**ABSTRACT:** Diaphorocleidus orthodaus n. sp. and Diaphorocleidus kabatai (Molnar, Hanek and Fernando, 1974) Jogunooiri, Kritsky, and Venkatanarasiah, 2004 are detailed from Astyanax orthodaus and Astyanax aeneus, respectively. Palomibtrema heteroancistrium (Price and Bussing, 1968) is described from specimens collected from A. aeneus, and Urocleidoides strombicirrus (Price and Bussing, 1967) is reported for the first time from A. aeneus and Astyanax fasciatus in Panama. Characithecium costaricensis (Price and Bussing, 1967) n. comb. is detailed based on specimens from A. aeneus. Characithecium costaricensis is characterized by having overlapping gonads, a medioventral vaginal aperture, a copulatory complex consisting of single counterclockwise coil of the copulatory organ that is articulated to the accessory piece, and a haptor having 2 pairs of anchors, dorsal and ventral bars, and 14 hooks. Measurements of body size varied substantially among individual worms, both within and across different host species and locations. However, the morphological differences were insufficient to separate species of Characithecium. This result suggests limited parasite speciation across sympatric species of Astyanax in Mexico and Panama.

**Urocleidoides** Mizelle and Price, 1964, was erected for a species that infected *Poecilia reticulata* (Poeciliidae) in a California aquarium. Mizelle et al. (1968) emended it by adding gonads overlapping or tandem, male copulatory organ coiled with a single or multiple rings, 1 or 2 prostatic reservoirs, and vaginal pore on the left side of the body or absent. *Urocleidoides* included species from fishes in 5 orders (Atheriniformes, Characiformes, Gymnotiformes, Perciformes, and Siluriformes) until Kritsky et al. (1986) emended *Urocleidoides* and restricted it to species having a sinistral vaginal sclerite. Kritsky et al. (1986) transferred several species to *Gnassevia* Kohn and Papern, 1964, and designated 22 species as incertae sedis, including the 5 dactylogyrids: *Urocleidoides costaricensis* Price and Bussing, 1967; *Urocleidoides heteroancistrium* Price and Bussing, 1968; *Urocleidoides kabatai* Molnar, Hanek, and Fernando, 1974; *Urocleidoides strombicirrus* Price and Bussing, 1967; and *Urocleidoides trinidadensis* Molnar, Hanek, and Fernando, 1974, all of which infect species of *Astyanax* (Characiformes). Since the emendation by Kritsky et al. (1986), 10 of those 22 species incertae sedis in *Urocleidoides* have been reassigned. We detail 5 monogenoideans from *Astyanax fasciatus* (Cuvier, 1819), *A. aeneus* (Gu¨nther, 1860), *A. orthodus* (Dussumier, 1870), and the Smithsonian Tropical Research Institute Freshwater Fish Collection, United States National Parasite Collection, Beltsville, Maryland (USNPC) and the National Helminthological Collection of Mexico (CNHE), Institute of Biology, National Autonomous University of Mexico, Mexico. Host names are from FishBase (Froese and Pauly, 2008) and the Smithsonian Tropical Research Institute Freshwater Fish Collection (Bermingham et al., 1997).

**DESCRIPTION**

*Characithecium* n. gen.

**Diagnosis:** Dactylogyridae Bychowsky, 1933. Body comprising cephalic region, trunk, peduncle, and haptor. Peduncle smooth. Two terminal and 2 bilateral cephalic lobes present; 3 pairs of bilateral head organs present; cephalic glands uncellular, lateral, or posterolateral to pharynx. Four eyes. Mouth subterminal, midventral; pharynx comprising muscular or glandular bulb; esophagus short; 2 intestinal ceca, confluent posterior to gonads, lacking diverticula. Common gonadal pore medioventral, near level of intestinal bifurcation. Gonads intercecal, overlapping (testis dorsal to germarium); ovary ventral or anteroventral to testis. Vas deferens apparently looping left intestinal cecum; seminal vesicle a simple dilation of vas deferens; single prostatic reservoir. Copulatory complex comprising proximally articulated male copulatory organ (MCO) and accessory piece. MCO tubular, sclerotized, comprising a base from which a coiled shaft in counterclockwise direction arises; accessory piece with complex distal region associated with terminal portion of MCO. Seminal receptacle pregermarial; vaginal aperture midventral. Vitellaria coextensive with intestine. Haptor globose, with 7 pairs of hooks with Dactylogyridae distribution and 2 anchor-bar complexes. Ventral anchor larger than dorsal anchor. Ventral bar with posteromedial projection. Hooks similar, each with depressed thumb, delicate point, and shank comprising 2 subunits (proximal subunit expanded). Infecting gill of neotropical characiforms.

