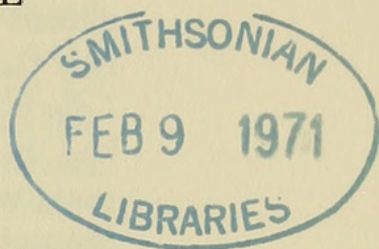


PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

STUDIES OF NEOTROPICAL CADDIS FLIES, XI:
THE GENUS *RHYACOPSYCHE* IN CENTRAL
AMERICA (HYDROPTILIDAE).¹

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Fritz Müller in a series of papers (1879b, 1880, 1881) proposed a number of generic names for Brazilian Trichoptera based almost exclusively on the morphology of the larval cases. Over the years the identity of many of these genera has been established, but a number have remained nomina dubia. The hydroptilid genus *Rhyacopsyche* is one whose identity has never been fully established, although more is known about it than about certain others.

Müller first used the name *Rhyacopsyche* in 1879a, without an included species or figures, stating only that the case is attached by a versatile stalk. Later in 1879b, an English version and condensation of his later works appeared, but without figures. In this paper the species is referred to as *R. hageni* and a full description of the larval and pupal cases and habits is given. The full description and figures of the curious cases of *R. hageni* appeared in 1880 and 1881. In none of these works is any description given of the larvae or adults of the species.

The first description of the larval and adult morphology was given by Thienemann (1905) who had obtained some of Müller's material containing larvae, pupae and pharate adults. He mentions that the larva is a typical hydroptilid, and describes and figures the odd ventral spine of the tarsi and the hooked and basally enlarged claw. He also describes, with primitive figures of the genitalia, the adult male. Möller published (1921)

¹ Field work of the author was supported by National Science Foundation grant GB-2616.

a previously unpublished figure from Müller showing the general larval habitus.

Ulmer in 1913 doubtfully referred some Paraguayan hydropatrids to this species. These are clearly not *hageni*, but apparently a species of *Neotrichia*. Thus has our knowledge of the genus remained.

In 1967 I described *Metrichia mexicana*, noting that it agreed with the genus *Metrichia* in key adult characters, but that the pattern of the genitalia was radically different. Later I discovered larvae, pupae and metamorphotypes of this species had been collected at Finca Mocá, Guatemala. The pupal cases were attached by short stalks, and appeared identical to those described and figured by Müller for *R. hageni*. Further the habitus and the structure of the larval tarsi (with the possible exception of having only 1 enlarged seta) and the claw was identical to that shown by Müller and Thienemann. The larval cases differed in not being attached by a long thread, but were very similar otherwise. Further study of Thienemann's adult description disclosed agreement in structure of the head, its appendages and ocelli, the spur count, and a correlation of general form of the genitalia.

On the basis of these correlations of larva, case and adult, I believe the species *mexicana* Flint is congeneric with *hageni* Müller. Because the knowledge of *Rhyacopsyche* has been so fragmentary, a diagnosis of the genus is presented here, together with descriptions of those species found to date in Central America.

Genus *Rhyacopsyche* Müller

Rhyacopsyche Müller, 1879a, p. 40 (Nom. nud.)

Rhyacopsyche Müller, 1879b, p. 143; 1880, p. 121; 1881, p. 72—Thienemann, 1905, p. 287.—Möller, 1921, p. 525.—Nielsen, 1948, p. 10.—Ulmer, 1957, p. 172.—Fischer, 1961, p. 81.

Type species: *Rhyacopsyche hageni* Müller, 1879b, monobasic.

Adult: Ocelli 3. Head with posterior warts open beneath, but without specialized structures. Antennae unmodified. Spurs 1,3,4. Mesonotum with scutellum divided transversely, with vertical posterior margin obsolete mesally; metascutellum roughly pentagonal in shape. Wings narrow and acuminate. Male genitalia with ninth segment produced into dorso-lateral lobes. Tenth tergum mostly contracted inside the ninth tergal

lobes. Claspers distinct, paired. Subgenital sclerite present, often reduced to linear structures mesad of claspers. Female genitalia with eighth tergum bearing from posterior margin a setate lobe (or lobes) surmounting a more ventral flap. Eighth and ninth segments with very long internal rods.

