

NEW SPECIES OF CADDISFLIES FROM PUERTO RICO (TRICHOPTERA)

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Abstract.—Recent collections from Puerto Rico, primarily made by Malaise and emergence traps, have taken six previously unknown species herein described: *Cariboptila trispinata*, *Cernotina mastelleri*, *Alisotrichia circinata*, *Alisotrichia setigera*, *Ochrotrichia (Metrichia) squamigera*, and *Ochrotrichia (Metrichia) ceer*. *Leptonema insulanum* is removed from the island list, however larvae of an unknown species of the genus have been collected thereon. Adult females of the unknown species of *Nectopsyche* earlier recorded from the island suggest it is *N. cubana* Bks., which is also recorded from the Dominican Republic for the first time.

Key Words: New species, Trichoptera, Glossosomatidae, Polycentropodidae, Hydropsychidae, Puerto Rico

The caddisfly fauna of the Antilles has been extensively investigated in the last 30 years by several trichopterists—Botosaneanu, Flint, Kumanski—who have personally collected on most major islands. As a result of this collecting effort and subsequent publications our knowledge of the insular faunas has exploded. Cuba now has the largest known fauna with around 90 species and subspecies of caddisflies. Thirty nine species are known from Jamaica, a number that will certainly rise when it is more intensively collected. Puerto Rico, counting those here reported, now holds 42 species. From the island of Hispaniola only about 30 species are reported, but several large collections from this island are now being studied and their publication will raise this number several fold. The Lesser Antillean islands are also being studied (including those species being reported in a separate paper in preparation): Guadeloupe—21, Dominica—36, Martinique—22, St. Lu-

cia—11, St. Vincent—16, Grenada—22, Barbados—2. These counts include genera reported from an island, usually as a result of larval collections, but whose specific identity is not known. My interpretation of these figures leads me to predict that the two largest islands, Cuba and Hispaniola, may each contain somewhat over 100 species, the smaller Jamaica and Puerto Rico only about 50 species, and the Lesser Antillean islands may hold up to 40 species each.

Puerto Rico was studied in the early sixties, and 35 species were reported at that time (Flint 1964). Although few collections have been made or seen from the island in the intervening years, only two new species were discovered in them (*Ochrotrichia verda* by Flint 1968, and *Helicopsyche propinqua* by Botosaneanu and Flint 1991). In early 1989 my colleague, Dr. E. C. Masteller, initiated the first emergence trap collection in an undisturbed forest site at the El Verde

Field Station. This produced the first examples of a remarkable new genus and species, *Kumanskiella karenae* Harris and Flint (1992), and induced me to join Dr. Masteller next season when he returned to resume this work. We used a variety of techniques to obtain material—ultraviolet lights, standard insect nets, emergence traps, and Malaise traps. Interestingly, the older techniques, lights and nets, produced only the same species as previously known from the island (with the exception of a single male of *Cernotina*). The emergence and Malaise traps took, in addition to many of the known species, a variety of species not previously known, often in great quantities. To the best of my knowledge these traps have not been used on other Antillian islands in a manner designed to collect aquatic insects, and until they are I expect that a number of small species not attracted to lights will be overlooked.

The Malaise trap was especially effective, and its use will be mentioned in more detail; another paper is being prepared on the results of the emergence trap collections. I have now used Malaise traps several times in the American tropics, often with great success. The greatest problem is finding a relatively undisturbed, forested, if possible, stream where the trap will not be vandalized. When such a site is found, the trap is placed across the stream, usually one that is 1 to 5 meters in width. The trap is emptied twice a day, dawn and dusk, and caddisflies are sorted from the other insects collected. An attempt is made to mount examples of all species that can be discriminated in the field, and the remaining material is preserved in alcohol.

Two Malaise traps were used in February of 1990, one remained on the Quebrada Prieta, the other was placed for several days over the Quebrada Toronja and then moved for the last few days to a small stream near the El Verde Station itself. The second trap only picked up a very few caddisflies at either situation; obviously I did not select sites

where many caddisflies were active. The Quebrada Prieta, however, was exceptionally productive. This trap often collected a hundred caddisflies a half day, and took examples of all the new species described here as well as *Kumanskiella karenae* and *Helicopsyche singulare*!

The new species are being described here to make the names available for the work on the emergence trap collections. Other species are mentioned when new information clarifying their status has been obtained. Type material is deposited in the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, DC; duplicates will be placed in the collection of the University of Puerto Rico and the Zoologisch Museum, Universiteit van Amsterdam, Netherlands.

