Zootaxa 2689: 37–47 (2010)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

The snail-case caddisfly subgenus *Helicopsyche* (*Feropsyche*) in Costa Rica, with the description of 3 new species (Trichoptera: Helicopsychidae)

KJELL ARNE JOHANSON[1] & RALPH W. HOLZENTHAL[2]

[1]*Swedish Museum of Natural History, Entomology Department, Box 50007, SE-104 05 Stockholm, Sweden.*
E-mail: kjell.arne.johanson@nrm.se
[2]*Department of Entomology, University of Minnesota, 1980 Folwell Ave., Room 219, St. Paul, Minnesota, 55108, U.S.A.*
E-mail: holze001@umn.edu

Abstract

Thirteen species of *Helicopsyche*, subgenus *Feropsyche* (Trichoptera: Helicopsychidae) are recorded from Costa Rica, including 3 new species: *H. alajuela*, **n. sp.**, *H. dorsocurvata*, **n. sp.**, and *H. golfitoensis*, **n. sp.**, as well as 10 previously described species: *H. borealis* (Hagen), *H. chiriquensis* Johanson & Malm, *H. dampfi* Ross, *H. incisa* Ross, *H. lewalleni* Denning & Blickle, *H. mexicana* Banks, *H. rentzi* Denning & Blickle, *H. selanderi* Ross, *H. truncata* Ross, and *H. vergelana* Ross. The male genitalia of the new species are illustrated and distribution maps are provided for all species.

Key words: Trichoptera, Helicopsychidae, *Helicopsyche*, *Feropsyche*, new species, new species records, Costa Rica

Introduction

The snail-case caddisfly genus *Helicopsyche* von Siebold, 1856, is a moderately large genus with about 250 described species (Holzenthal *et al.* 2007, Morse 2008). The genus has been recorded from all major faunal regions, except Antarctica (Johanson 1998) and has the highest species diversity between 5–30°N and 15–45°S (Johanson 1997). With 30 described *Helicopsyche* species (Johanson 2006), the 17,000 km^2 large New Caledonian mainland has the highest density of species in the world. The 117 described species of New World *Helicopsyche* are included in 2 subgenera, *Cochliopsyche* Müller, 1885, and *Feropsyche* Johanson, 2002 (Flint *et al.* 1999; Flint & Sykora 2004; Johanson 2002, 2003a, 2003b, 2003c; Johanson & Holzenthal 2004; Johanson & Malm 2006). The first record of *Helicopsyche* (*Feropsyche*) from Costa Rica was given by Bueno-Soria & Flint (1978) who listed *H. vergelana* Ross, 1956, but without any locality data. A year later Denning & Blickle (1979) described *H. rentzi* from Guanacaste Province, Costa Rica, and Johanson (2002) presented more data from Costa Rica for that species. Holzenthal (1988) added *H. borealis* (Hagen, 1861) to the Costa Rican fauna and Johanson (2002) added more data including records from Cartago and Guanacaste Provinces. *Helicopsyche piroa* Ross, 1944, and *H. incisa* Ross, 1956, were recorded from Costa Rica for the first time by Johanson (2002), and *Helicopsyche vazquezae* (Flint, 1986) of the subgenus *Cochliopsyche* was recorded for the first time from Costa Rica by Holzenthal (1988) and Monson *et al.* (1988). Except for a work on the *Helicopsyche* of Venezuela (Johanson & Holzenthal 2004) and a treatment of the caddisflies of Hispaniola (Flint & Sykora 2004), there are no previously published data on Neotropical Helicopsychidae on a regional basis

Material and methods

This study is based on specimens housed in the University of Minnesota Insect Collection, St. Paul, Minnesota, USA (UMSP) and the National Museum of Natural History, Smithsonian Institution, Washington,

Accepted by J. Morse: 12 Nov. 2010; published: 26 Nov. 2010

DC, USA (NMNH). Types and other material examined are deposited in these collections as well as the Swedish Museum of Natural History, Entomology Department, Stockholm, Sweden (NHRS), and the Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica (INBIO). The material was collected between 1967 and 1998, with a major part collected between 1986 and 1991. Material from 35 localities is represented in this study, covering a major part of Costa Rica, including the provinces of Alajuela (7 localities), Cartago (6 localities), Guanacaste (6 localities), Limón (3 localities), San José (3 localities), Heredia (1 locality), and Puntarenas (9 localities). Complete locality records of all specimens housed in UMSP are available from http://www.entomology.umn.edu/museum/databases/BIOTAdatabase.html. A few specimens of *H. dampfi* were reared, following the methodology given in Jackson & Sweeney (1995). The specimens in alcohol were identified to species without initial treatment of the genitalia. The pinned specimens were identified after the abdomen was removed from the rest of the body and macerated in hot 8% KOH. The new species were temporarily mounted in Euparal on a microscope slide and illustrated using a drawing tube mounted on a Leitz Ortholux II light microscope. The individual illustrations were scanned on an Epson Perfection V700 scanner at 600 dpi (grayscale) and mounted on plates in Adobe® Photoshop® CS v.8.0. After illustration, the genitalia were transferred to glycerol in a micro-vial together with the rest of the specimen. Terminology for morphological characters mainly follows that of Johanson (1998) and Oláh & Johanson (2008).

Species descriptions

Helicopsyche alajuela, new species

Fig. 1–7, 22

Helicopsyche alajuela is most similar to *H. chipoensis* Johanson & Malm, 2006, *H. chiriquensis* Johanson & Malm, 2006, *H. perija* Johanson & Holzenthal, 2004, and *H. circulata* Johanson & Holzenthal, 2004, particularly due to the similar shape of the primary branch of the gonopods. The new species is easily distinguished from these by the absence of the basomesal lobes on the gonopods.