Larva: Head without special ornamentation. Thoracic nota divided mesally; metanotum without anterolateral enlargement; no apparent sternal sclerites. Legs all short and similar in structure; apex of tibia expanded and bearing several enlarged setae; tarsus short and broad with one (or possibly two) enlarged, platelike ventral seta; claw angled ventrad, inflated basally. Abdomen slightly compressed, segments 4-7 enlarged slightly. Anal prolegs united to sides of tenth segment, claw free.

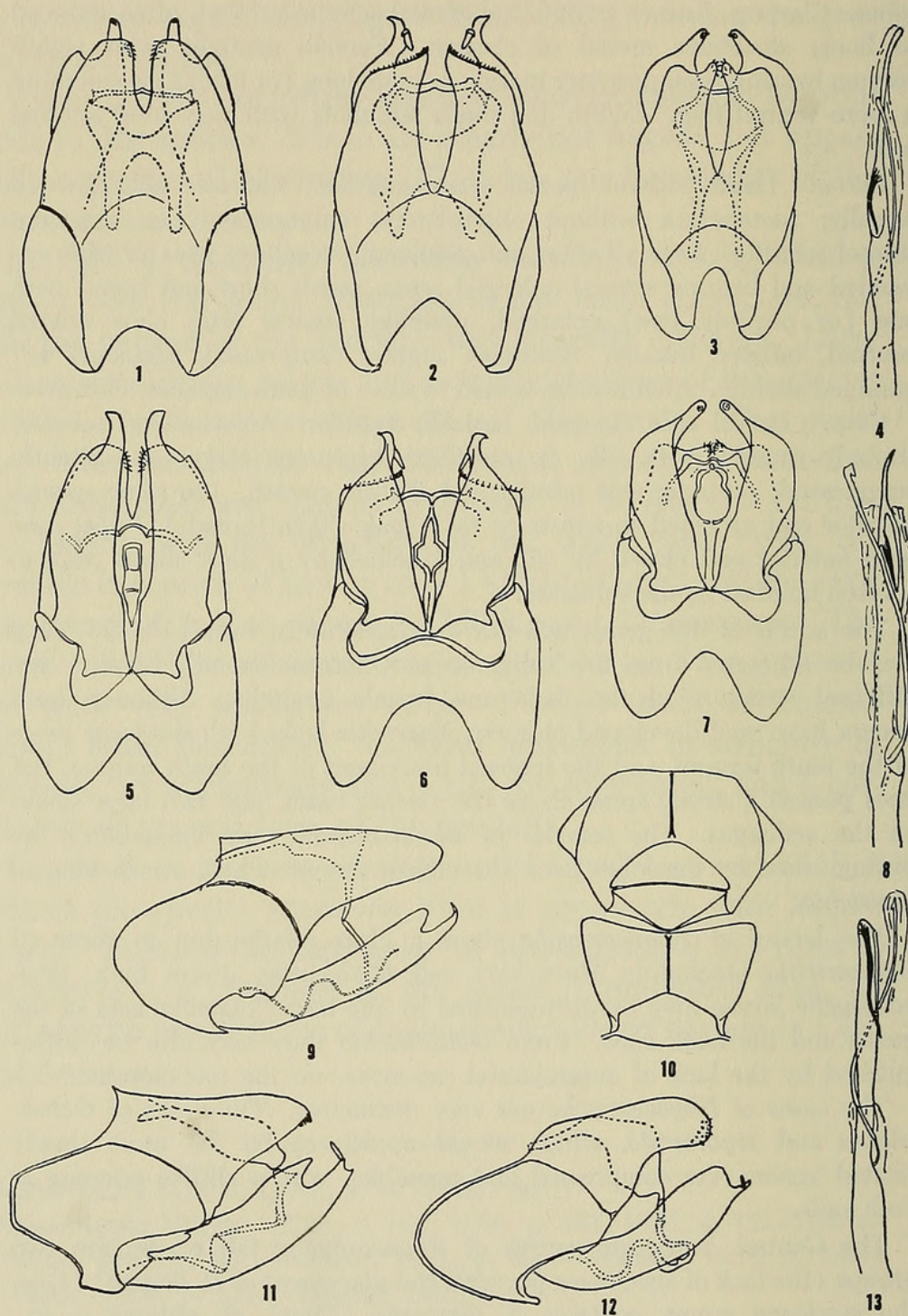
Case: Larval case elongate, basically tubular. Anterior end tubular, strongly rimmed with silk; at midlength becoming larger and slightly compressed; posterior end tubular and slightly curved. (In some species anterior end attached to substrate by a long silken thread.) Pupal case with anterior end closed by silk and attached by a short silken stalk to a silken holdfast on the substrate.

