *D. nanus*-group is updated to include the new species. Here we also report for the first time *D. santacatarinae* Irmeler and *D. parvulus* from Pará state, Brazil. Finally, a discussion about the sexual dimorphism on sternum VIII is also provided for the genus.

**Key-Words.** Amazon; Morphology; Neotropical; Rove beetles; Taxonomy.

## INTRODUCTION

The tribe Diochini Casey includes the worldwide genus *Diochus* Erichson and the Chilean and Argentinian genus *Antarctothius* Coiffait & Saiz. The Vietnamese genus *Coomania* Cameron was recently removed from Diochini and now is assigned to *Coomaniinae* Zyla & Solodovnikov (Zyla & Solodovnikov, 2019). Here we adopt Diochini as tribe of Staphylininae following Cai *et al.* (2019), and not as tribe of Xantholininae, as suggested by Zyla & Solodovnikov (2019). In both above mentioned studies, Diochini is a sister-group of (Othiini (Maorothiini, Xantholinini).

The species of *Diochus* are found in forest floor litter and they are easily identified by the minute and aciculate apical maxillary palpomere, and the neck, which is nearly one-third the width of the head. A detailed diagnosis for the genus was provided by Smetana (1982) and Zhou & Zhou (2016). *Diochus* includes 78 extant species and one fossil (Chatzimanolis & Engel, 2011; Newton, 2019). Recently, Irmeler (2017) revised the Neotropical species of *Diochus* and allocated the 37 species

in six species-groups. One of them, the *Diochus* nanus-group, includes four species, which share body with light colouration (yellow to light brown), antennomeres 4-10 wider than long, aedeagus with parameres widened at apex forming a large plate or with two or three lobes, and each paramere with three apical long setae (Irmeler, 2017). Another group is the *D. verhaaghi*-group, with two species that share body brown (darker than *D. nanus*-group), aedeagus with parameres slightly widened at apex, not bifurcate, and each paramere with four apical setae (Irmeler, 2017). Among the specimens studied by Cajaiba *et al.* (2017) we identified three species of *Diochus* belonging to the two species groups discussed above (two in *D. nanus*-group and one in *D. verhaaghi*-group). One of the species in *D. nanus*-group is considered as new and herein described. The key for *D. nanus*-group from Irmeler (2017) is updated to include the new species. Here we also report for the first time *D. santacatarinae* Irmeler and *D. parvulus* Kraatz from Pará state. Finally, a discussion about the sexual dimorphism on sternum VIII is also provided for the genus.

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## MATERIAL AND METHODS

The specimens were collected in the municipality of Uruará, state of Pará, in areas of primary forest, secondary forest with 15 years of regeneration, secondary forest with five years of regeneration, agriculture (cocoa plantations, *Theobroma cacao* L.), and pasture for extensive livestock (Figs. 1-3). The material is deposited in "Coleção Entomológica Pe. Jesus Santiago Moure", Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Brazil (DZUP) and in the Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (MZSP). Dried specimens were immersed in 10% potassium hydroxide overnight (about 12-15 hours), followed by a bath of acetic acid to neutralize the hydroxide and then water to remove any residue. Dissections were performed under a stereoscopic microscope, and the habitus photographs and dissected parts were illustrated using a light or stereoscopic microscope. The additional measurements follow Irmeler (2017): eye length (EL), head length (HL), relative length of eyes as EL : HL ratio, width of head at posterior angles of head (PW), width of head at anterior edge of eyes (EW), and the divergence of head abbreviated as PW : EW ratio. The dissected parts were placed inside micro vials with glycerin and pinned with the respective specimens. Label information is listed in sequence from top to bottom. The data from each label are enclosed within double quotes (" "), a forward slash (/) separates lines, and information enclosed by square brackets ( [ ] ) provides additional details. The terminology follows Irmeler (2017).