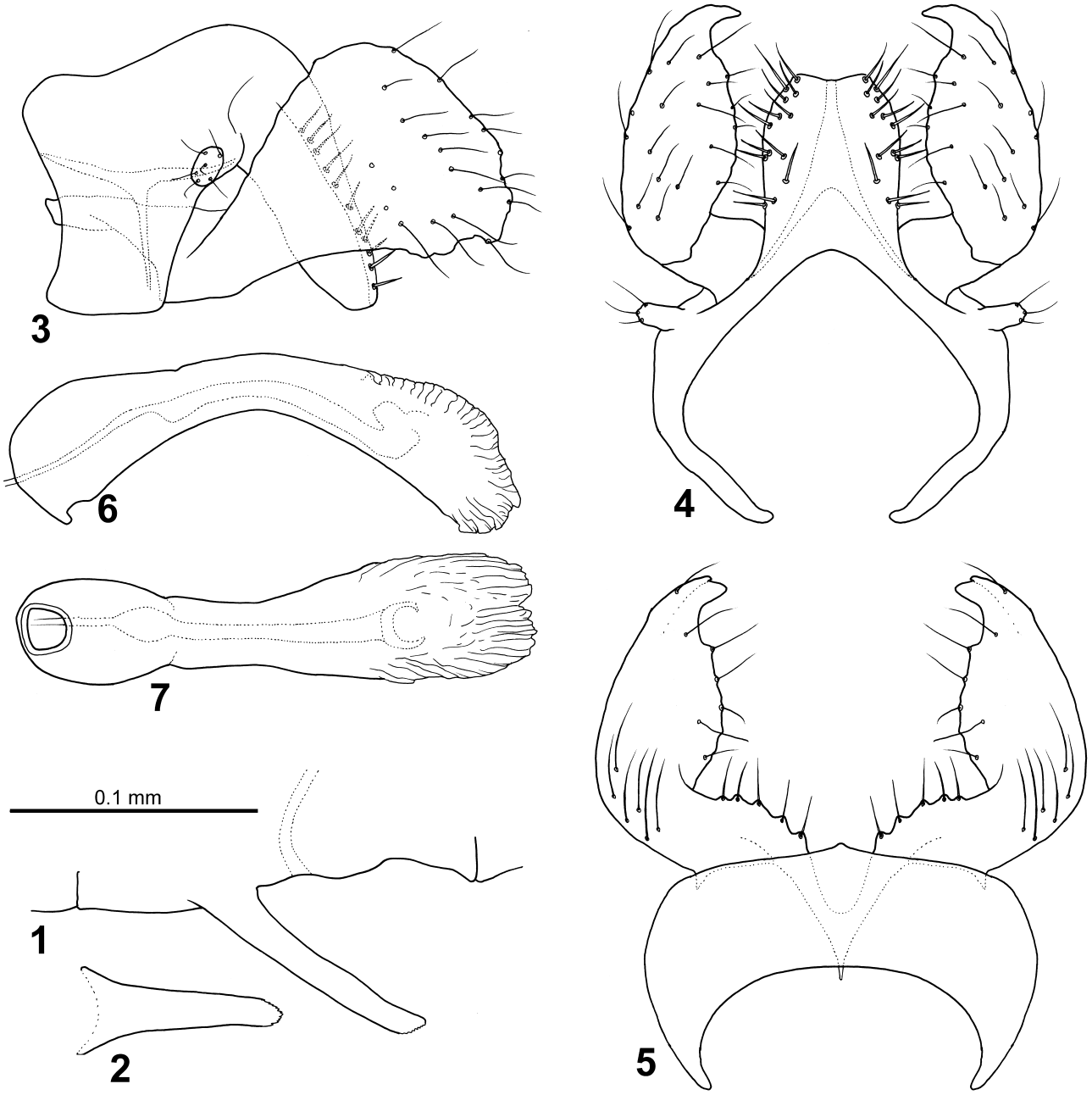
Forewing length 3.4 mm, hind wing length 2.4 mm.

Male abdomen and genitalia (Fig. 1–7). Sternal process VI long, straight, oriented posteroventrad; parallel-sided in lateral view (Fig. 1); weakly tapering in ventral view (Fig. 2). Anterior lobe of segment IX (Fig. 3) narrowly ellipsoid in lateral view, oriented anterodorsad from midheight of segment IX; anterodorsal and anteroventral margins concave; ventral margin long, straight (Fig. 3); in dorsal view, inner margin forming diamond-shaped cavity (Fig. 4); in ventral view, with small central posterior process (Fig. 5); lateral apodeme nearly horizontal (Fig. 3), tapering anteriorly, meeting anterior margin, sub-marginal line absent; tergal transverse apodeme absent; sternal transverse apodemes present. Tergum X, in lateral view, oriented posteroventrad (Fig. 3), straight, apex rounded, weakly tapering along its length (Fig. 4); in dorsal view, tongue-shaped (Fig. 4), apical part shallowly notched, with about 13 pairs of equally long megasetae in longitudinal group, starting basally on segment. Superior appendage tubular (Fig. 4). Primary branch of gonopods, in lateral view (Fig. 3), strongly broadened distad, narrowest immediately behind posterior margin of segment IX; dorsal margins semi-circular, weakly undulating; ventral margin irregularly undulating (Fig. 3); apices produced mesad. Basomesal lobes absent; posterobasal margins strongly undulating, with setae (Fig. 5). Basal plate, in lateral view (Fig. 3), nearly straight, wide along its length; in ventral view, sharply triangular (Fig. 5). Phallic apparatus, lateral view, wide proximally (Fig. 6), narrowest at mid-length, apex about as broad as base; slightly curving ventrad along its length; in ventral view, with basis narrow; (Fig. 7) slightly wider proximally and distally; endotheca weakly produced, posteroventral part well sclerotized; sperm channel slender anteriorly before sharply widening at 1/3rd phallic length (Fig. 6).

Male holotype. COSTA RICA: Alajuela: Reserva Forestal San Ramón, Río San Lorencito and tribs, 10.216°N, 84.607°W, 13–16.vi.1988, 980 m [C.M. & O.S. Flint, Holzenthal] (NMNH, alcohol).

Paratype. same data as holotype, abdomen lost—1 male (NMNH, alcohol).