The adults of this genus will key to *Metrichia* in Ross (1944). They may be separated from this subgenus of *Ochrotrichia* only by the very different structure of the male and female genitalia. Although both genera have well-developed claspers, *Metrichia* lacks both the large lobes of the ninth tergum, and the internal placement of the tenth tergum, but does possess a strong spine above the clasper bases, and two large hooks on the aedeagus. The females of *Rhyacopsyche* may immediately be distinguished by the lobes from the eighth tergum which are lacking in *Metrichia*.

The larvae of *Rhyacopsyche* show a clear relationship to those of *Ochrotrichia* (including *Metrichia*) and *Hydroptila*. From both, *Rhyacopsyche* larvae may be distinguished by the large, platelike seta of the tarsus and the hook claw. From *Ochrotrichia* they may also be distinguished by the lack of anterolateral expansion on the metanotum.

The cases of *Rhyacopsyche* are very distinctive. The cases of *Ochrotrichia* and *Hydroptila*, which would appear to be the most closely related genera, are compressed and purselike, with a slitlike opening at both ends.

The Central American species of *Rhyacopsyche* fall easily into two groups (the lack of specimens prevents the placement of *R. hageni*). One, the *mexicana* group, contains *R. mexicana* (Flint), *R. obliqua* n. sp., and *R. torulosa* n. sp. The claspers of this group are elongate and the subgenital plate has been modified to narrow, ribbonlike sclerites lying between the claspers. The females have a simple eighth sternum. The second group contains *R. turrialbae* n. sp. only. The claspers of this species are developed dorsoventrally, and the subgenital plate is very large and heavily sclerotized. The posterior margin of the eighth sternum of the female is considerably modified.



FIGS. 1-13. Meso- and metanota, dorsal (10); male genitalia, dorsal (1, 2, 3), ventral (5, 6, 7), and lateral (9, 11, 12), and aedeagus, apical half (4, 8, 13) of *Rhyacopsyche mexicana* (Flint) (1, 4, 5, 9, 10), *R. obliqua* n. sp. (2, 6, 8, 11), and *R. torulosa* n. sp. (3, 7, 12, 13).

Key to species.

1. Male with clasper produced dorsoventrally, subgenital plate large with a twisted spine from dorsal margin; female with posterior margin of eighth sternum bearing a central conical projection and lateral shelflike flaps *R. turrialbae*
 Male with claspers elongate, subgenital plate represented by ribbon-like straps between claspers; female with posterior margin of eighth sternum unmodified 2
2. Male with posterodorsal lobes of ninth segment obliquely truncate in both dorsal and lateral aspects; female with a pair of setate lobes from eighth tergum *R. obliqua*
 Male with ninth tergal lobes either rounded or with a small rounded lobe in dorsal aspect and evenly rounded in lateral aspect; female with a single setate lobe from eighth tergum 3
3. Male with ninth tergal lobes bearing a small rounded apicomesal lobe; female with ventral lobe from eighth tergum narrowed mesad and heavily sclerotized *R. torulosa*
 Male with ninth tergal lobes evenly rounded; female with ventral lobe tongue-shaped and more lightly sclerotized *R. mexicana*