Family Glossosomatidae

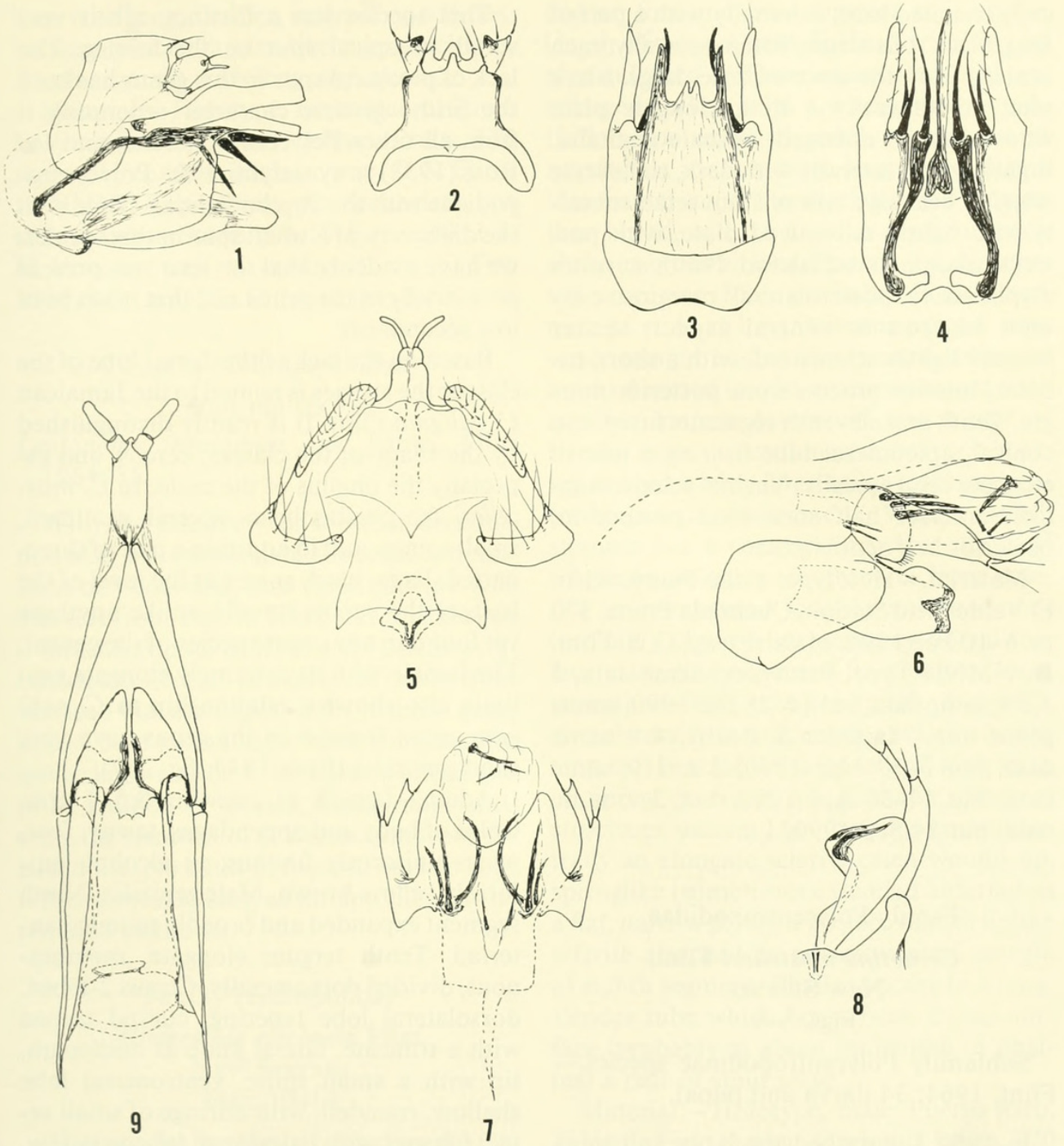
Cariboptila trispinata Flint,

NEW SPECIES

Figs. 1–5

This is a very distinct species, not closely related to the other described species. The ventral genital capsule of the male offers a number of unique structures: a thin, dorsomesal lobe, the long, dark process on each side of this lobe that bears terminally a long, dark spine (the dorsalmost of the 3 apparent spines in lateral aspect), the dorsolateral, fingerlike lobe of the lateral plate which also bears from a mesal shelf near the base of this lobe two long, black spines (the mesal and ventral spines of the triad), and the ventral lobes which also seem to be borne, ventromesally, from this lateral plate.