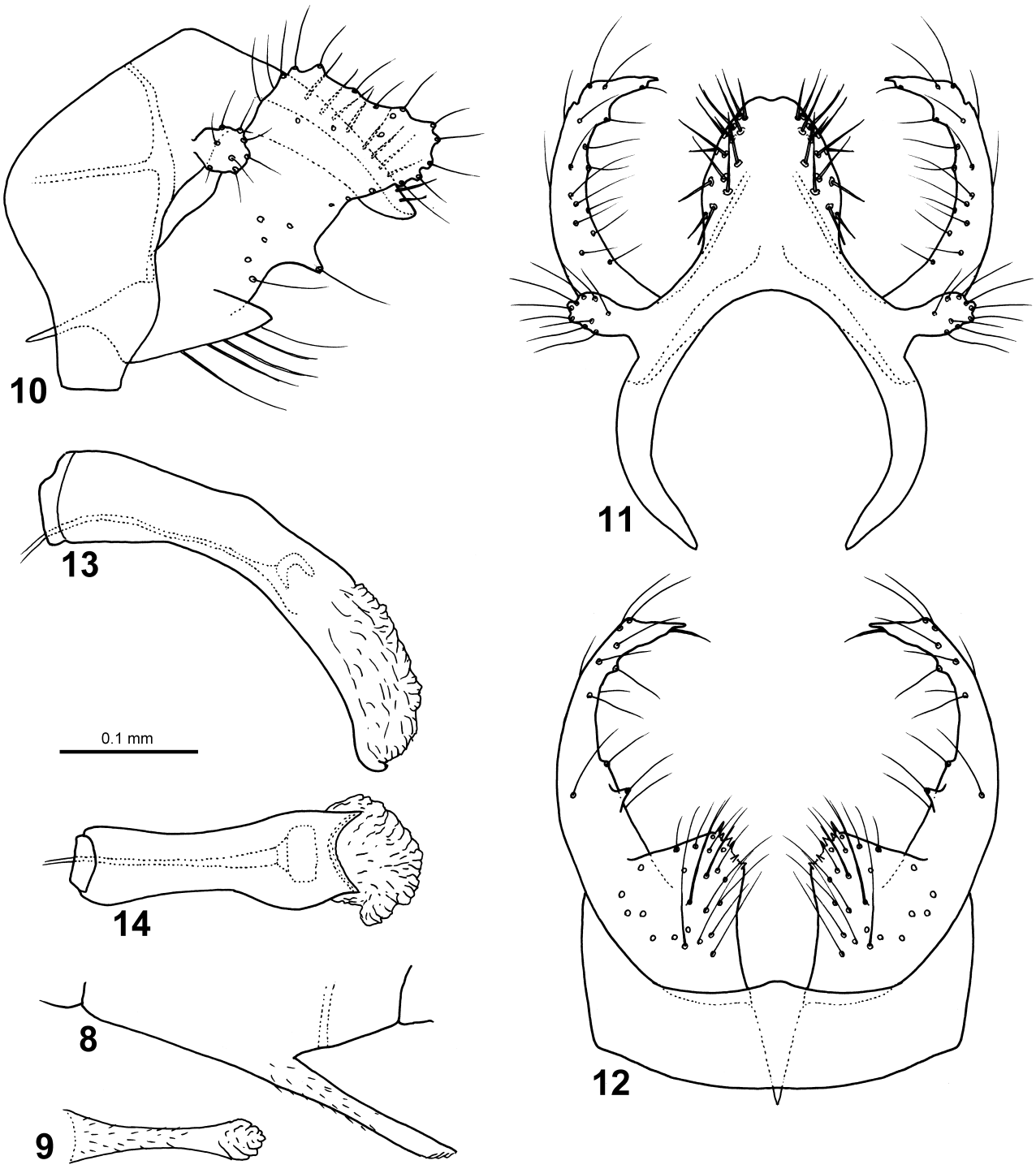
Distribution. Costa Rica (Alajuela) (Fig. 22).
Etymology. *Alajuela*, named after the province of the type locality.



FIGURES 1–7. *Helicopsyche alajuela*, new species, holotype. 1—sternum VI, lateral; 2—sternum VI process, ventral; 3—genitalia, lateral; 4—genitalia, dorsal; 5—genitalia, ventral; 6—phallic apparatus, lateral; 7—phallic apparatus, ventral. Scale bar (0.1 mm) refers to all figures.

***Helicopsyche golfitoensis*, new species**
Fig. 8–14, 22

Helicopsyche golfitoensis is most similar to *H. tachira* Johanson & Holzenthal, 2004, particularly in the shape of the primary branch of the gonopods. *Helicopsyche golfitoensis* is easily distinguished from *H. tachira* by the presence of a long process on the posteroventral margin of the primary branch of the gonopods and by the wide anterior lobes of segment IX.



FIGURES 8–14. *Helicopsyche golfitoensis*, new species, holotype. 8—sternum VI, lateral; 9—sternum VI process, ventral; 10—genitalia, lateral; 11—genitalia, dorsal; 12—genitalia, ventral; 13—phallic apparatus, lateral; 14—phallic apparatus, ventral. Scale bar (0.1 mm) refers to all figures.

Forewing length 4.0 mm; hind wing length 2.9 mm.

Male abdomen and genitalia (Fig. 8–14). Sternal process VI long, straight, oriented posteroventrad; parallel-sided in lateral view (Fig. 8); narrowest at midlength in ventral view (Fig. 9). Anterior lobe of segment IX (Fig. 10) widely ellipsoid in lateral view, oriented anterad from midheight of segment IX; anterodorsal margin nearly straight; anteroventral margin shallowly concave; ventral margin short, straight

(Fig. 10); in dorsal view, inner margin forming ovoid cavity (Fig. 11); in ventral view, with small central posterior process (Fig. 12); lateral apodeme nearly horizontal (Fig. 10); fading before anterior margin of segment, sub-marginal line absent; tergal and sternal transverse apodemes present. Tergum X, in lateral view, slightly curving posteroventrad (Fig. 10), straight, apex pointed, oriented posterad; in lateral view, weakly tapering along its length (Fig. 10); in dorsal view (Fig. 11), parallel-sided basally, narrowing from mid-length; apex shallowly notched, with about 14 pairs of equally long megasetae laterally longitudinal group starting just proximally of mid-length of segment. Superior appendage club-shaped (Fig. 10, 11). Primary branch of gonopods, in lateral view (Fig. 10), generally rectangular; dorsal half with undulating margins; apex wide, produced posterad; anterodorsal margin irregular; posteroventral margin with long posteroventral process with apical seta. Basomesal lobes narrowly triangular in lateral view (Fig. 10); in ventral view each with truncate apex covered by minute megasetae; mesal margins weakly concave (Fig. 12). Basal plate, in lateral view (Fig. 10), straight, wide distally ; sharply narrowing anterad from mid-length; narrowly triangular in ventral view (Fig. 12). Phallic apparatus, in lateral view, wider anteriorly (Fig. 13), distally parallel-sided; slightly curving ventrad along its length; basis broad; in ventral view (Fig. 14), slightly wider proximally, strongly wider distally; endotheca not produced, posteroventral part well sclerotized; sperm channel slender, not widening posteriorly.