## RESULTS

Twelve species of *Diochus* belonging to the five species groups are recorded from the Brazilian Amazon (Table 1), two of which are therein recorded for the first time: *D. santacatarinae* Irmeler, belonging to the *D. verhaaghi*-group (species group recorded for the first time from the Brazilian Amazon), and *D. parvulus* Kraatz (species for the first time recorded from the state of Pará) and *D. cleidecostae* Caron & Navarro sp. nov.

### *Diochus santacatarinae* Irmeler, 2017 (Figs. 4, 7-9, 18-19)

*Diochus santacatarinae* Irmeler, 2017: 34 (original description, type locality: "Brazil: Santa Catarina").

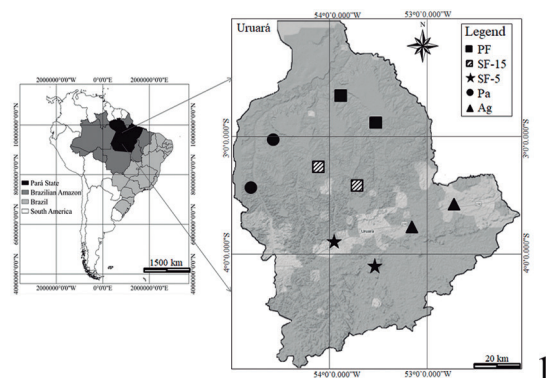
Holotype (not seen) deposited in Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (SDEI) (Irmeler, 2017).

**Material examined:** "Brasil, Pará, Uruará / Cap5 [secondary vegetation with five years of regeneration], VI-2015, / Intermediário [collection information], Serrapilheira [Forest litter] / Reinaldo, Wully, Sidi, col." [white label, printed in black] (6 ♂ dissected, 4 ♀ dissected, DZUP). "Brasil, Pará, Uruará / Cap15 [secondary vegetation with 15 years

**Table 1.** *Diochus* species groups and valid species recorded from the Brazilian Amazon.

<b>Diochus inornatus-group</b>	<b>Diochus longicornis-group</b>
<i>D. amazonensis</i> Irmeler, 2017	<i>D. longicornis</i> Sharp, 1876
<i>D. hanagarthi</i> Irmeler, 2017	<i>D. tarsalis</i> Sharp, 1876
<i>D. inornatus</i> Sharp, 1885	
<i>D. novus</i> Irmeler, 2017	<b>Diochus maculicollis-group</b>
<i>D. tricolor</i> Irmeler, 2017	<i>D. peruvianus</i> Irmeler, 2017
<i>D. vicinus</i> Sharp, 1876	
<b>Diochus verhaaghi-group</b>	<b>Diochus nanus-group</b>
<i>D. santacatarinae</i> Irmeler, 2017	<i>D. cleidecostae</i> Caron & Navarro sp. nov.
	<i>D. parvulus</i> Kraatz, 1860

of regeneration], VI-2015, / Intermediário [collection information], / Serrapilheira [Forest litter] / Reinaldo, Wully, Lucas, / Sidi, col." [white label, printed in black] (2 ♂ dissected, DZUP). "Brasil, Pará, Uruará / Cacau [cocoa plantations, *Theobroma cacao* L.], II-III-2015, / Inverno [winter season], Serrapilheira [Forest litter] / Reinaldo, Wully, Lucas, col." [white label, printed in black] (3 ♂, DZUP). "Brasil, Pará, Uruará / Mata [Native Vegetation], VI-2015, / Intermediário [collection information], / Serrapilheira [Forest litter] / Reinaldo, Wully, Lucas, / Sidi, col." [white label, printed in black] (1 ♀, DZUP). "Brasil, Pará, Uruará



**Figures 1-3.** (1) Municipality of Uruará, state of Pará, northern Brazil (PF, primary forest; SF-15, secondary forest with 15 years of regeneration; SF-5, secondary forest with five years of regeneration; Ag = agriculture; Pa = pasture for extensive livestock). (2) Detail of primary forest. (3) Detail of agriculture (cocoa plantations, *Theobroma cacao* L.).