Adult.—Length of forewing 2–2.5 mm. Color golden-brown; forewing golden-brown, posterior margin paler with 2 small, white flecks, anterior margin with a very small, white spot, and a larger more diffuse spot over stigma. Sixth sternum in male with a slender, pointed process, $\frac{3}{4}$ length of sternum; in female process reduced to a small point. Male genitalia. Ninth tergum small,



Figs. 1-9. *Cariboptila trispinata*, male genitalia. 1, lateral; 2, ninth and tenth terga, dorsal; 3, genital capsule, ventral; 4, same, dorsal. 5, *C. trispinata*, female genitalia, ventral. *Cernotina mastelleri* male genitalia. 6, lateral; 7, tenth tergum, cerci and phallus, dorsal; 8, clasper and cercus, ventral. 9, *C. mastelleri*, female genitalia, ventral.

rounded ventrally, posteromesal margin bearing a small, darkened tooth; sublaterally a pair of setate tubercles. Tenth tergite small, ovate, with a small, posteromesal, dark lobe and several setae. All ventral structures united into a large, oval capsule:

lateral plate with dorsolateral angle prolonged into fingerlike lobe, posterior margin of lateral plate shelf-like on inner face, which bears dorsally 2, large, black spines, venter filled by a lightly sclerotized plate which is developed posterolaterally into a thin, api-

cally rounded lobe; internally with a pair of long, black rods arising anteroventrally, each bearing from the apex a single, large, black seta; dorsomesally a thin, elongate plate whose base is enlarged. Female genitalia. Eighth venter laterally with dark, transverse sclerites bearing a row of stout setae; mesally with lightly sclerotized plate, with posterior margin flared laterad. Ninth sternites displaced to posterolateral margins, only seen edge-on in ventral aspect; venter mesally lightly sclerotized, with a short, tubular, interior process from posterior margin. Tenth and eleventh segments fused into conical, apicomeral tube bearing a pair of elongate cerci apically. Vaginal sclerite ring-like, anterior half somewhat pinched-in, posterior half semicircular.

Material.—Holotype, male: Puerto Rico, El Verde Field Station, Quebrada Prieta, 370 m, 6–10 Feb 1990, Malaise trap, O. S. Flint, Jr. NMNH Type. Paratypes: Same data, 5 ♂, 5 ♀; same data, but 14–28 Feb 1990, emergence trap, Masteller & Buzby, 4 ♀; same data, but 5–30 Mar 1990, 2 ♂, 1 ♀; same data, but 11–30 Apr 1990, 1 ♂, 3 ♀; same data, but 24 Sep 1990, 1 ♀.

Family Polycentropodidae

Cernotina mastelleri Flint,

NEW SPECIES

Figs. 6–9

Subfamily Polycentropodinae species.—
Flint, 1964: 34 (larva and pupa).

In 1964 I described the larva and pupa of an, at that time, unknown genus of Polycentropodinae. With the subsequent discovery and description of larvae of *Cernotina*, it was apparent that these unknowns were this genus, but no adults were yet known from the island. The first adult, a male, was taken in 1989 and, in the following year, another male and the first female. Although the immatures were taken from the western end of the island and the adults from the eastern, it seems virtually certain that they all pertain to one species.

This species has a distinct, albeit very small, preapical spur on the foreleg. The lack of preapical spur in this genus has been the prime generic character separating it from all other Polycentropodidae, and led Ross (1938) to synonymize the Polycentropodidae with the Psychomyiidae. Now, with the discovery of a small spur in this species, we have evidence that the spur was present primitively in the genus and that it has been lost secondarily.

Based on the lack of the dorsal lobe of the clasper the species is related to the Jamaican *C. caligata* Flint. It is readily distinguished by the shape of the clasper, cercus, and especially the phallus of the male. In *C. mastelleri* the phallus bears several, scattered, small spines, and in addition a pair of three-parted, large, black spines at the level of the base of the cercus (totally unlike anything yet found in any other species of the genus). The female with its extremely elongate genitalia also shows a relationship to *C. caligata*; most females in the genus have very short genitalia (Ross 1944, fig. 267).

Adult.—Length of forewing 3.5–4 mm. Color of body and appendages, tawny, forewings uniformly fuscous; in alcohol, uniformly yellow-brown. Male genitalia. Ninth segment expanded and broadly rounded anteriorly. Tenth tergum elongate, membranous, divided dorsomesally. Cercus 2-lobed: dorsolateral lobe tapering, curved mesad with a truncate, lateral knob at midlength, tip with a small spine; ventromesal lobe shallow, rounded, with a fringe of small setae. Clasper with basodorsal lobe very low, not obviously spinose; apex divided into a pair of parallel, transverse, darkened lobes. Phallus with a complex set of internal spines: 2 small, black spines basally beneath a small, lightly sclerotized tube, a pair of clusters, each composed of 3 large, black, spines arising from a common base at the level of base of the cercus, and apically 3 small dark spines, one considerably larger than the others. Female genitalia. Lateral lobes of eighth sternum long and slender. Ninth sternum with a pair of small lobes, meeting on mid-

line; with long, slender, internal apodemes, between which is a vase-like vaginal sclerite. Tenth segment with long, apical cerci.