Male holotype. COSTA RICA: [Puntarenas] 2.8 mi E of Golfito, 18–19.vii.1967 [O.S. Flint, Jr.] (NMNH, alcohol).

Distribution. Costa Rica (Puntarenas) (Fig. 22).

Etymology. *Golfitoensis*, named for the town of Golfito, near the type locality.

***Helicopsyche dorsocurvata*, new species**

Fig. 15–21, 22

Helicopsyche dorsocurvata is most similar to *H. disjuncta* Johanson & Holzenthal, 2004, from which it is separated by having tergum X with a deep, narrow apical notch instead of a very wide, rectangular notch.

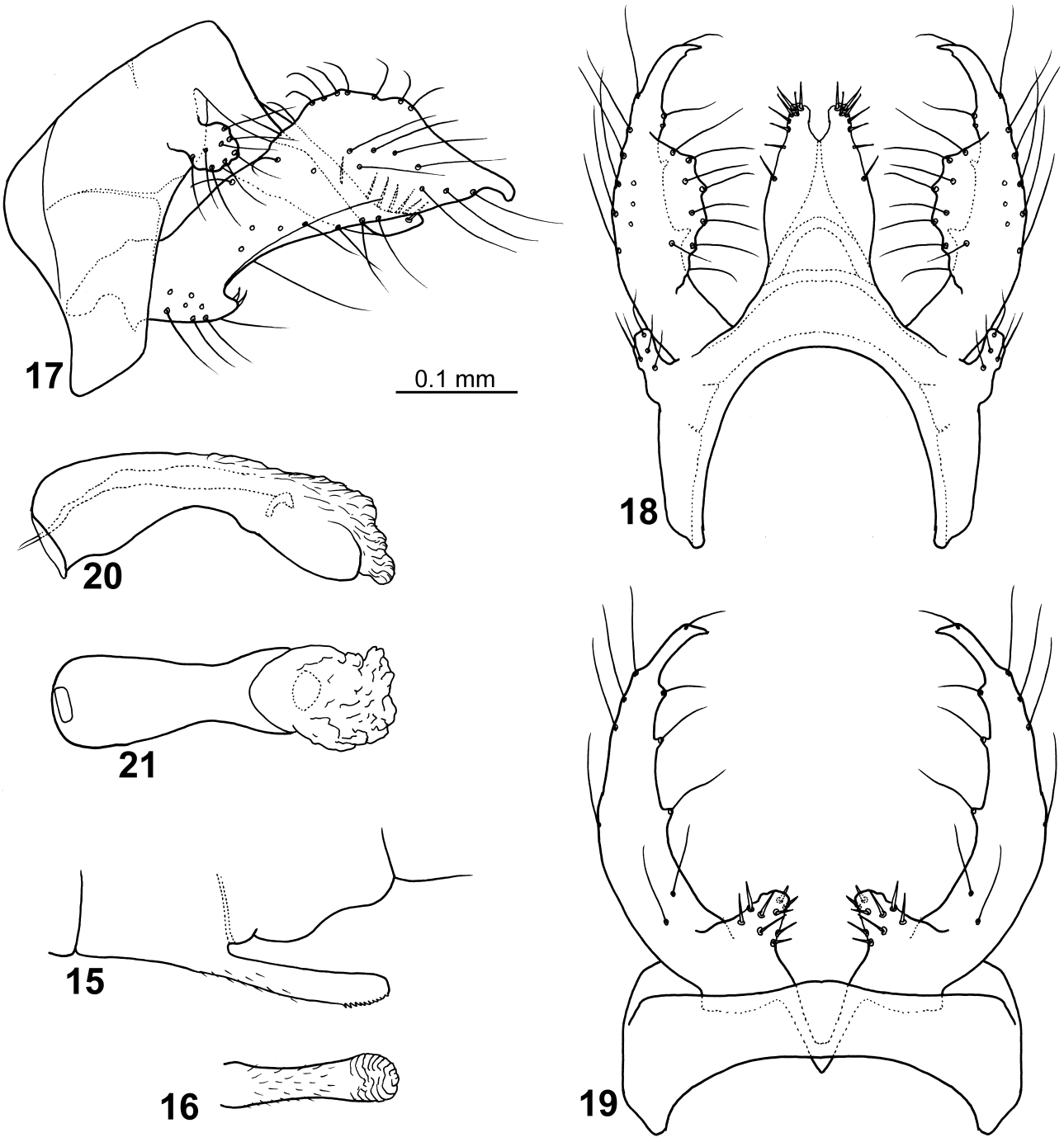
Forewing length 4.3 mm; hind wing length 3.5 mm.

Male abdomen and genitalia (Fig. 15–21). Sternal process VI long, straight, thick, oriented posterad; nearly parallel-sided in lateral view (Fig. 15); narrowest at mid-length in ventral view (Fig. 16). Anterior lobe of segment IX (Fig. 17) widely ellipsoid in lateral view, oriented anterad from below midheight of segment IX; anterodorsal margin nearly straight; anteroventral margin shallowly concave; ventral margin short, straight (Fig. 17); in dorsal view, inner margin forming semi-circular cavity (Fig. 18); in ventral view, with wide, shallow central posterior process (Fig. 19); lateral apodeme horizontal, curving ventrad towards well-developed sub-marginal line (Fig. 17); tergal transverse apodemes short, weak; sternal transverse apodemes running along posterior margin of segment IX. Tergum X, in lateral view, curving dorsad (Fig. 17), apex pointed; tapering along its length (Fig. 17); in dorsal view (Fig. 18) basally narrow, widening at mid-length before narrowing towards apex; apex deeply notched; about 8 pairs of equally long megasetae present laterally in longitudinal group starting distally of mid-length of segment; most megasetae confined to apex. Superior appendages club-shaped (Fig. 17). Primary branch of gonopods, in lateral view (Fig. 17), widening distally; dorsal margin with undulating margin; apex long, narrowing posterally; anterodorsal margin irregular; posteroventral margin smooth, nearly straight, without marginal processes. Basomesal lobes short in lateral view (Fig. 17); in ventral view oriented posteromesad; each lobe with rounded apex covered by small megasetae; mesal margins strongly concave (Fig. 19). Basal plate, in lateral view (Fig. 17) curving ventrad, thick; anterior part narrower than posterior part; in ventral view, narrowly triangular (Fig. 19). Phallic apparatus, in lateral view, widest anteriorly (Fig. 20), narrowest at mid-length; distally slightly widening; slightly curving ventrad along its length; in ventral view, with basis narrow; (Fig. 21) slightly wider proximally, narrowest at mid-length, strongly wider distally; endotheca not produced, posteroventral part well sclerotized; anterior part of sperm channel slender, widening inside phallus at 1/3rd phallic length.