/ Mata [Native Vegetation], IX-X-2015, / Verão [summer season], Serrapilheira [Forest litter] / Reinaldo, Wully, Lucas, / Sidi, col." [white label, printed in black] (1 ♂, 2 ♀, DZUP). "Brasil, Pará, Uruará / Mata [Native Vegetation], II-III-2015, / Inverno [winter season], Serrapilheira [Forest litter] / Reinaldo, Wully, Idielson, / col." [white label, printed in black] (1 ♂, DZUP).

**Diagnosis and description:** See Irmeler (2017: 34-35).

**Remarks:** The specimens from Pará, identified as *Diochus santacatarinae*, have similar aedeagus (mainly parameres) and spermatheca as those illustrated by Irmeler (2017) (Figs. 7-9). However, the males have the sternum VIII with posterior margin emarginate at the middle, whereas the females have the sternum VIII with posterior margin broad, curved and slightly acute at the middle (Figs. 18-19). The male and female sternum VIII were not described by Irmeler (2017). In the same way, Smetana (1982) and Zhou & Zhou (2016) have not discussed the male and female sternum VIII for *Diochus*. Smetana (1977) illustrated the emarginate posterior margin of sternum VIII of the male of *D. nanus* Erichson, but did not discuss it for the females. Naomi (1989) commented about the sexual dimorphism on sternum VIII in many rove beetle groups, but not explicitly for *Diochus*. Chatzimanolis & Engel (2011) described the fossil species *D. electrus* based on a female in which the sternum VIII shows no secondary sexual structures (maybe with posterior margin rounded or at least not emarginate). We believe that the sexual dimorphism on sternum VIII in *Diochus* is common and might also occur in other species of the genus.

The specimens of *D. santacatarinae* studied here were found in forest litter of cocoa plantations (*Theobroma ca-*

*cao* Linnaeus) (Fig. 3), secondary vegetation (five and 15 years of regeneration) and native vegetation (Fig. 2).

*Diochus santacatarinae* was previously known from French Guiana, Ecuador, Peru and southern Brazil (Santa Catarina state). The species is recorded for the first time from Pará state, in northern Brazil.

***Diochus parvulus* Kraatz, 1860**  
(Figs. 5, 10-14)

*Diochus parvulus* Kraatz, 1860: 27 (original description, type locality: "Bahia"); Bernhauer & Schubert, 1914: 319 (catalogue, as valid species); Blackwelder, 1943: 456 (mention as synonym of *D. nanus* Erichson); Blackwelder, 1944: 143 (catalogue, as synonym of *D. nanus* Erichson); Herman, 2001: 2447 (catalogue, as synonym of *D. nanus* Erichson); Irmeler, 2017: 39 (re-description, as valid species).

Holotype (not seen) deposited in Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (SDEI) (Irmeler, 2017).

**Material examined:** "Brasil, Pará, Uruará / Mata [Native vegetation], VI-2015, / Intermediário [collection information], / Pitfall banana / Reinaldo, Wully, Lucas, / Sidi, col." [white label, printed in black] (1 ♂, dissected, DZUP). "Brasil, Pará, Uruará / Pastagem [Pasture for extensive livestock], VI-2015, / Intermediário [collection information], / Serrapilheira [Forest litter] / Reinaldo, Wully, Idielson, / col." [white label, printed in black] (1 ♀, dissected, no head, DZUP).