Material.—Holotype, male: Puerto Rico, El Verde Field Station, Quebrada Prieta, 370 m, 6–10 Feb 1990, Malaise trap, O. S. Flint, Jr. NMNH Type. Paratypes: Same data, but stream below Station, 8–10 Feb 1990, 1 ♀. El Yunque, trail to pool, 650 m, 22 Feb 1989, light trap, E. C. Masteller, 1 ♂.

Family Hydropsychidae

Leptonema species

Leptonema insulanum, nec Banks, Flint 1964: 36.

With the discovery of the true distribution of *L. insulanum* to be the coastal mountains of Venezuela, it is clear that the type was not from Puerto Rico, but mislabelled (Flint, McAlpine & Ross 1987). However, I made a collection of a series of larvae from Maricao that are *Leptonema*, without question. These larvae have been compared to larvae known to be *L. insulanum* and found to be a different species, further substantiating the removal of *L. insulanum* from the island list. No adult of *Leptonema* has been taken in recent years, so the specific identity remains unknown.

Family Hydroptilidae

Alisotrichia circinata Flint,

NEW SPECIES

Figs. 10–14

This species is closely related to the Cuban species *A. flintiana* Bots. and *A. cimarona* Bots. with both of which it shares the apicoventral hooks of the eighth segment and the anterodorsal rods with very long, stout setae. It differs from both in the structure of the internal complex, especially in the presence of the (frequently) coiled anteroventral plate.

Adult.—Length of forewing 1.5–2 mm. Color basically fuscous marked with silvery white spots: hair tuft on head between antennae, and on forewings at base and apex

and on fore and hind margins at $\frac{1}{3}$ and $\frac{2}{3}$ length of wing. Ocelli 2. Head with frontal area indented and bearing a cluster of short, enlarged scales; palpi not apparently modified; scape enlarged, oddly rounded and bearing on inner surface long hairs (fitting into frontal cavity), pedicel distinctly longer than broad, with 16 flagellar segments each about as broad as long. Spurs 0, 2, 4. No sternal processes. Male genitalia. Eighth sternum as wide as long, tapering apicad; posterior margin ending in a pair of submesal hooks directed mesad, in dorsal aspect with anterior margin developed into a pair of slender lobes directed mesad and each bearing at apex a very large spine reaching posterior margin of segment. Within eighth sternum lies a complex structure, most of whose homologies are obscure: from anterior margin extend long, lateral apodemes (probably of ninth segment); on dorsal surface extending posteriad lie a pair of long, parenthesis-like sclerites (tenth tergites?); dorsolaterally at midlength a sclerite (ninth tergum?) bearing dorsally several long setae attaining posterior of genitalia; internal structures unclear, but bearing anteroventrally an elongate sclerite often wound-up, springlike (sometimes extended anteriad as a flat, narrow plate); a posteroventral liplike sclerite attached to posteroventral margin of eighth segment. Phallus ending in a long, slender tube which bears from dorsal surface (probably at about midlength of phallus) a pair of stout setae.