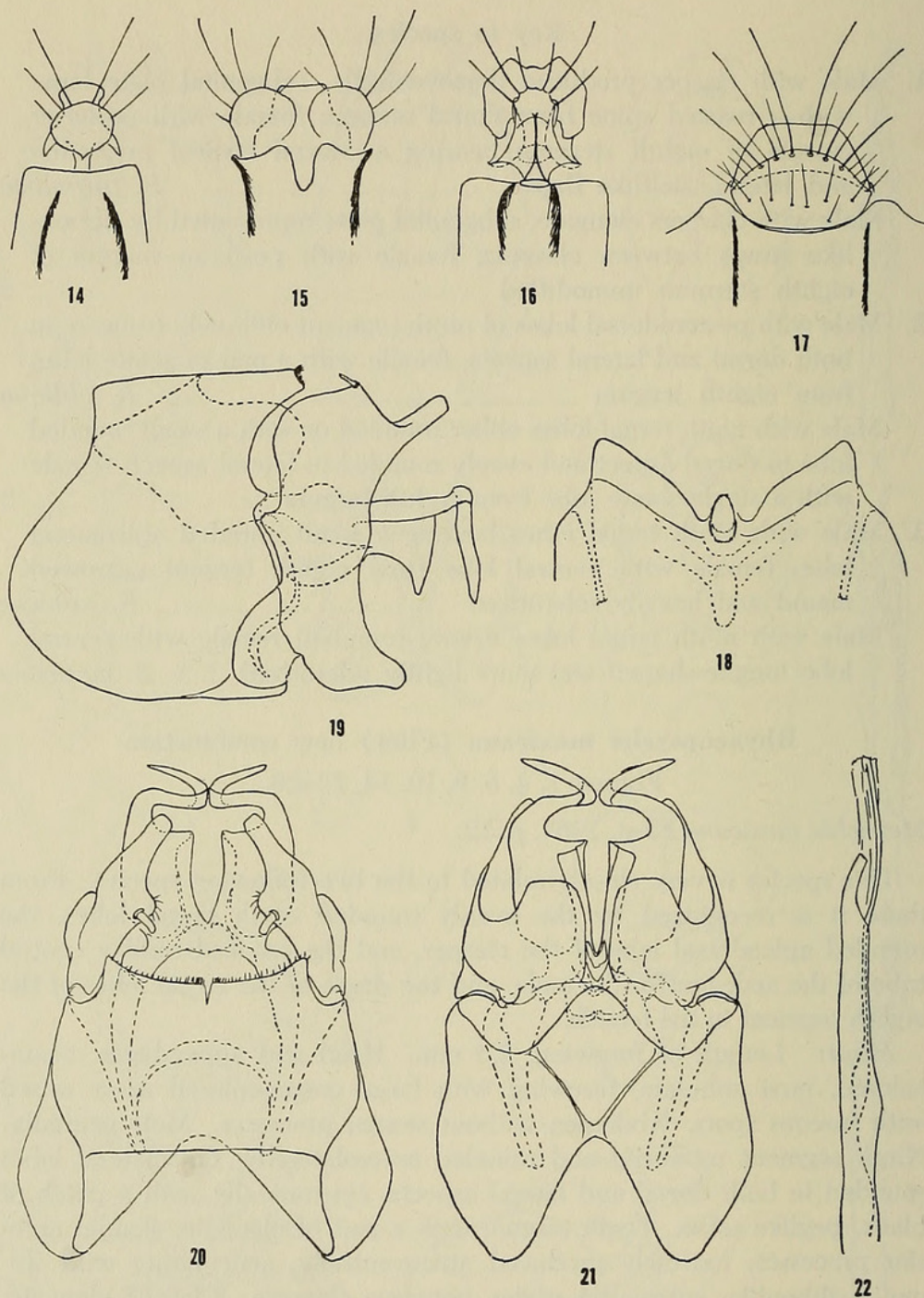
***Rhyacopsyche mexicana* (Flint) new combination**

Figures 1, 4, 5, 9, 10, 14, 23-26.

Metrichia mexicana Flint, 1967, p. 12.

This species is very closely related to the two following species. From these it is recognized by the evenly rounded ninth tergal lobes, the rounded apicodorsal lobe of the clasper, and the crooked rodlike central tube of the aedeagus in the male, and the shape of the tergal lobes of the eighth segment in the female.

Adult: Length of forewing, 2.5 mm. Head and appendages cream-colored, tarsi annulate, forewing with large cream-colored areas mixed with fuscous spots. Abdomen without sternal processes. Male genitalia: Ninth segment produced and rounded anterolaterally; dorsolateral lobes rounded in both dorsal and lateral aspects, apicomesally with a patch of black, peglike setae. Tenth tergum with a pair of elongate, slender anterior processes; narrowly produced apicoventrally, articulating with sinuous, ribbonlike subgenital plates between claspers. Clasper elongate, parallel-sided, apicodorsal lobe produced, with rounded apex; apicoventral lobe elongate, with an enlarged apicodorsal seta. Aedeagus with basal half tubular, slightly enlarged basad; apical half with lateral filament short and tightly appressed to central tube; central tube prolonged into a slightly crooked rod, at midlength bearing a dark, appressed, basally-directed spine. Female genitalia: Eighth sternum simple. Eighth tergum with a pair of dark, slightly divergent submesal bars; from posterior margin a mesal, buttonlike dark lobe bearing 6 setae, from beneath a paler tongue-like flap.