**TAXONOMIC SUMMARY**

**Type species:** *Characithecium costaricensis* (Price and Bussing, 1967) n. comb. from *A. aeneus* (Gu¨nther, 1860) in southeast Mexico.

**Etymology:** The genus name is for the host family Characidae and *theckium*, meaning a “little box” or “small case,” and is in reference to the host family Characidae.

**MATERIALS AND METHODS**

Fish were collected by electrofishing and cast netting during August 2006 and 2007 from 2 cenotes (Chaaamac [20°51’53”N, 90°09’18”W] and Dzonot Cervera [21°22’36”N, 88°49’59”W]) in southeast Mexico and 7 rivers (Agua Claras at its confluence with the Bayano Lake [09°15’05.1”N, 78°41’1.2”W], Caldera [08°38’18”N, 82°23’36”W], Cardenas [09°60’17.5”N, 71°34’11.5”W], Chiriquito [08°41’14”N, 82°17’27”W], Nigua [09°16’44”N, 82°24’55”W], Pirati [09°03’36”N, 78°39’57”W], and Quebrada Traicionera [09°08’20.1”N, 82°18’25.0”W]) from the Republic of Panama. The collection, preparation, and descriptions of helminths follow Mendoza-Franco et al. (2007). Additional specimens were mounted unstained in Gray and Wess’s medium to examine the sclerotized structures. Measurements, all in micrometers (μm), represent straight-line distances between extreme points and are expressed as the mean followed by the range and number (n) of structures measured in parentheses; body length includes the haptor. Numbering of hook pairs follows Mizelle (1936) and Mizelle and Price (1963). Type and voucher specimens have been deposited in the United States National Parasite Collection, Beltsville, Maryland (USNPC) and the National Helminthological Collection of Mexico (CNHE), Institute of Biology, National Autonomous University of Mexico, Mexico. Host names are from FishBase (Froese and Pauly, 2008) and the Smithsonian Tropical Research Institute Freshwater Fish Collection (Bermingham et al., 1997).

**Fish** were collected by electrofishing and cast netting during August 2006 and 2007 from 2 cenotes (Chaaamac [20°51’53”N, 90°09’18”W] and Dzonot Cervera [21°22’36”N, 88°49’59”W]) in southeast Mexico and 7 rivers (Agua Claras at its confluence with the Bayano Lake [09°15’05.1”N, 78°41’1.2”W], Caldera [08°38’18”N, 82°23’36”W], Cardenas [09°60’17.5”N, 71°34’11.5”W], Chiriquito [08°41’14”N, 82°17’27”W], Nigua [09°16’44”N, 82°24’55”W], Pirati [09°03’36”N, 78°39’57”W], and Quebrada Traicionera [09°08’20.1”N, 82°18’25.0”W]) from the Republic of Panama.

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**CHARACITHECIUM N. GEN.**
the close host-parasite relationship of this taxon to Neotropical characiforms.

**Remarks**

*Characthecium* n. gen. is primarily characterized by having: (1) eyes; (2) overlapping gonads (testis dorsal to germarium); (3) a seminal vesicle formed by a simple dilation of the vas deferens; (4) an articulated MCO and accessory piece; (5) MCO with a coiled shaft in counter-clockwise direction; (6) vaginal aperture in midventral position; (7) ventral anchor larger than dorsal anchor; (8) ventral bar with postero medial projection; and (9) hook shanks, each composed of 2 subunits (proximal subunit expanded). *Characthecium* is most similar to *Ancistrohaptor* Agarwal and Kritsky, 1998, a genus including species that infect *Triportheus* spp. by having eyespots, overlapping gonads, an accessory piece articulated to base of MCO, ventral anchor larger than dorsal anchor, and hook shanks composed of 2 subunits. However, *Characthecium* differs from *Ancistrohaptor* at least by having a medioventral vaginal aperture and a postero medial projection on the ventral bar and by lacking an anteromedial groove on the ventral bar (present in *Ancistrohaptor* spp.).