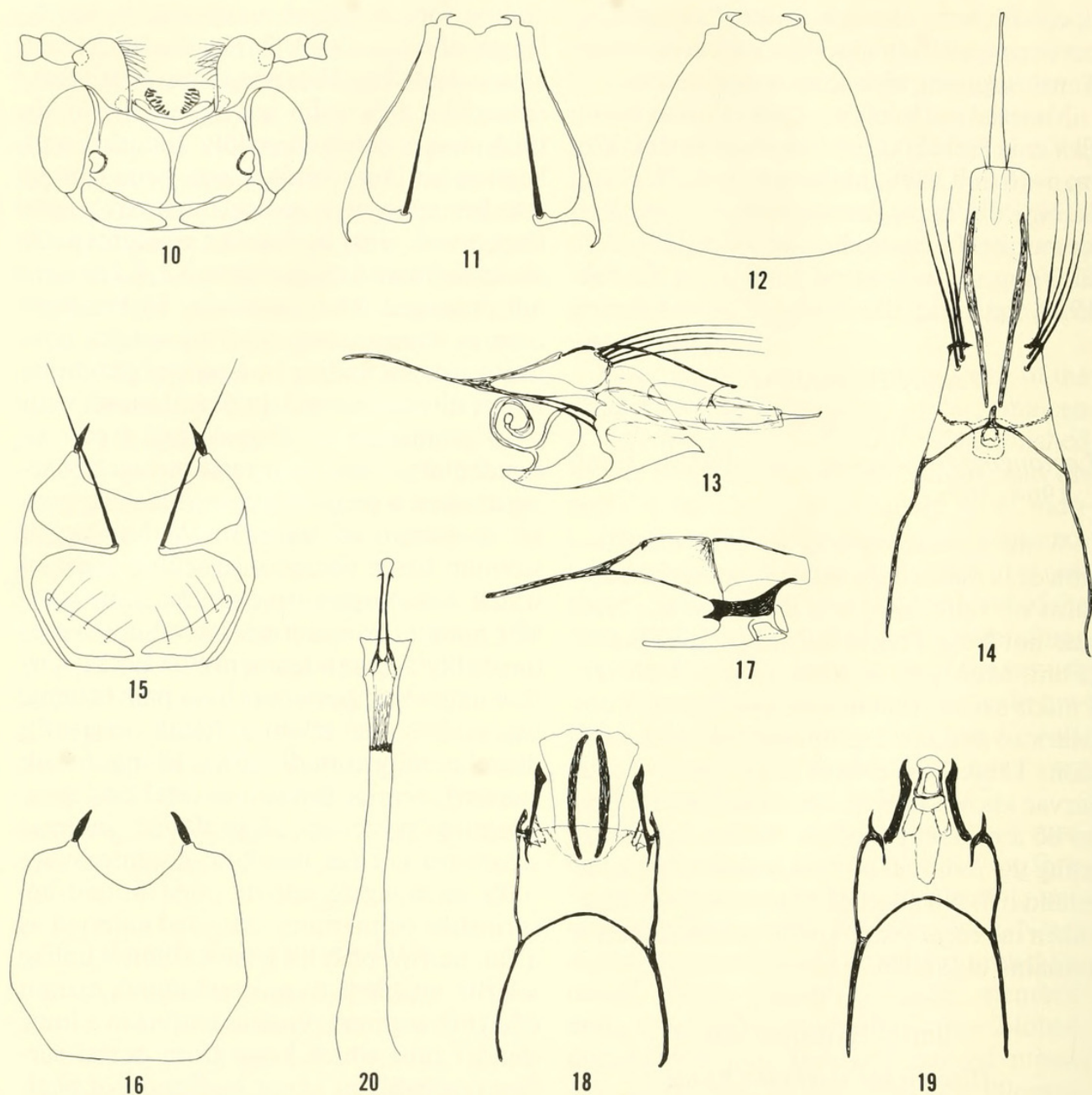
Material.—Holotype, male: Puerto Rico, El Verde Field Station, Quebrada Prieta, 370 m, 6–10 Feb 1990, Malaise trap, O. S. Flint, Jr. NMNH Type. Paratypes: Same data, 22 ♂; same data, but 9 Nov 90, emergence trap, K. Buzby & E. C. Masteller, 1 ♂; 6 Jan 92, 1 ♂.

Alisotrichia setigera Flint,

NEW SPECIES

Figs. 15–20

The presence of the setigerous rods from the dorsal margin of the eighth sternum allies this species with the preceding, *A. cir-*



Figs. 10–20. *Alisotrichia circinata*, male. 10, head, dorsal; 11, eighth sternum, dorsal; 12, same, ventral; 13, genitalia, less eighth sternum, lateral; 14, same, dorsal. *Alisotrichia setigera*, male genitalia. 15, eighth sternum, dorsal; 16, same, ventral; 17, genitalia, less eighth sternum, lateral; 18, same, dorsal; 19, same, ventral; 20, phallus.

cinata. However, the presence of a pair of stout, black spines from the posterior margin of the sternum rather than submesal hooks, and the presence of a conspicuous black process from the posterolateral margin of the internal complex renders the two species immediately separable.

Adult.—Length of forewing 1.5–2 mm.

Color basically fuscous marked with a silvery-white hair tuft on head between antennae, and forewings marked with silvery-white spot, one at base, another on foremargin at $\frac{1}{3}$ and a complete crossband at $\frac{2}{3}$ length of wing. Ocelli 2. Head with frontal area indented and bearing a cluster of short, enlarged scales; palpi not apparently mod-

ified; scape enlarged, oddly rounded and bearing on inner surface long hairs (fitting into frontal cavity), pedicel distinctly longer than broad, with 16 flagellar segments each about as broad as long. Spurs 0,2,4. Seventh sternal processes hook-like, recurved posteriad. Male genitalia. Eighth sternum as wide as long, almost parallel-sided; posterior margin ventrally with a pair of sublateral, black, spinelike setae, in dorsal aspect at midlength with a pair of slender lobes directed mesad and each bearing at apex a very large spine reaching much beyond posterior margin of segment. Within eighth sternum lies a complex structure, most of whose homologies are obscure: from anterior margin extend long, lateral apodemes (probably of ninth segment), on dorsal surface extending posteriad lie a pair of parenthesis-like sclerites (tenth tergites?); posterolaterally bearing a strong, black, process ending in an apicodorsal point; apicoventrally with a strange, lobate structure. Phallus ending in a slender tube which bears from a subapical expansion a membranous collar; at about third length of phallus a dark ring basad of which phallus is a simple tube.