**Diagnosis and description:** See Irmeler (2017: 39-41).

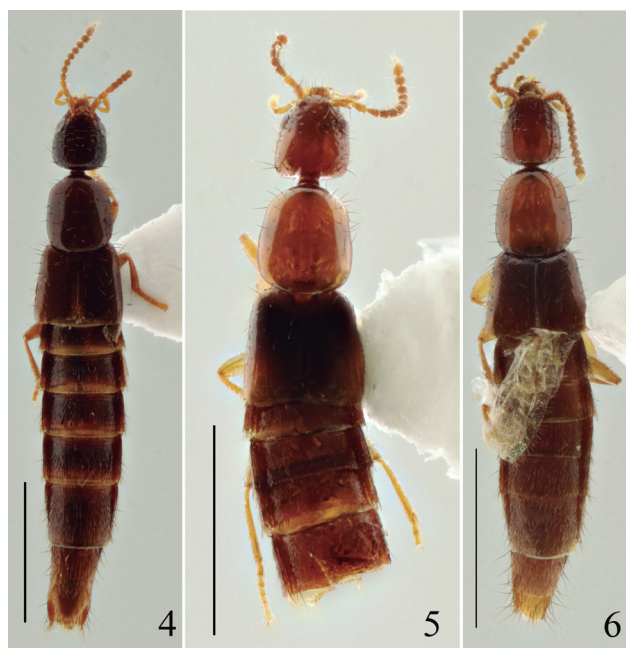
**Remarks:** The specimens from Pará, identified as *Diochus parvulus*, have similar aedeagus (mainly parameres) and spermatheca as those illustrated by Irmeler (2017) (Figs. 10-14). However, similarly to *Diochus santacatarinae*, the male of *D. parvulus* has the sternum VIII with posterior margin emarginate at the middle, whereas the female has the sternum VIII with posterior margin broad curved and slightly acute at the middle.

The specimens of *D. parvulus* were collected using the winkler method in forest litter of pasture for extensive livestock and using pitfalls baited with banana in native vegetation (Fig. 2).

*Diochus parvulus* was previously known from Venezuela, Ecuador, Paraguay, Argentina and Brazil (from the states of Amazonas, Mato Grosso, Rio de Janeiro and Santa Catarina). The species is recorded for the first time from the state of Pará.