Male holotype. COSTA RICA: Cartago, Reserva Tapanti, Quebrada Palmitos and falls, 1400 m, 9.72°N, 83.78°W [Holzenthal, Blahnik & Muñoz] (UMSP000100631) (UMSP, alcohol).

Distribution. Costa Rica (Cartago) (Fig. 22).

Etymology. *Dorsocurvata*, named after the dorsally curving tergum X.



FIGURES 15–21. *Helicopsyche dorsocurvata*, new species, holotype. 15—sternum VI, lateral; 16—sternum VI process, ventral; 17—genitalia, lateral; 18—genitalia, dorsal; 19—genitalia, ventral; 20—phallic apparatus, lateral; 21—phallic apparatus, ventral. Scale bar (0.1 mm) refers to all figures.

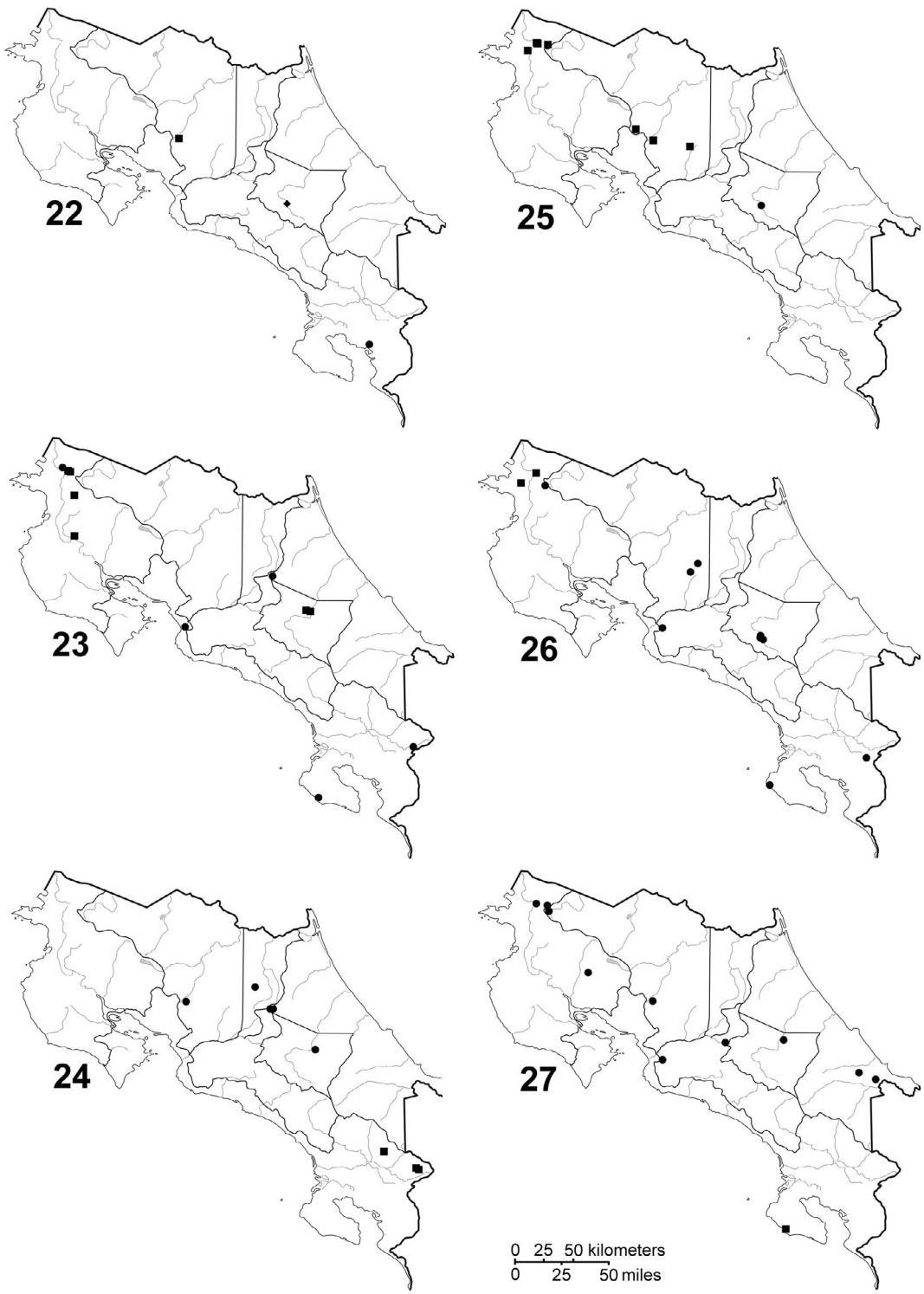


FIGURE 22. Map of Costa Rica showing distributions of *H. alajuela*, new species (filled rectangle), *H. golfitoensis*, new species (filled circle), and *H. dorsocurvata*, new species (filled diamond).
FIGURE 23. Map of Costa Rica showing distributions of *H. lewalleni* (filled circles), and *H. borealis* (filled rectangles).
FIGURE 24. Map of Costa Rica showing distributions of *H. chiriquensis* (filled circles), and *H. mexicana* (filled rectangles).
FIGURE 25. Map of Costa Rica showing distributions of *H. truncata* (filled circle), and *H. dampfi* (filled rectangles).
FIGURE 26. Map of Costa Rica showing distributions of *H. incisa* (filled circles), and *H. vergelana* (filled rectangles).
FIGURE 27. Map of Costa Rica showing distributions of *H. rentzi* (filled circle), and *H. selanderi* (filled rectangle). The scale bar refers to all maps.

New species records

Helicopsyche borealis (Hagen, 1861)

Distribution in Costa Rica given in Fig. 23.