Material.—Holotype, male: Puerto Rico, El Verde Field Station, Quebrada Prieta, 370 m, 6–10 Feb 1990, Malaise trap, O. S. Flint, Jr. NMNH Type. Paratypes: Same data, 50 ♂; same data, but 27 Mar 90, emergence trap, K. Buzby & E. C. Masteller, 1 ♂; 2 Apr 90, 1 ♂; 1 Jun 90, 1 ♂; 15 Jun 90, 1 ♂; 3 Sep 90, 1 ♂; 10 Oct 90, 1 ♂; 17 Oct 90, 1 ♂; 7 Nov 90, 1 ♂; 7 Jan 91, 1 ♂; 27 May 91, 1 ♂; 29 May 91, 1 ♂; 22 Jun 91, 1 ♂; 31 Aug 91 to 3 Feb 92, 19 ♂. Sabana, Bisley stream #3, tributary to Rio Mameys, 3 Jun 91, emergence trap, K. Buzby & E. C. Masteller, 1 ♂.

Ochrotrichia (Metrichia) squamigera

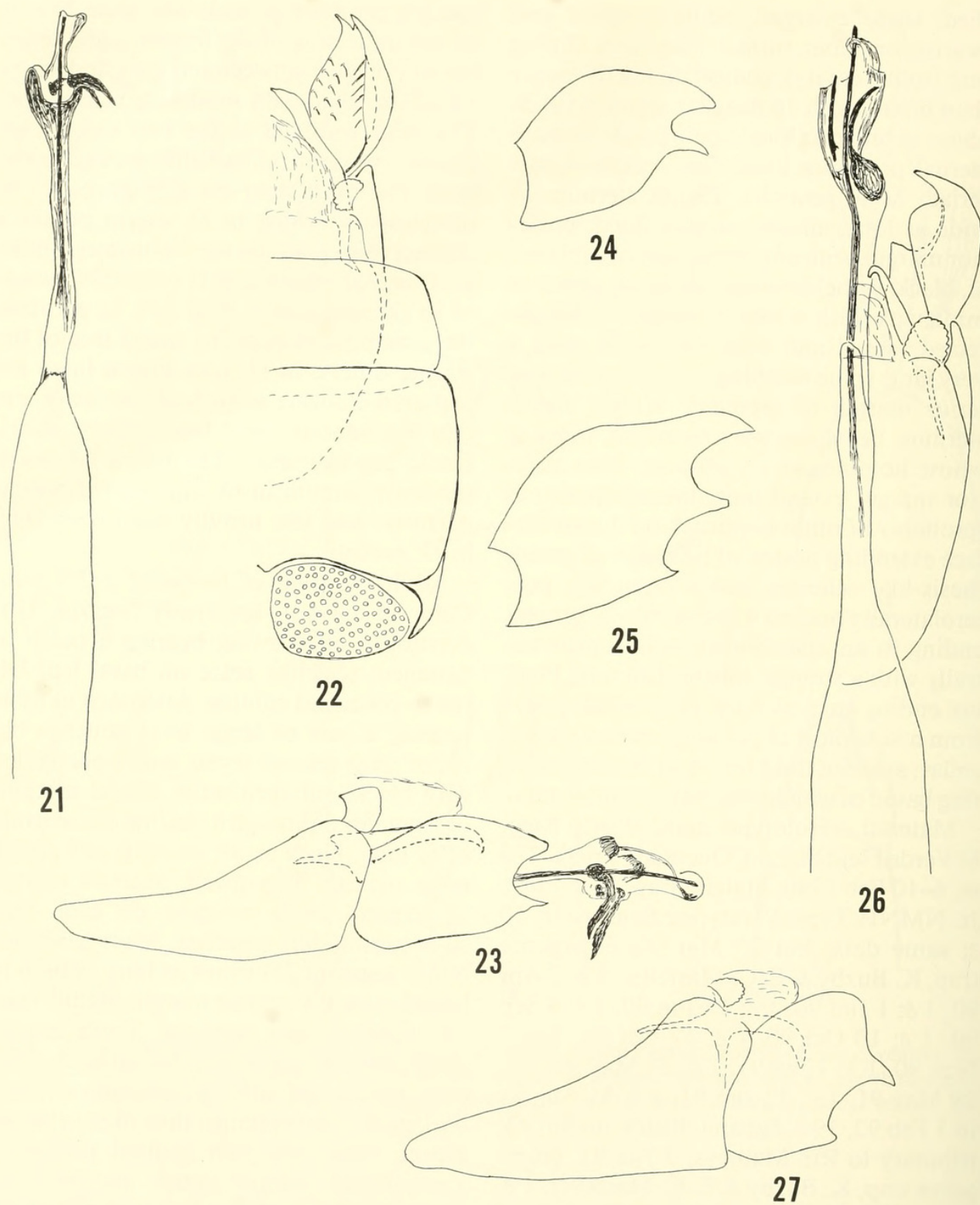
Flint, NEW SPECIES

Figs. 21–24

This species is very closely related to *O. (M.) excisa* Kum. from Cuba. It shares some of the more unusual characteristics with this

species: presence of scale-like setae basally on the underside of the forewing and large, round pouches between terga six and seven which are filled with modified, black setae. The male genitalia in the two species are also nearly identical, but differences do exist here. The most clear-cut differences are in the claspers, which in *O. excisa* possess a distinct third point on the ventromesal margin (Fig. 25), which area is smoothly rounded in *O. squamigera* (Fig. 24). In addition the ornamentation of the mesal face of the clasper differs: in *O. squamigera* there are scattered elongate setae here, but in *O. excisa* the ventral third bears many, short, black, peg-like setae. The lateral hooks of the tenth tergum in *O. squamigera* appear narrower and less heavily sclerotized than in *O. excisa*.

Adult.—Length of forewing 2–2.3 mm. Color in alcohol, uniformly fuscous. Undersurface of forewing bearing a patch of flattened, scalelike setae on basal half between costa and cubitus. Abdomen of male bearing a pair of large, oval pouches between terga six and seven, each pouch filled with black, enlarged