***Diochus cleidecostae* Caron & Navarro sp. nov.**  
(Figs. 6, 15-17, 20-22)

**Type material:** HOLOTYPE (♂, DZUP): "Brasil, Pará, Uruará / Cap5 [secondary vegetation with five years of

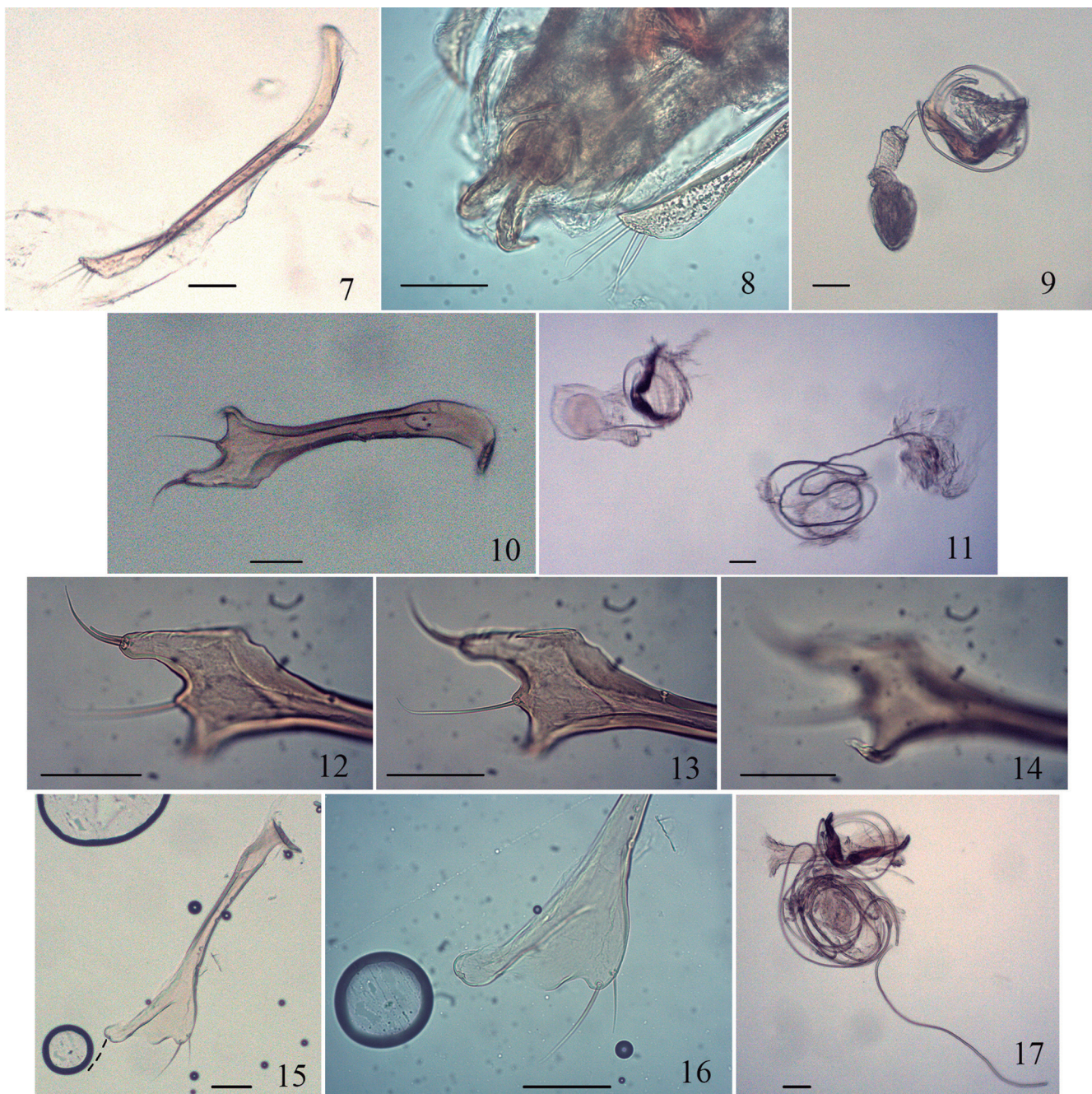


**Figures 4-6.** Habitus (dorsal). (4) *Diochus santacatarinae* Irmeler; (5) *D. parvulus* Kraatz; (6) *D. cleidecostae* Caron & Navarro sp. nov., paratype (female). Scale bars: 1 mm.

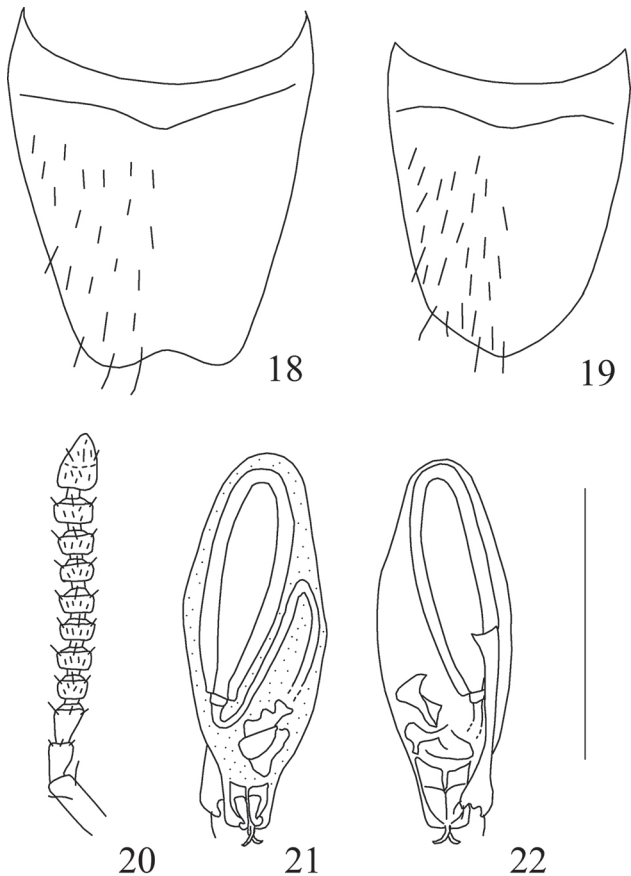
regeneration], VI-2015, / Intermediário [collection information], Serrapilheira [Forest litter] / Reinaldo, Wully, Sidi, col." [white label, printed in black]; "HOLOTYPE / *Diochus cleidecostae* Caron & Navarro / det. E. Caron, 2019" [red label, printed in black]. PARATYPES: the first label as the holotype; "PARATYPE / *Diochus cleidecostae* Caron & Navarro / det. E. Caron, 2019" [yellow label, printed in black] (2 ♂, 2 ♀, DZUP and 1 ♂, 1 ♀, MZSP). "Brasil, Pará, Uruará / Mata [native vegetation], IX-X-2015, / Verão [summer season], Pitfall-carne [fresh meat] / Reinaldo, Wully, Lucas, / Sidi, col." [white label, printed in black]; "PARATYPE / *Diochus cleidecostae* Caron & Navarro / det. E. Caron, 2019" [yellow label, printed in black] (1 ♀, DZUP).