Material examined. COSTA RICA: Guanacaste: Río Tizate, 7.2 km NE Cañas Dulces, 10°46'23"N, 085°26'56"W, 28.vi.1986 [Holzenthal, Heyn, Armitage]—100 males and females (UMSP, alcohol); Río Tempisquito, Maritza, 10°57'29"N, 85°29'49"W, 19–20.vii.1987 [Holzenthal, Morse, Clausen]—1 male (UMSP, alcohol), same except 30–31.viii.1990, [Holzenthal, Blahnik, Quesada]—7 males, 18 females (UMSP, pinned); Río Tempisquito Sur, Maritza, 10°57'00"N, 85°28'48"W, 30.viii.1990 [Huisman & Quesada]—1 male, 1 female (UMSP, alcohol); Río Tizate, 7.2 km NE Cañas Dulces, 10°46'23"N, 85°26'56"W, 28.vi.1986 [Holzenthal, Heyn, Armitage.]—1 male, 2 females (UMSP, alcohol); **Cartago**: Río Reventazón, CATIE along Sendero Espaveles, 9°53'35"N, 083°39'04"W, 22.iii.1991 [Muñoz-Quesada]—2 males, 11 females (UMSP, alcohol).

***Helicopsyche chiriquensis* Johanson & Malm, 2006**

Distribution in Costa Rica given in Fig. 24.

Material examined. COSTA RICA: Cartago: Suiza, 980 m, 5.xii.1998 [P.A. Opler]—1 male (NMNH, alcohol); **Limón:** Parque Nacional Braulio Carrilo, Quebrada Gonzalez, 480 m, 10.160°N, 83.939°W, 12–14.v.1990 [Holzenthal & Blahnik]—3 males (UMSP, pinned); **Alajuela:** Reserva Forestal San Ramón, Rio San Lorencito and tribs, 960 m, 10.216°N, 84.606°W, 6–10.iii.1991 [Holzenthal, Muñoz & Huisman]—3 males (UMSP, pinned); **San José:** P.N. Brulio Carrillo, Est. Carrillo, Q. Sanguijuela, 800 m, 10.160°N, 83.963°W, 27.iii.1987 [Holzenthal, Hamilton & Heyn]—2 males (INBIO, pinned); **Heredia:** P.N. Braulo Carrillo, Est. El Ceibo, Rio Peje, 480 m, 10.327°N, 84.078°W, 29–31.v.1990 [Holzenthal, Blahnik & Muñoz]—12 males (UMSP, pinned).

***Helicopsyche dampfi* Ross, 1956**

Distribution in Costa Rica given in Fig. 25.

Material examined. COSTA RICA: Guanacaste: Estacion Maritza, Rio Tempisquito, reared, emergence 17.iii.1992 [B.W. Sweeney]—2 males (NMNH, alcohol); same data, except adult emerged 17.i.1994—1 male, 1 female (UMSP, alcohol); same data, except adult emerged 10.i.1994—1 male (UMSP, alcohol); Est. Maritza, R. Tempisquito Sur elev. 580 m, 10°57’25’’N, 85°29’42’’W, reared from egg, adult emerged 22.i.1994—1 male (UMSP, alcohol); same data, except 10°57’10’’N, 85°29’25’’W, reared from egg, adult emerged 5.ii.1994—1 male (UMSP, alcohol); same data, except adult emerged 9.i.1994—1 male (UMSP, alcohol); Parque Nacional Guanacaste, ca. 0.7 km N Est. Maritza, 550 m, 10.96°N, 85.50°W, 31.viii.1990 [Huisman & Quesada]—1 male (UMSP, pinned); same data, except—2 males, 1 female (INBIO, alcohol); **Alajuela:** Reserva Forestal San Ramón, Rio San Lorencito and tribs , 10.216°N, 84.606°W, 980 m, 6–10.iii.1991 [Holzenthal, Muños, Huisman]—3 males, 5 females (INBIO, alcohol); same data, except 2 males (pinned); Reserva Bosque Nubosa, Monteverde, Río Peñas Blancas, 10.30°N, 84.74°W, 950 m, 1.iii.1986 [Holzenthal & Fasth]—1 male (UMSP, pinned); Cerro Campana, R. Bochinche trib., 6 km (air) NW Dos Ríos, 10.945°N, 85.413°W, 600 m, 22–23.vii.1987 [Holzenthal, Morse & Clausen]—1 male (UMSP, pinned); Reserva Forestal San Ramon, Río San Lorencito and tribs., 980 m, 10.216°N, 84.607°W, 30.iii–1.iv.1987 [Holzenthal, Hamilton & Heyn]—1 male (UMSP, pinned); same data, except 28–30.vii.1990 [Holzenthal, Blahnik & Muñoz]—5 males (UMSP, pinned); Quebrada Virgencita, 10.2 km S Bajos del Toro, 1780 m, 10.168°N, 84.326°W, 5–6.ix.1990 [Holzenthal, Blahnik & Huisman]—2 males (UMSP, pinned).

***Helicopsyche incisa* Ross, 1956**

Distribution in Costa Rica given in Fig. 26.

Material examined. COSTA RICA: Cartago: Reserva Tapanti, Quebrada Palmitos and falls, 1400 m, 9.72°N, 83.78°W, 1–2.viii.1990 [Holzenthal, Blahnik & Muñoz]—2 males (UMSP, pinned); same data, except 2–3.vi.1990—5 males; same data, except 23.viii.1990 [Holzenthal & Huisman]—1 male; same data, except 24–25.iii.1991 [Holzenthal, Muñoz & Huisman]—3 males; Reserva Tapanti, Rio Dos Amigos and falls, ca 6 km (rd) NW tunnel, 1500 m, 9.704°N, 83.783°W, 23.iii.1991 [Holzenthal, Muñoz & Huisman]—4 males (UMSP, pinned); Reserva Tapanti, waterfall, ca. 1 km (road) NW tunnel, 1600 m, 9.69°N, 83.76°W, 24.iii.1991 [Holzenthal, Muñoz & Huisman]—1 male (UMSP, pinned); same data, except 4–5.viii.1990 [Holzenthal, Blahnik & Muñoz]—22 males; **San José:** Res. Biol. Carara, Rio Carara, in Carara, 200 m, 9.778°N, 84.531°W, 14.iii.1991 [Holzenthal, Muñoz & Huisman]—1 male (UMSP, pinned); same data, except 9.viii.1990 [Holzenthal, Blahnik & Muñoz]—15 males; **Alajuela:** Rio Toro, 3.0 km (rd) SW Bajos del Toro, 1530 m, 10.204°N, 84.316°W, 3–4.ix.1990 [Holzenthal, Blahnik & Huisman]—2 males (INBIO, pinned); Quebrada Latas, 8.9 km NE Bajos del Toro, 1030 m, 10.269°N, 84.260°W, 6.ix.1990 [Holzenthal, Blahnik & Huisman]—1 male (UMSP, pinned); **Puntarenas:** Rio Jaba at rock quarry, 1.4 km (air) W Las Cruces, 1150 m, 8.79°N, 82.97°W, 14.vi.1986 [Holzenthal, Heyn & Armitage]—3 males (UMSP, pinned); Parque Nacional Corcovado, Piedra el Arco, 20 m, 8.582°N, 83.709°W, 10–11.iv.1989 [Holzenthal & Blahnik]—2 males (UMSP, pinned); Rio Jaba at rock quarry, 1.4 km (air) W Las Cruces, 1150 m, 8.79°N, 82.97°W, 15.iii.1991 [Holzenthal, Muñoz & Huisman]—5 males (UMSP, pinned); same data, except 9.viii.1990—22 males; **Guanacaste:** Quebrada Garcia, 10.6 km ENE Quebrada Grande, 470 m, 10.862°N, 85.428°W, 8.iii.1986 [Holzenthal & Fasth]—1 male (INBIO alcohol).