setae; lateral margins of segments 5 through 8 bearing dense fringes of long, black setae; seventh and eighth terga strongly sclerotized, anterior margin of tergum seven concave on each side to accommodate pouches. Male genitalia. Ninth segment $2\frac{1}{2}$ times as long as high in lateral aspect; posterior margin slightly convex. Cercus small, rounded. Tenth tergum lightly sclerotized basally; lateral hook elongate, tip curved slightly ventromesad and darkened. Clasper longer than high in lateral aspect, apex with two pointed processes, ventromesal margin evenly curved from ventralmost process; inner face with scattered, short, spinate setae. Phallus with inflated basal and slender apical sections of equal length; apical section traversed by a slender, dark ejaculatory duct; subapically with a pair of equal spines arising from enlarged and convoluted bases, tip of phallus projecting, lightly sclerotized.



Figs. 21–27. *Ochrotrichia (Metrichia) squamigera*, male genitalia. 21, phallus, dorsal; 22, genitalia plus abdominal terga 7 through 9, dorsal; 23, genitalia, lateral; 24, clasper, ventrolateral. 25, *Ochrotrichia (Metrichia) excisa*, male clasper, ventrolateral. *Ochrotrichia (Metrichia) ceer*, male genitalia. 26, genitalia and phallus, dorsal; 27, same, lateral.

Material.—Holotype, male: Puerto Rico, El Verde Field Station, Quebrada Prieta, 370 m, 6–10 Feb 1990, Malaise trap, O. S. Flint, Jr. NMNH Type. Paratype: Same data, 1 ♂.

***Ochrotrichia (Metrichia) ceer* Flint,**

NEW SPECIES

Figs. 26, 27

This species is related to *O. (M.) esepa* Bots. from Cuba. There are distinct differences, however, in the structure of the claspers and phalli between the two species. In *O. ceer* the apical point of the clasper is more distinct and angled mesad and the dorsal lobe is larger, the lateral spine of the phallus is short and truncate, and the ninth segment is fully twice as long as high.