**Diagnosis:** Within *Diochus* nanus-group, *D. cleidecostae* Caron & Navarro sp. nov. differs from *D. apicipennis* Cameron, *D. nanus* and *D. perplexus* Cameron by having an aedeagus with clearing trifurcate apex of parameres (parameres bifurcate at the apex in *D. apicipennis*, *D. nanus* and *D. perplexus*), and differs from *D. parvulus* by having three apical long setae of parameres distributed on ventral and dorsal lobes, and without long setae on medial lobe (one of three apical long setae on medial lobe in *D. parvulus*).

**Description: Male:** Maximum body length: 3.00 mm; maximum elytral width: 0.56 mm. Body light brown to



**Figures 7-17.** Dissected parts, microscope photographs. (7-9) *Diochus santacatarinae* Irmiler: (7) Paramere; (8) Apex of aedeagus; (9) Spermatheca; (10-14) *D. parvulus* Kraatz: (10) Paramere; (11) Spermatheca; (12) Apex of paramere, focusing on ventral lobe; (13) Apex of paramere, focusing on median lobe; (14) Apex of paramere, focusing on dorsal lobe. (15-17) *D. cleidecostae* Caron & Navarro sp. nov.: (15) Paramere (dashed line indicates lost seta); (16) Apex of paramere; (17) Spermatheca. Scale bars: 0.06 mm.



**Figures 18-22.** Dissected parts, drawings. (18-19) *D. santacatarinae* Irmiler: (18) Sternite 8 of male, ventral; (19) Sternite 8 of female, ventral; (20-22) *D. cleidecostae* Caron & Navarro sp. nov.: (20) antenna; (21) Aedeagus, dorsal; (22) Aedeagus, ventral. Scale bars: 0.5 mm.

brown, elytra darker (Fig. 6); appendices yellowish, antennae slightly darker than other appendices; antennomere 11 with apical half lighter than basal half. **Head:** Head longer than wide, length 0.40 mm, width 0.34 mm; eyes prominent, 0.11 mm long; temples twice as long as eyes; EL : HL = 0.28; temples parallel, PW : EW = 1.18; posterior angles rounded. Dorsal surface of head slightly microsculptured, vertex impunctate midline, convergent row of four punctures from anterior edge of eyes to middle of vertex, postocular area and at posterior marginal area more setiferous punctures. Antennae slightly longer than head; antennomere 1 nearly as long as 2-3 combined; 2 as long as 3; 3 one-fourth longer than 4; 4-10 wider than long, with same length, slightly increasing in width; 10 around twice wider than long; 11 nearly wider than 10 and length of 9-10 combined (Fig. 20). Gular plate with sides divergent towards anterior margin. **Thorax:** Pronotum longer than wide, 0.50 mm long and