**Characthecium costaricensis** (Price and Bussing, 1967) n. comb.

(Figs. 1–10)

Supplemental observations (measurements based on 16 specimens from Chaamac and on 2 from Dzonot Cervera [brackets]; Body 280 (215–370; n = 11) [330] long, fusiform; greatest width 80 (54–100; n = 11) [88–95], usually at level of testis. Cephalic margin broad; cephalic lobes moderately developed; each head organ (see HO in Fig. 1) made up of groupings of terminations of cephalic gland (see Fig. CG in Fig. 1) ducts. Eyes subequal. Pharynx spherical, 16 (13–18; n = 9) [20] in diameter. Peduncle broad, relatively short; haptor 62 (55–72; n = 10) [70–72] wide. Ventral anchor 34 (33–35; n = 19) [38 (36–40; n = 31)] long, with elongate superficial root, short deep root, slightly straight shaft, moderately elongate point; base 17 (17–18; n = 8) wide. Dorsal anchor 28 (28–29; n = 10) [27] long, with tapered elongate superficial root, slightly straight shaft, moderately elongate point; base 14 (14–15; n = 5) wide. Ventral bar 21 (19–24; n = 10) [22] long, slightly arched posteriorly with expanded distal tips, bearing acute postero medial projection. Dorsal bar 24 (23–25; n = 8) [22] long, slender, slightly arced posteriorly, with rounded tips. Hooks similar; each with protruding thumb, delicate shaft having a point and dilated shank; hook pairs 1 and 5 reduced in size; filamentous hooklet (FH) loop protruding thumb, delicate shaft having a point and dilated shank; hook slightly arced posteriorly, with rounded tips. Hooks similar; each with elongate superficial root, short deep root, slightly straight shaft, moderately elongate point; base 17 (17–18; n = 8) wide. Dorsal anchor 28 (28–29; n = 10) [27] long, with tapered elongate superficial root, slightly straight shaft, moderately elongate point; base 14 (14–15; n = 5) wide. Ventral bar 21 (19–24; n = 10) [22] long, slightly arched posteriorly with expanded distal tips, bearing acute postero medial projection. Dorsal bar 24 (23–25; n = 8) [22] long, slender, slightly arced posteriorly, with rounded tips. Hooks similar; each with protruding thumb, delicate shaft having a point and dilated shank; hook pairs 1 and 5 reduced in size; filamentous hooklet (FH) loop protruding thumb, delicate shaft having a point and dilated shank; hook slightly arced posteriorly, with rounded tips.

**Nigeria**

**Quebradita**

*Characithecium* 

**Remarks**

Host and locality: *Astyanax aeneus* (Günther, 1860) (Characiformes: Characidae), Chaamac cenote (20°51’53”N, 90°09’18”W) in southeast Mexico.

*Study of infection: Gills.*

Other host and localities: Dzonot Cervera cenote in Mexico and Nigua River in Panama.

*Other localities: Dzonot Cervera cenote in Mexico and Nigua River in Panama.*

**Synonyms:** Urocleidoides costaricensis (Price and Bussing, 1967) Kritsky and Leboy, 1972 from *A. fasciatus* (type host) in Colombia; Urocleidoides *astyanacis* Goia, Silva-Corredor and Toledo-Artigas, 1988 from *A. fasciatus* (Cuvier, 1819) and *Astyanax scabripinnis* Jenuyns, 1842 from Atibaia and Jaguari rivers, and tributaries near Campinas, São Paulo state, Brazil (Goia et al., 1988).

**Table I. Comparative measurements (in micrometers; mean with range in parentheses; n = number of structures measured) of Characthecium costaricensis (Price and Bussing, 1967) from 3 species of Astyanax from 6 rivers in Panama.**