FIGS. 14–22. Female eighth tergal lobes, dorsal (14, 15, 16, 17), and eighth sternum, ventral (18): male genitalia, lateral (19), dorsal (20), ventral (21), and aedeagus, apical half (22) of *Rhyacopsyche mexicana* (Flint) (14), *R. obliqua* n. sp. (15), *R. torulosa* n. sp. (16), and *R. turrialbae* n. sp. (17–22).

Larva: Length, 3–3.5 mm. Sclerites pale yellow, sparingly marked with fuscous. Thoracic nota with anterior margins bearing a row of large, decumbent, darkened setae. Abdominal terga with 3 pairs of setae

on segment 1, 2 pairs each on segments 2-8, all setae arising from a small sclerite; sterna 1-8 each with a pair of small, simple setae. Ninth tergite with a pair of large submesal setae, and 3 pairs of small lateral setae. Supporting sclerites of anal claw with 2 large conspicuous setae; claw with a single hook.

Case: Larval case, 4.5 mm. long, 1 mm wide. Silken, fusiform, outer surface completely covered with small sand grains. Pupal case, 5-6 mm. long, 1 mm. wide. Generally similar to larval case but anterior end attached by a silken stalk .5-1 mm. long, posterior end compressed and split along dorsal and ventral margins (this gapes open after emergence of pupa).

Material: MEXICO: VERACRUZ; Rio Tacolapan, route 180, km. 551, 25-26 July 1966, Flint & Ortiz, ♂ holotype, 14 ♂ 12 ♀ paratypes; Cuitlahuac, 10-12 Aug. 1964, P. J. Spangler, 1 ♂ paratype. GUATEMALA: SUCHITEPEQUEZ; Finca Mocá, 12 June 1966, Flint & Ortiz, 3 ♂ 1 ♀ paratypes, 2 larvae, 4 prepupae, 19 pupae, 1 ♂ 2 ♀ metamorphotypes, 20 pupal cases. ESCUINTLA; Rio Metapa, 10 km. southeast Escuintla, 275 m. elev., 5-6 Mar. 1970, E. J. Fee, 1 ♂.

Biology: The immature stages of this species have been collected only once, but in very distinctive circumstances. The Rio Bravo just above Finca Mocá is a few yards wide with an average depth of a foot or so. The bottom is mostly inorganic matter, in size from small sand grains to large boulders, and, to judge from the general rarity of caddisfly larvae, subject to rather frequent scouring floods.