0.44 mm wide; anterior and posterior angles rounded; anterior third strongly convergent. Dorsal surface of pronotum glossy; adjacent to wide impunctate midline with row of three punctures; interstice between anterior pair twice as wide as interstices between posterior pairs; four additional punctures laterad; several setiferous punctures along lateral margin. Elytra wider than long, 0.44 mm long, 0.56 mm wide; sides divergent towards posterior margin; posterior margin slightly emarginate. Elytra glossy, setiferous punctures in irregular rows; first row of five punctures adjacent to suture line; two additional rows laterad; interstice between two rows on disc much closer than between row at suture and first row on disc. Hind wings developed. Tarsal formula 5-5-5; fore tarsomeres 1-4 strongly dilated; mid and hind tarsomeres 1-4 clearing decreasing in length; mid and hind tarsomeres 5 nearly the length of 3-4 combined. **Abdomen:** Abdominal segments III-VI with sides subparallel, VII-VIII clearing convergent to posterior margin; densely pubescent. Posterior margin of tergum VIII truncate at middle two-fourths. Posterior margin of sternum VIII emarginate at the middle. Tergum X separating tergum IX in two equal parts. Tergum IX with elongate ventral struts. Posterior margin of sternum IX emarginate at the middle. Posterior margin of tergum X rounded. Aedeagus twice as long as wide (Figs. 21-22); seminal vesical of endophallus diagonal, 0.62 times as long as central lobe; basal inner duct shortly looped; complex of sclerotised apical forceps; central lobe with acute and crossed apical hooks. Parameres well-developed, each widened and forming large plate at the apex, trifurcate; three apical long setae, two on ventral lobe and one on dorsal lobe (Figs. 15-16).

**Female:** Similar to male, except for posterior margin of sternum VIII broadly rounded; tergum IX without ventral struts; sternum IX consisting of pair of hemisternites; spermatheca small with capsule of subspherical shape; bursa copulatrix in lateral position to coiled approximately circular duct (Fig. 17).

**Biological notes:** The specimens of *D. cleidecostae* sp. nov. were found in forest litter secondary vegetation (five years of regeneration) and native vegetation (Figs. 1, 2).

**Etymology:** The specific name “cleidecostae” is formed from a personal name and treated as noun in the genitive case (ICZN, 1999, art. 31.1). The specific name honors the Brazilian coleopterologist Dr Cleide Costa, from MZSP and specialist of immature insects.

**Key to males of the Neotropical species of *Diochus* belonging to the *D. nanus*-group  
(Adapted from Irmiler, 2017, through the couplets 27 to 29)**

1. Eyes small, EL : HL ratio 0.21 (Irmiler, 2017: fig. 45E); parameres broadly curved at the apex (Irmiler, 2017: fig. 37B). Guadeloupe and Saint Vincent..... *D. apicipennis* Cameron
- Eyes larger, EL : HL ratio 0.27-0.28 (Figs. 5-6); parameres bifurcate or trifurcate at the apex ..... 2
2. Parameres trifurcate at the apex, with dorsal, medial and ventral lobes ..... 3

- Parameres clearing bifurcate at the apex, with dorsal and ventral lobes..... 4
3. Body yellow with anterior half of elytra black (Fig. 5); trifurcate parameres with one apical long setae on medial lobe (Figs. 10, 12-14). Venezuela, Ecuador, Brazil, Paraguay and Argentina ..... *D. parvulus* Kraatz
- Body light brown to brown, anterior half of elytra not distinctly darker than posterior half (Fig. 6); trifurcate parameres without apical setae on medial lobe (Figs. 15-16). Brazil ..... *D. cleidecostae* Caron & Navarro sp. nov.
4. Apical incision of parameres short and acute (Irmeler, 2017: fig. 34B), pronotum polished without remains of microsculpture. Barbados, Cuba, Grenada, Guadeloupe, Dominican Republic, Puerto Rico, British Virgin Islands, Trinidad, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Venezuela, Colombia, Guyana, French Guiana, Ecuador, Peru ..... *D. perplexus* Cameron
- Apical incision of parameres deep and obtuse (Irmeler 2017: fig. 35B), pronotum shiny with remains of microsculpture on anterior half. Costa Rica, Panama, Colombia, Suriname and Saint Thomas ..... *D. nanus* Erichson

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