<table>
<thead>
<tr>
<th>Morphological structures</th>
<th>A. aeneus</th>
<th>A. ruberimus</th>
<th>A. fasciatus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body length</td>
<td>246 (195–322; n = 16)</td>
<td>202 (151–250; n = 15)</td>
<td>287 (240–330; n = 15)</td>
</tr>
<tr>
<td>Greatest width</td>
<td>91 (60–105; n = 12)</td>
<td>64 (60–90; n = 9)</td>
<td>125 (100–150; n = 12)</td>
</tr>
<tr>
<td>Pharynx</td>
<td>16 (14–18; n = 12)</td>
<td>10 (8–12; n = 9)</td>
<td>15 (12–18; n = 12)</td>
</tr>
<tr>
<td>Ventral anchor length</td>
<td>32 (28–35; n = 10)</td>
<td>32 (28–35; n = 10)</td>
<td>32 (28–35; n = 10)</td>
</tr>
<tr>
<td>Ventral anchor width</td>
<td>13 (11–14; n = 12)</td>
<td>13 (11–14; n = 12)</td>
<td>13 (11–14; n = 12)</td>
</tr>
<tr>
<td>Dorsal anchor length</td>
<td>27 (24–26; n = 10)</td>
<td>27 (24–26; n = 10)</td>
<td>27 (24–26; n = 10)</td>
</tr>
<tr>
<td>Dorsal anchor width</td>
<td>14 (12–15; n = 12)</td>
<td>14 (12–15; n = 12)</td>
<td>14 (12–15; n = 12)</td>
</tr>
<tr>
<td>Hook pair 1</td>
<td>16 (13–17; n = 12)</td>
<td>16 (13–17; n = 12)</td>
<td>16 (13–17; n = 12)</td>
</tr>
<tr>
<td>Hook pair 2</td>
<td>22 (19–24; n = 10)</td>
<td>22 (19–24; n = 10)</td>
<td>22 (19–24; n = 10)</td>
</tr>
<tr>
<td>Hook pair 3</td>
<td>25 (22–28; n = 10)</td>
<td>25 (22–28; n = 10)</td>
<td>25 (22–28; n = 10)</td>
</tr>
<tr>
<td>Hook pair 4</td>
<td>28 (25–30; n = 10)</td>
<td>28 (25–30; n = 10)</td>
<td>28 (25–30; n = 10)</td>
</tr>
<tr>
<td>Accessory piece length</td>
<td>17 (14–18; n = 12)</td>
<td>17 (14–18; n = 12)</td>
<td>17 (14–18; n = 12)</td>
</tr>
</tbody>
</table>

**Taxonomic summary**

Host and locality: *Astyanax aeneus* (Günther, 1860) (Characiformes: Characidae), Chaamac cenote (20°51’53”N, 90°09’18”W) in southeast Mexico.

*Study of infection: Gills.*

Other host and localities: Dzonot Cervera cenote in Mexico and Nigua River in Panama.

*Other host and localities: Dzonot Cervera cenote in Mexico and Nigua River in Panama.*

Synonyms: *Urocleidoides costaricensis* (Price and Bussing, 1967) Kritsky and Leboy, 1972 from *A. fasciatus* (type host) in Colombia; *Urocleidoides astyanacis* Goia, Silva-Corredor and Toledo-Artigas, 1988 from *A. fasciatus* (Cuvier, 1819) and *Astyanax scabripinnis* Jenuyns, 1842 from Atibaia and Jaguari rivers, and tributaries near Campinas, São Paulo state, Brazil (Goia et al., 1988).

**Specimens deposited:** 11 voucher specimens in CNHE (6274, 6275, 6276); 9 in USNPC (100963, 100964, 100965).

**Remarks**

Kritsky and Thatcher (1974) reported with additional morphometrical data for this species based on specimens collected from *A. fasciatus* in Colombia. Kritsky et al. (1986) emended *Urocleidoides* and considered *U. costaricensis* incertae sedis. *Characithecium costaricensis* is commonly reported from southern and central Mexico and Nicaragua as *U. costaricensis* (Mendoza-Franco et al., 1999, 2003; Salgado-Maldonado et al., 2001). The description of *U. astyanacis* is identical to that of *Ch. costaricensis* and we consider *U. astyanacis* as a junior subjective synonym of *Ch. costaricensis*. Although *Ch. costaricensis* has been redescribed (Kritsky and Leiby, 1972) and reported several times as *U. costaricensis* in the Neotropics, the description is based solely on the sclerotized structures from the copulatory complex and the haptor. Herein, a partial illustration of whole mounted specimens is provided (Fig. 1) to confirm the position of some of the internal organs. Most signif-

**FIGURES 1–10.** *Characithecium costaricensis* (Price and Bussing, 1967) n. comb. from *A. aeneus* from southeast Mexico. (1) Whole mount (composite, ventral view; hooks not inked are in dorsal position). (2) Ventral anchor. (3) Dorsal anchor. (4) Ventral bar. (5) Dorsal bar. (6) Copulatory complex (dorsal). (7) Hook (pair 5). (8) Hook (pair 2). (9) Ventral anchor. (10) Dorsal anchor (these 2 latter structures are from *A. aeneus* from Panama). All figures are drawn to the 20-μm scale, except 1 (50-μm) and 9 and 10 (25-μm). Abbreviations: AP, accessory piece; BA, base; CG, cephalic glands; HO, head organs; MCO, male copulatory organ; SA, short articulation; SR, seminal receptacle; SV, seminal vesicle.
icantly, we report a medioventral vaginal aperture rather than a sinistral vagina as reported by Kritsky and Leiby (1972). We also report several new host species and geographical records for this species in Table I.