***Helicopsyche lewalleni* Denning & Blickle, 1979**

Distribution in Costa Rica given in Fig. 23.

Material examined. COSTA RICA: Puntarenas: Parque Nacional Corcovado, Est. Sirena, Río Camaronal, 30 m, 8.482°N, 83.589°W [Holzenthal & Blahnik]—4 males (UMSP, pinned); Reserva Biológica Carara, Quebrada Bonita, 35 m, 9.775°N, 84.605°W, 18–20.v.1990 [Holzenthal & Blahnik]—2 males (UMSP, pinned); Est. San Miguel, Q. San Miguel, 40 m, 14.xi.1991, 10 al, L-N 174100, 41150 [F.A. Quesada]—2 males (INBIO, pinned); **Guanacaste:** Parque Nacional Guanacaste, El Hacha, Queb. Pedregal, 300 m, 10.983°N, 85.539°W, 27.vii.1987 [Holzenthal, Morse & Clausen]—1 male (UMSP, pinned); **Limón:** Parque Nacional Braulio Carrillo, Quebrada González, 480 m, 10.160°N, 83.939°W, 12–14.v.1990 [Holzenthal & Blahnik]—3 males (UMSP, pinned).

***Helicopsyche mexicana* Banks, 1901**

Distribution in Costa Rica given in Fig. 24.

Material examined. COSTA RICA: Puntarenas: Rio Guineal, ca. 1 km (air) E Finca Helechales, 9.076°N, 83.092°W, 22.ii.1986, 840 m [Holzenthal, Morse, Fasth]—1 male, 11 females (UMSP, alcohol); Rio Cotón in Las Alturas, 8.938°N, 82.826°W, 16.ii.1986, 1360 m [Holzenthal, Morse, Fasth]—1 male (INBIO, alcohol); same data, except pinned—2 males; Rio Bellevista, ca. 1.5 km NW Las Alturas, 1400 m, 8.951°N, 82.846°W, 16–17.iii.1991 [Holzenthal, Muñoz & Huisman]—1 male (UMSP, pinned).

***Helicopsyche rentzi* Denning & Blickle, 1979**

Distribution in Costa Rica given in Fig. 27.

Material examined. COSTA RICA: Alajuela: Cerro Campana, R. Bochinche trib., 6 km (air) NW Dos Ríos, 600 m, 10.945°N, 85.413°W, 22–23.vii.1987 [Holzenthal, Morse & Clausen]—3 males (UMSP, pinned); same data, except 640 m, 10.9°N, 85.4°W, 15–16.iii.1986 [Holzenthal & Fasth]—1 male; Reserva Forestal San Ramón, Rio San Lorencito and tribs, 960 m, 10.216°N, 84.606°W, 6–10.iii.1991 [Holzenthal, Muñoz & Huisman]—2 males (UMSP, pinned); **Limón:** Rio Uatsi, ca 8 km (air) W Bribri, 60 m, 9.62°N, 82.90°W, 25.iii.1987 [Holzenthal, Hamilton & Heyn]—1 male (UMSP, pinned); Reserva Biol. Hitoy-Cerere, Rio Cerere, 90 m, 9.671°N, 83.028°W, 23–24.iii.1987 [Holzenthal, Hamilton & Heyn]—2 males (UMSP, pinned); **Guanacaste:** Parque Nacional Guanacaste, Maritza, Rio Tempisquito, 550 m, 10.958°N, 85.497°W, 19–20.vii.1987 [Holzenthal, Morse & Clausen]—1 male (UMSP, alcohol); same data, except 30–31.viii.1990 [Huisman, Blahnik & Quesada]—2 males; **San José:** Res. Biol. Carara, Rio del Sur, 1.5 km (rd) S Carara, 160 m, 9.769°N, 84.531°W, 13.iii.1991 [Holzenthal, Muñoz & Huisman]—2 males (INBIO, pinned); **Cartago:** Rio Chitaria, route 10, 10 km NW Rio Reventazón, 740 m, 9.920°N, 83.604°W, 21.iii.1991 [Holzenthal, Muñoz & Huisman]—1 male (UMSP, pinned).

***Helicopsyche selanderi* Ross, 1956**

Distribution in Costa Rica given in Fig. 27.

Material examined. COSTA RICA: Puntarenas: Parque Nacional Corcovado, Est. Sirena, Río Camaronal, 8.481°N, 83.594°W, 5 m, 12–13.iv.1989 [Holzenthal & Blahnik]—2 males (UMSP, alcohol).

***Helicopsyche truncata* Ross, 1956**

Distribution in Costa Rica given in Fig. 25.

Material examined. COSTA RICA: Cartago: Res. Tapanti, Quebrada, Palmitos and falls, 1400 m, 9.72°N, 83.78°W, 24–25.iii.1991 [Holzenthal, Muñoz & Huisman]—1 male (UMSP, pinned).

***Helicopsyche vergelana* Ross, 1956**

Distribution in Costa Rica given in Fig. 26.