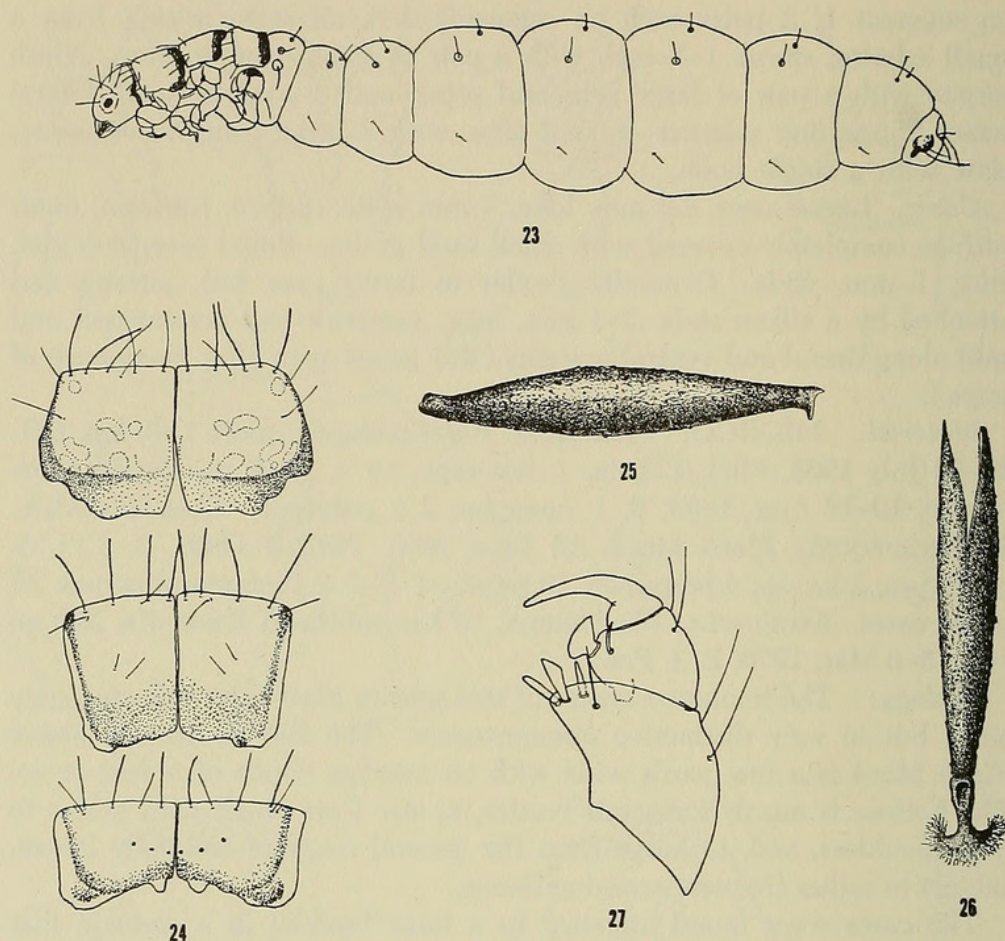
The cases were found attached to a huge boulder in a cascade that was in contact with a second boulder in such a manner that most of the water poured out between the rocks at shoulder height as from a spout. The majority of the inner and under surface of the boulders were thus out of the water, but subject to the splash and a film of water seeping down from above. The pupae were attached by their holdfasts to this inner surface in the moist, but not submerged region, and projected at right angles from the boulder.

Two larval cases were taken, but one has a slight amount of silk from its anterior end and was obviously in the process of being attached for pupation. The other has no silk whatever. Whether this is indicative that this species does not attach its larval case by a long silken thread, as does *R. hageni*, or whether it represents a specimen taken at that time after it might have cut away its larval thread and before it started its pupal attachment is not known.

***Rhyacopsyche torulosa* new species**

Figures 3, 7, 12, 13, 16

This species is closely related to the other species of the *mexicana* group. It may be recognized in the males by the small apicomesal lobe of the ninth tergal lobes, the longer and more mesally directed apico-ventral lobe of the claspers, and the truncate apex of the aedeagus. The



FIGS. 23-27. Larval habitus, lateral (23), thoracic nota of flattened prepupa, dorsal (24), apex of larval leg, lateral (27), larval case, lateral (25), and empty pupal case, anterior (26) all of *Rhyacopsyche mexicana* (Flint). Figs. 25 and 26 drawn by Mr. Andre D. Pizzini.

female eighth tergal lobes are very distinctive, especially the ventral lobe which is heavily sclerotized and shaped somewhat like a butterfly.

Adult: Length of forewing, 3 mm. Color in alcohol, dark brown. Abdomen without sternal processes. Male genitalia: Ninth segment produced and rounded anterolaterally; dorsolateral lobe rounded in lateral aspect, in dorsal aspect with a small rounded apicomesal lobe which bears ventromesally some small, black, peglike setae. Tenth tergum with long, slender anterior processes; produced ventrad apically, articulating with sinuous, ribbonlike subgenital plates between claspers. Clasper long and rather parallel-sided, apicodorsal lobe not produced; apicoventral lobe elongated mesally with a small dorsal seta. Aedeagus tubular for basal half, with base slightly enlarged; apical half bearing a filament spiraling around central tube; central tube obliquely truncate, apex bearing a dark, appressed, basally-directed spine. Female genitalia: Eighth sternum simple. Eighth tergum with submesal dark bars diverging

anteriorly; from posterior margin a dark bar connecting with a heavily sclerotized mesal lobe bearing 6 setae, with a heavily sclerotized lobe subtending dorsal lobe ventrally and laterally and articulating with it basally.