**Diaphorocleidus orthodusus n. sp.**

*(Figs. 11–18)*

Description (based on 14 slightly contracted specimens): Body 180–145 long, foliiform; greatest width 58–63 near level of testis. Cephalic margin broad; cephalic lobes moderately developed; 3 bilateral pairs of head organs and cephalic glands indistinct. Four eyes, subequal; few eye granules present in cephalic region. Pharynx subovate 14–15 in diameter. Peduncle broad; haptor hexagonal, 83 (76–92; n = 5) wide. Anchors similar; each with elongate superficial root, well-developed deep root, curved shaft, and short point; ventral anchor 36 (34–37; n = 23) long, base 20 (18–21; n = 19) wide; dorsal anchor 27 (25–28; n = 28) long, base 14 (14–15; n = 20) wide. Ventral bar 28 (25–28; n = 13) long, broadly U-shaped with enlarged terminations and a slight anteromedial and posteromedial indentation; dorsal bar 30 (27–31; n = 15) long, slender, broadly U-shaped, with terminations directed laterally. Hooks similar; each with protruding thumb, delicate shaft and point, dilated shank; hook pairs 1 and 5 reduced in size; FH loop 1/3 shank length (pairs 1 and 5), 1/3 shank length (pairs 2, 3, 4, 6, and 7); hook pairs 2, 3, 4, 6 and 7: 19 (17–20; n = 64) long; hook pairs 1 and 5: 14 (13–15; n = 24) long. MCO tubular, delicate, comprising a sinistral loop, base with spherical flange, diameter of a poorly defined ring 31 (25–35; n = 5). Accessory piece 25 (22–27; n = 14) long, round. Vaginal aperture sinistral. Seminal receptacle not observed. Gonads overlapping; testis dorsal, slightly visible at end of germarium; seminal vesicle a distal expansion of vas deferens; prostatic reservoir single. Oviduct, ootype, and uterus not observed. Vitellaria scattered throughout trunk, except in regions of reproductive organs.

**Taxonomic summary**

Type host: Astyanax orthodus Eigenmann, 1907 (Characiformes: Characidae).

Site of infection: Gills.

Type locality and collection date: Nigua river in Panama (09°16′44″N, 82°24′55″W), September 2006.

Specimens deposited: Holotype in CNHE (6277); 6 paratypes in CNHE (6278); and 7 in USNPC (100962).

Etymology: The specific name is for the host species.

**Remarks**

*Diaphorocleidus orthodusus* n. sp. most closely resembles *Diaphorocleidus armillatus* Jogunoori, Kritsky, and Venkatanarasaiyah, 2004 (type species of the genus) from the Neotropical *Gymnocorymbus ternetzi* (Characidae) by having anchors with elongate superficial root, but differs from this species at least by possessing an MCO comprising a sinistral loop (a coil of 2 counterclockwise rings in *D. armillatus*) and a base with a spherical flange (proximal and distal flanges in *D. armillatus*). This is the sixth named species of *Diaphorocleidus*-parasitizing characids and the second species of this parasite genus reported from the Neotropics (Jogunoori et al., 2004; Mendoza-Franco et al., 2007).

**Diaphorocleidus kabatalis** (Molnar, Hanek, and Fernandez, 1974)

Jogunoori, Kritsky, and Venkatanarasaiyah, 2004 (Figs. 19–33)

Supplemental observations (measurements based on 5 specimens from Chamaac and on 6 from Dzonot Cervera [brackets]): Body 270–298 [290 (248–347; n = 4)] long, fusiform; greatest width 90–105 [98 (80–115; n = 4)], usually at level of testis. Cephalic margin broad; cephalic lobes moderately developed; 3 bilateral pairs of head organs; cephalic glands present. Four eyes, subequal. Pharynx spherical 19–22 [22 (18–27; n = 4)] in diameter; esophagus short, peduncle broad; haptor subrectangular 68–70 [83 (68–90; n = 3)]. Ventral anchor 34 (30–34; n = 6) [36 (31–37; n = 11)] long, with elongate superficial root, deep root narrowing distally, short shaft and point; base 19 (19–20; n = 6) [24 (19–27; n = 10)] wide. Dorsal anchor 29 (27–30; n = 6) [31 (30–32; n = 8)] long, with well-developed base, moderately short shaft, short point; base 15 (n = 6) [19 (15–20; n = 8)] wide. Ventral bar 27 (25–29; n = 4) [37 (28–43; n = 7)] long, slender, broadly U-
shaped with enlarged terminations; dorsal bar 35 (34–36; n = 4) [44 (36–52; n = 6)] long, variable, U- to V-shaped, with terminations directed laterally. Hooks similar, each with protruding thumb, delicate shaft and point, dilated shank; hook pairs 1 and 5 reduced in size; FH loops ≈1½ shank length; hook pairs 2, 3, 4, 6, and 7: 19 (19–21; n = 9) [23 (19–24; n = 19)] long; hook pair 1: 16 (n = 3) [18 (17–18; n = 6)] long; hook pair 5: 14 (n = 2) [13 (13–14; n = 6)] long. MCO comprising a delicate coil of 1–½ counterclockwise rings, base with lateral flange, proximal ring diameter 13–15 [15–22]. Accessory piece 24 (20–26; n = 5) [29 (23–33; n = 6)] long, variable, distally pincershaped. Vaginal aperture sinistral, a delicate tube leading into small vesicle anterior to germarium. Gonads overlapping, germarium 30–45 [47 (34–55; n = 3)] long, 21 [21 (19–24; n = 3)] wide; testis dorsal, slightly visible at end of germarium; seminal vesicle a distal enlargement (expansion) of vas deferens; prostatic reservoir single. Oviduct, ootype, and uterus not observed. Vitellaria scattered throughout trunk, except in regions of reproductive organs. Measurements of specimens of *D. kabatai* from *Astyanax* spp. in Panama are provided in Table II.