Material examined. COSTA RICA: Guanacaste: Parque Nacional Guanacaste, Maritza, Río Tempisquito, 550 m, 10.958°N, 85.497°W, 19–20.vii.1987 [Holzenthal, Morse & Clausen]—1 male (UMSP, pinned); Parque Nacional Santa Rosa, Río Cuajijinquil, 250 m, 10.881°N, 85.613°W, 25.vii.1987 [Holzenthal, Morse & Clausen]—1 male (UMSP, pinned).

Acknowledgements

We are thankful to Dr. Oliver S. Flint, Jr., National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A., for lending us material from Costa Rica. The junior author wishes to thank the Instituto Nacional de Biodiversidad and the Servicio de Parques Nacionales, Costa Rica, for logistic and other support. Special thanks are expressed to those who participated in fieldwork, but especially F. Muñoz, J. Huisman, and R. Blahnik. Field research and subsequent taxonomic studies were supported by National Science Foundation grants BSR-8512368, BSR-8917684, DEB-9400632, and DEB-0117772. This support is gratefully acknowledged. Two anonymous referees gave valuable input on the manuscript.

References

Bueno-Soria, J. & Flint, O.S., Jr. (1978) Catálogo sistemático de los Tricópteros de México (Insecta: Trichoptera), con algunos registros de Norte, Centro y Sudamérica. *Anales del Instituto de Biologia, Universidad Nacional Autónoma de México, Series de Zoologia*, 57, 299–310.

Denning, D.G. & Blickle, R.L. (1979) New species of *Helicopsyche* (Trichoptera: Helicopsychidae). *Pan-Pacific Entomologist*, 55, 27–33.

Flint, O.S., Jr. (1986) Studies of Neotropical caddisflies, XXXVI: the genus *Cochliopsyche* in Middle America (Trichoptera: Helicopsychidae). *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología*, 56, 213–216.

Flint, O.S., Jr. Holzenthal, R.W. & Harris, S.C. (1999) *Catalog of the Neotropical Caddisflies (Trichoptera)*. Ohio Biological Survey, Columbus, Ohio, 1–239 pp.

Flint, O.S., Jr. & Sykora, J.L. (2004) Caddisflies of Hispaniola, with special reference to the Dominican Republic (Insecta: Trichoptera). *Annals of the Carnegie Museum*, 73, 1–60.

Hagen, H.A. (1861) Synopsis of the Neuroptera of North America with a list of the South American species. *Smithsonian Miscellaneous Collections*, 4 (1), xx+347 pp.

Holzenthal, R.W. (1988) Catalogo systematico de los Trichopteros de Costa Rica (Insecta: Trichoptera). *Brenesia*, 29, 51–82.

Holzenthal, R.W., Blahnik, R.J., Prather, A.L. & Kjer, K.M. (2007) Order Trichoptera Kirby 1813 (Insecta), Caddisflies. *In*, Z.-Q. Zhang & W.A. Shear (editors). Linneaus Tercentenary: Progress in Invertebrate Taxonomy, *Zootaxa*, 1668, 639–701.

Jackson, J.K. & Sweeney, B.W. (1995) Egg and larval development times for 35 species of tropical stream insects from Costa Rica. *Journal of the North American Benthological Society*, 14, 115–130.

Johanson, K.A. (1997) Zoogeography and diversity of the snail case caddisflies (Trichoptera: Helicopsychidae). *In:* Holzenthal, R.W. & Flint, O.S., Jr. (Eds.), *Proceedings of the 8th International Symposium on Trichoptera*. Ohio Biological Survey, pp. 205–212.

Johanson, K.A. (1998) Phylogenetic and biogeographic analysis of the family Helicopsychidae (Insecta: Trichoptera). *Entomologica scandinavica, Supplement*, 53, 1–172.

Johanson, K.A. (2002) Systematic revision of American *Helicopsyche* of the subgenus *Feropsyche* (Trichoptera: Helicopsychidae). *Insect Systematics and Evolution, Supplement*, 60, 1–146.

Johanson, K.A. (2003a) The *Helicopsyche* (*Feropsyche*) (Insecta, Trichoptera, Helicopsychidae) from Barro Colorado Island, Panama. *Zootaxa*, 283, 1–12.

Johanson, K.A. (2003b) Revision of the Neotropical caddisfly subgenus *Helicopsyche* (*Cochliopsyche*) (Trichoptera, Helicopsychidae), with descriptions of twelve new species. *Insect Systematics and Evolution*, 34, 381–414.

Johanson, K.A. (2003c) The sister species of Jamaican *Helicopsyche kingstona* sp.n., is Mexican *H. villegasi* Denning & Blickle (Trichoptera, Helicopsychidae). *Tijdschrift voor Entomologie*, 146, 33–37.

Johanson, K.A. (2006) Check-list of New Caledonian Trichoptera. http://www2.nrm.se/en/caledonia/trichopteranc.html [Accessed 26 September 2008.]

Johanson, K.A. & Holzenthal, R.W. (2004) Thirteen new species and new distribution records of *Helicopsyche* (*Feropsyche*) Johanson from Venezuela (Trichoptera: Helicopsychidae). *Zootaxa*, 711, 1–40.

Johanson, K.A. & Malm, T. (2006) Seven new *Helicopsyche* (*Feropsyche*) Johanson, 2002 from the Neotropical region and Nearctic Mexico (Insecta: Trichoptera: Helicopsychidae). *Zootaxa*, 1208, 1–24.

Monson, M.P., Holzenthal, R.W. & Ahlstrand, G.G. (1988) The larvae and pupa of *Cochiliopsyche vazquezae* (Trichoptera: Helicopsychidae). *Journal of the North American Benthological Society*, 7, 152–159.

Morse, J.C. (2008) Trichoptera World Checklist. http://entweb.clemson.edu/database/trichopt/index.htm [Accessed 26 September 2008.]

Müller, F. (1885) Wie Ensteht die Gleiderung der Insektenfuhler? *Kosmos*, 17, 201–204.

Oláh, J. & Johanson, K.A. (2008) Reasoning an appendicular and functional caddisfly genital terminology. *Braueria*, 35, 29–40.

Ross, H.H. (1944) The caddisflies or Trichoptera of Illinois. *Bulletin of the Illinois Natural History Survey*, 23, 1–326.

Ross, H.H. (1956) New species of *Helicopsyche* from the western hemisphere (Trichoptera, Helicopsychidae). *Journal of the Washington Academy of Sciences*, 46, 397–401.