Material: Holotype, male: GUATEMALA, ESCUINTLA, Rio Metapa, 10 km. southeast Escuintla, 275 m. elev., 5-6 March 1970, E. J. Fee. USNM Type 71115. Paratypes: Same data, 16 ♂ 22 ♀.

***Rhyacopsyche obliqua* new species**

Figures 2, 6, 8, 11, 15

This the third species of the *mexicana* group, is closely related to the others. It may be recognized in the male by the dorsolateral lobes of the ninth segment which are pointed in both dorsal and lateral aspects, the pointed apicodorsal lobe of the claspers, and the acuminate point to the central tube of the aedeagus. The female is immediately recognizable by the two, rounded, setate lobes dorsally from the apex of the eighth tergum.

Adult: Length of forewing, 2.5 mm. Color in alcohol, brown. Abdomen without sternal processes. Male genitalia: Ninth segment produced anterolaterally into a truncate lobe; dorsolateral lobe pointed in lateral aspect, in dorsal aspect obliquely truncate, apicomeral angle pointed, posteroventral surface with short, black, peglike setae. Tenth tergum with broader, shorter anterior processes; slightly produced apicoventrally and articulated with sinuous, straplike, subgenital plates between claspers. Clasper elongate, parallel-sided, with apicodorsal lobe produced into a point, apicoventral lobe shallowly bifid, dorsal part with a greatly enlarged seta. Aedeagus with basal half tubular, enlarged basad; apical half with lateral filament curving over central tube; central tube produced into a sharp point apically, subapically with a darkened, appressed, basally directed spine. Female genitalia: Eighth sternum simple. Eighth tergum with elongate, parallel, submesal, dark bars; posterior margin divided mesally, with a pair of buttonlike lobes each bearing 6 setae, ventromesially with a small tongue-like flap.

Material: Holotype, male: MEXICO, VERACRUZ, Fortin de las Flores, 17 May 1964, Blanton, et al. USNM Type 71116. Paratypes: Same data, 42 ♂ 22 ♀.

***Rhyacopsyche turrialbae* new species**

Figures 17-22

This species I place in its own group due to the distinctiveness of both the male and female genitalia. In the male the vertical claspers, the greatly enlarged subgenital plate with its twisted dorsal spine, and the very different aedeagus are diagnostic. In the female the modified eighth sternum is distinctive as is the rather simple, semicircular dorsal and ventral lobes of the eighth tergum.

Adult: Length of forewing, 3–3.5 mm. Antenna cream-colored, head pale anteriorly, brown dorsally, legs mostly brown, tarsi of hind and midlegs annulate; forewing with intermingled patches of brown, cream-colored, and golden hairs. Seventh sternum with a small apicomesal point. Male genitalia: Ninth segment inflated and slightly rounded anteriorly; dorsolateral lobe slightly developed, truncate apically with posterior margin bearing short, black, peglike setae. Tenth tergum retracted within ninth tergum and with moderately long basal processes, with strong lateral supports to the subgenital plate. Subgenital plate large and strongly sclerotized, widely open dorsally, and deeply divided midventrally; dorsolateral margin partially separated and produced into a long, twisted, apical spine, apicoventral angle narrowly produced ventrad; basoventrally articulating with a lightly sclerotized, straplike sclerite lying between clasper bases. Clasper tall and narrow, developed into a small basoventral lobe and a larger dorsal lobe which bears dorsally a greatly enlarged, short seta and apically a fingerlike lobe. Aedeagus with basal half tubular and slightly inflated basad; apex basically tubular with a dark filament extending beyond central tube and ending in a lightly sclerotized sheath; central tube slightly curved and narrowed subapically and ending abruptly. Female genitalia: Eighth sternum with a small, conical, central lobe and with posterolateral margins produced into thin, shelflike flaps. Eighth tergum with parallel, submesal, dark bars; from posterior margin dorsally a heavily sclerotized, transversely oval lobe bearing numerous setae, articulating basoventrally with a large, humped, strongly sclerotized, ventral lobe.

Material: Holotype, male: COSTA RICA, CARTAGO, Chitaria, 19 June 1967, Flint & Ortiz. USNM Type 71117. Paratypes: Same data, 14 ♂ 18 ♀; 3 miles west of Turrialba, 18–21 June 1967, Flint & Ortiz, 2 ♂ 1 ♀.

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