**Taxonomic summary**

**Host and locality:** *Astyanax aeneus* Günther, 1860 (Characiformes: Characidae), Dzonot Cervera (21°22′36″N; 88°49′59″W) in southeast Mexico.

**Site of infection:** Gill

**Other localities:** Chaamac cenote in Mexico, and Nigua, Caldera, and Chiquitico Rivers in Panama.

**Remarks**

Kritsky et al. (1986) revised *Urocleidoides* and considered *U. kabatai* incertae sedis. Jogunoori et al. (2004) proposed *Diaphorocleidus* as a new species, *D. amyllus* from *G. ternetzi* (Characidae), and transferred several species in incertae sedis from *Urocleidoides* (s. l.) into *Diaphorocleidus* on the basis of those species having: (1) overlapping gonads; (2) an unarticulated copulatory organ and accessory piece; (3) a coiled MCO with counterclockwise rings; and (4) a sinistroversal vaginal aperture. Thus, Jogunoori et al. (2004) considered *U. kabatai* a species of *Diaphorocleidus*, based on the copulatory complex described above. Based on comparisons of our current material with the original drawings of *Urocleidoides anops* (Figs. 19–23 in Men-doza-Franco et al., 1999) and *Ancycrocephalinae* gen. sp. (Figs. 11–18 in Mendoza-Franco et al., 2003), all specimens appear to be identical to *D. kabatai*, suggesting that *U. anops* and *Ancycrocephalinae* gen. sp. were previously misidentified (see Figs. 19–33 and Table II).

**Palombitrema heteroancistrium** (Price and Bussing, 1968) **Suriano 1997**

(Figs. 34–45)

Supplemental observations (measurements based on 12 specimens from Chaamac and on 35 specimens from Dzonot Cervera [brackets]):

Body 355 (285–480; n = 44) [59 (58–82; n = 6)] long, fusiform; greatest width 103 (94–110; n = 9) [98 (75–127; n = 34)] usually at the level of testis. Cephalic margin broad; cephalic lobes moderately shaped. Four eyes, subequal. Pharynx spherical, 19 (16–23; n = 12) [21 (17–23; n = 33)] in diameter; esophagus moderately long. Peduncle broad; haptor subrectangular, 69 (62–85; n = 8) [75 (65–88; n = 38)] wide. Ventral anchor 18 [18–19 (n = 10)] long, with well-differentiated roots, slightly depressed superficial root, short tapered deep root, curved shaft, short in comparison to base 13 [12–15; n = 10] wide. Dorsal anchor 27–28 (n = 6) [27 (26–28; n = 14)] long, having poorly differentiated deep root and curved shaft bearing short point; base 12–15 [15 (14–16; n = 11)] wide. Ventral bar 23 (21–26; n = 4) [22 (20–32; n = 16)] long, broadly V-shaped with expanded terminations and a slight posteroventral indentation; dorsal bar 30 (28–33; n = 5) long, variable, rod or slightly U-shaped, with terminations directed laterally. Hooks dissimilar; each with delicate shaft and point, dilated shank; FH loop ½–1½ shank length; hook pairs 2, 3, 4, and 8: 18 (n = 3) [16 (16–17; n = 14)] long; hook pair 6: 10–11 [11 (10–12; n = 11)] long; hook pair 7: 33 (31–34; n = 4) long; hook pairs 1 and 5: 11 (10–12; n = 8) long. MCO a delicate coiled tube of about 1½ poorly defined counterclockwise rings, base with lateral flange, diameter of the proximal ring 17 (17–19; n = 4). Accessory piece 26 (23–29; n = 8) long, flabellate, comprising 2 subunits, posterior to subunit connected to the base of MCO. Vagina sinistral, a well-sclerotized tortuous tube directed posteriorly, twisted before connecting to seminal receptacle; seminal receptacle small, medial, anterior to germarium. Gonads overlapping, germarium 52 (40–80; n = 8) [51 (38–67; n = 19)] long, 31 (27–35; n = 7) [30 (20–45; n = 27)] wide; testis dorsal, slightly visible at end of germarium 15 [12 (10–17; n = 6)] long, 14 [12 (10–14; n = 53)] wide; seminal vesicle a distal enlargement (expansion) of vas deferens; prostatic reservoir single; oviduct, ootype, and uterus not observed. Vitellaria scattered throughout trunk, except in regions of reproductive organs; large glandular mass posterior to vitellaria. Measurements of specimens of *P. heteroancistrium* from *Astyanax* spp. in Panama are provided in Table III.