Adult.—Length of forewing 2 mm. Color mostly silvery due to hair on thorax, legs and forewings, with fuscous hair intermixed, especially in oblique bands on forewings; head and antennae with cream-colored hair. Forewing not modified. Abdomen of male bearing a pair of small, darkened, oval sacs between terga four and five; a pair of small, lense-like pockets between terga six and seven, each with a single, dark spot within; lateral margin of segment 5 with an oblique fringe of long, black setae; seventh sternum with a small apicomesal point. Male genitalia. Ninth segment 2 times as long as high in lateral aspect; posterior margin sinuous. Cercus small, rounded. Tenth tergum lightly sclerotized basally; lateral hook elongate, tip curved ventrad, slightly hooked in dorsal aspect. Clasper as long as high in lateral aspect; apex with a pointed process angled apicomesad, ventromesal margin with a distinct angle, dorsal margin developed into a broad lobe; inner face with scattered, short, spinate setae. Phallus with inflated basal section only about third as long as slender apical section and terminating with a blunt process overlaying the apical section just beyond midlength; apical section traversed by a slender, dark ejaculatory duct; subapically with a pair of spines arising from enlarged and convoluted basal sclerites,

larger spine with a notably enlarged base; tip flattened and convoluted, lightly sclerotized.

Material.—Holotype, male: Puerto Rico, El Verde Field Station, Quebrada Prieta, 370 m, 6–10 Feb 1990, Malaise trap, O. S. Flint, Jr. NMNH Type. Paratype: Same data, 86 ♂. Sabana, Bisley stream #3, tributary to Rio Mameys, 8 Feb 1990, emergence trap, E. C. Masteller, 1 ♂.

Family Leptoceridae

Nectopsyche ?cubana (Banks)

Leptocella Flint, 1964: 64.

A few adults of the Puerto Rican *Nectopsyche* have finally been taken, but unfortunately none are male. They have been compared with the types of *N. cubana* and other examples from Jamaica and Dominican Republic (new record), and found to be in close agreement in maculation. However, lacking a male from Puerto Rico, I can not confirm this identity on the basis of genitalia. Until males are taken and both maculation and male genitalia can be compared, I prefer to leave the identification questioned.

Material.—Puerto Rico, Rio Mameyes at Rt. 988, Sabana, 8 Jan 1991, E.C. Masteller, 2 ♀.

Puerto Rican Trichoptera

The following is a list of all the species of caddisflies known from Puerto Rico, and reflects current family and generic placement. The total figures are 10 families, 25 genera and subgenera, and 42 species. This may be compared to the totals in 1964 (adjusted for current systematics) 10 families, 24 genera and subgenera, and 35 species.

Family Hydrobiosidae

Atopsyche trifida Denning

Family Glossosomatidae

Campsiophora pedophila Flint

Cariboptila orophila Flint

Cariboptila trispinata Flint

Family Philopotamidae

- Chimarra* (*Curgia*) *albomaculata* (Kolbe)
Chimarra (*Chimarra*) *maldonadoi* Flint
Chimarra (*Chimarra*) *puertoricensis* Flint

Family Xiphocentronidae

- Xiphocentron* (*Antillotrichia*) *haitiensis* (Banks)
Xiphocentron (*Antillotrichia*) *borinquensis* Flint

Family Polycentropodidae

- Antillopsyche* *tubicola* Flint
Cernotina *mastelleri* Flint
Polycentropus *zaneta* Denning

Family Hydropsychidae

- Macronema* *matthewsi* Flint
Leptonema species
Smicridea (*Smicridea*) *protera* (Denning)
Smicridea (*Smicridea*) *alticola* Flint

Family Hydroptilidae

- Leucotrichia* *tubifex* Flint
Alisotrichia *hirudopsis* Flint
Alisotrichia *circinata* Flint
Alisotrichia *setigera* Flint
Neotrichia *iridescens* Flint
Kumanskiella *karenae* Harris & Flint
Hydroptila *martorelli* Flint
Hydroptila *medinai* Flint
Oxyethira (*Loxotrichia*) *puertoricensis* Flint
Oxyethira (*Loxotrichia*) *janella* Denning
Oxyethira (*Dampftrichia*) *arizona* Ross
Ochrotrichia (*Ochrotrichia*) *spinosissima* Flint
Ochrotrichia (*Ochrotrichia*) *gurneyi* Flint
Ochrotrichia (*Ochrotrichia*) *marica* Flint
Ochrotrichia (*Ochrotrichia*) *verda* Flint
Ochrotrichia (*Metrichia*) *juana* Flint
Ochrotrichia (*Metrichia*) *squamigera* Flint
Ochrotrichia (*Metrichia*) *ceer* Flint

Family Leptoceridae

- Oecetis* *pratti* Denning
Oecetis *inconspicua* (Walker)
Nectopsyche ?*cubana* (Banks)

Family Calamoceratidae

- Phylloicus* *pulchrus* Flint

Family Helicopsychidae

- Helicopsyche* *minima* Siebold
Helicopsyche *ramosi* Flint
Helicopsyche *singulare* Botosaneanu & Flint
Helicopsyche *propinqua* Botosaneanu & Flint

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