**Remarks**

Our supplemental observations are intended to complement Suriano’s (1997) redescription of *P. heteroancistrium*, which includes highly diagrammatic figures of the haptoral structures that do not accurately represent the morphology of anchors and hooks (Suriano’s Figs. 2, 3, and 6). Further, Suriano (1997) indicates that *P. heteroancistrium* has an “ovary anterior to testis,” while the drawing (Fig. 1 in that paper) depicts gonads in tandem. The gonads of *P. heteroancistrium* are clearly overlapping in specimens that we evaluated. Considering these discrepancies, we provide new illustrations, measurements, and morphological information for this species. For instance, the large glandular mass posterior to vitellaria observed in the present specimens of *P. heteroancistrium* (Fig. 34) may be associated with the haptor. This gland mass appears to be similar to that described for *Cichlidogyrus hallitypicus* Price and Kirk, 1967 and *Dupliclassorius andinus* Viozzi and Brugni, 2004 (see El-Naggar and Kearns, 1989; Viozzi and Brugni, 2004). To date, there are other 2 species of *Palombitrema* ( *Palombitrema chasmusense* [Suriano, 1981] Suriano, 1997 and *Palombitrema triangulum* [Suriano, 1981] Suriano, 1997 from *Curimata giberti* [Curimatidae] and *Oligosarcus jenynsii* [Characidae]) reported in Argentina. *Palom- bitrema heteroancistrium* has previously been reported in Costa Rica, Colombia, Nicaragua, and Mexico (Kritsky and Leiby, 1972; Kritsky and Thatcher, 1974; Mendoza-Franco et al., 1999, 2003); its occurrence in Panama represents a new geographical record.

*Urocleidoides strombificrus* (Price and Bussing, 1967) **Kritsky and Thatcher, 1974**

Supplemental observations: (see Table IV).

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Table III. Comparative measurements (in micrometers; mean with range in parentheses; n = number of structures measured) of Palombitrema heteroancistrium (Price and Bussing, 1968) Suriano 1997 (Monogenoidea: Dactylogyridae) from 2 species of Astyanax (Characidae) from 3 rivers in Panama.

<table>
<thead>
<tr>
<th>Morphological structures</th>
<th>Nigua</th>
<th>Quebrada</th>
<th>Piriai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body length</td>
<td>270</td>
<td>299 (268–337; n = 7)</td>
<td>306 (270–355; n = 20)</td>
</tr>
<tr>
<td>Greatest width</td>
<td>75</td>
<td>91 (66–105; n = 7)</td>
<td>80 (40–100; n = 21)</td>
</tr>
<tr>
<td>Pharynx</td>
<td>15</td>
<td>15 (13–16; n = 7)</td>
<td>18 (14–21; n = 23)</td>
</tr>
<tr>
<td>Haptor width</td>
<td>63</td>
<td>64 (50–75; n = 7)</td>
<td>66 (45–79; n = 22)</td>
</tr>
<tr>
<td>Ventral anchor length</td>
<td>20 (19–20; n = 4)</td>
<td>20 (19–21; n = 15)</td>
<td>17 (16–18; n = 20)</td>
</tr>
<tr>
<td>Ventral anchor length</td>
<td>12 (12–13; n = 4)</td>
<td>13 (12–15; n = 15)</td>
<td>12 (10–13; n = 20)</td>
</tr>
<tr>
<td>Dorsal anchor length</td>
<td>28 (27–30; n = 4)</td>
<td>29 (28–30; n = 16)</td>
<td>26 (25–26; n = 19)</td>
</tr>
<tr>
<td>Dorsal anchor length</td>
<td>14 (13–15; n = 4)</td>
<td>15 (14–18; n = 16)</td>
<td>12 (10–14; n = 18)</td>
</tr>
<tr>
<td>Ventral bar length</td>
<td>(23–25)</td>
<td>22 (18–26; n = 12)</td>
<td>22 (18–24; n = 9)</td>
</tr>
<tr>
<td>Dorsal bar length</td>
<td>(31–32)</td>
<td>31 (28–34; n = 7)</td>
<td>24 (22–27; n = 8)</td>
</tr>
<tr>
<td>Hook pairs 2, 3, and 4</td>
<td>16 (n = 3)</td>
<td>15 (14–16; n = 31)</td>
<td>14 (13–15; n = 27)</td>
</tr>
<tr>
<td>Hook pair 6</td>
<td>11 (n = 5)</td>
<td>11 (10–12; n = 29)</td>
<td>11 (10–12; n = 22)</td>
</tr>
<tr>
<td>Hook pair 7</td>
<td>29 (29–30; n = 4)</td>
<td>30 (28–33; n = 8)</td>
<td>26 (23–30; n = 19)</td>
</tr>
<tr>
<td>Male copulatory organ length</td>
<td>(15–20)</td>
<td>18 (17–20; n = 7)</td>
<td>15 (13–17; n = 5)</td>
</tr>
<tr>
<td>Accessory piece length</td>
<td>(22–26)</td>
<td>27 (24–30; n = 10)</td>
<td>32 (27–35; n = 11)</td>
</tr>
<tr>
<td>Germarial length</td>
<td>25</td>
<td>36 (32–42; n = 3)</td>
<td>28 (22–38; n = 3)</td>
</tr>
<tr>
<td>Germarial width</td>
<td>35</td>
<td>22 (21–25; n = 3)</td>
<td>19</td>
</tr>
</tbody>
</table>

Remarks
The morphometrical data presented in Table IV allowed us to identify this species as U. strombicirrus. After revision of Urocleidoides, this species was considered in incertae sedis by Kritsky et al. (1986). Since then, no generic reassignment has been made for U. strombicirrus, yet, it has been reported from Colombia and Nicaragua (see Mendoza-Franco et al., 2007; present study). Characithecium possesses only a single species, Ch. costaricensis (Price and Bussing, 1967) comb. n., which infects 3 host species of Astyanax across Central America, from southeastern Mexico to Panama. The body size of individual specimens of Ch. costaricensis varied substantially both within and across different host species and locations. However, the morphological differences were insufficient to designate or separate new species of Characithecium (see Table I). Similar morphometric differences, where morphologically identical specimens differ in size, have been found in other dactylogyrids (Kritsky et al., 1989, 2007). The continuous distribution of Ch. costaricensis on Astyanax spp. from South America to central Mexico (Salgado-Maldonado et al., 1967) comb. n., which infects 3 host species of Astyanax across Central America, from southeastern Mexico to Panama. The body size of individual specimens of Ch. costaricensis varied substantially both within and across different host species and locations. However, the morphological differences were insufficient to designate or separate new species of Characithecium (see Table I). Similar morphometric differences, where morphologically identical specimens differ in size, have been found in other dactylogyrids (Kritsky et al., 1989, 2007). The continuous distribution of Ch. costaricensis on Astyanax spp. from South America to central Mexico (Salgado-Maldonado et al.,

DISCUSSION
The 3 monogenoidean genera, Characithecium n. gen., Diaphorolecud, and Palombitrema (plus U. strombicirrus), are morphologically well separated. Diaphorolecud includes 6 species infecting hosts in Astyanax, Bryconops, Brycon, Gymnocorymbus, and Hemigrammus. Palombitrema includes 3 species infecting species of Curimata (Curimatidae) and Oligosar-
2001, 2004) suggest that dispersal across Central America has resulted in limited speciation within this genus. Similarly, the apparently low level of host specificity of *Ch. costaricensis* could also reduce the potential for speciation. While *Ch. costaricensis* reportedly infects only *Astyanax* spp. (Mendoza-Franco et al., 1999, 2003), a thorough examination of other fish genera within Characidae could increase our knowledge of the host specificity and diversification patterns of this species and other dactylogyrids that infect species of *Astyanax*.

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