**Tempisquitoneura**, a new genus of Neotropical Orthocladinae (Diptera:Chloronotidae) symphoretic on *Corydalis* (Megaaploeta:Corydalidae)

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Abstract. The adult male, adult female, pupa, and larva of a new genus (*Tempisquitoneura*) of midge (Diptera:Chloronotidae) are described and illustrated from specimens collected and reared from *Corydalis* (Megaaploeta:Corydalidae) in northwestern Costa Rica. Larvae and pupae of the midge live attached to *Corydalis* larvae. The genus belongs in the *Corydaleina* group of the subfamily Orthocladinae but its relationship to the two other described genera in the group (*Corydalea* and *Thienemannella*) will remain unclear until more Neotropical members of this group are described and analyzed in all life stages.

Key words: Diptera, Chloronotidae, *Tempisquitoneura mexicana*, new genus, new species, Costa Rica, symphoretic, Megaaploeta.

De la Rosa (1992) described generic relationships between several lesser species and *Corydalis* (Megaaploeta:Corydalidae) in northwestern Costa Rica. Among these was a muge (Diptera:Chloronotidae) larva designated as "*Thienemannella sp. nov."". Examination of all three life stages of this chloronomid indicates that establishment of a new genus is necessary to accommodate the taxon.

*Corydalis* larvae were collected in the field and taken to the laboratory in individual glass vials full filled with stream water. Larvae were then placed in small closed aquaria through which stream water flowed (piped into the artificial stream system in the laboratory directly from the Rio Tempisquitone). A clean rock was provided as a substrate. Larvae were fed cuidadosly and stonily larvae daily, the small aquatic larvae were checked twice a day for emerged chloronomids. When one was found, the pupal exuvia was removed, and when possible, the larval case (still attached to the *Corydalis* larva) was collected as well. Several hours were allowed for hardening of the adult structures before preservation in 70-75% ethanol.

Morphological terminology and methodology follow Epler (1987), Oliver and Dillon (1989), and Sattger (1980). All measurements are in mm except where noted, and consist of the range and, for samples with four or more specimens, the mean.

**Tempisquitoneura Epler, new genus**

Type species: *Tempisquitoneura mexicana* Epler, by monotypy.

**Diagnosis**

*Tempisquitoneura* Adults—Small, brightly patterned species; wing length about 1 mm.

Eyes large, small, retracted, without dorsal mesial extension. Tempora and maxillae fused, with 1 jaw vertical and several outer vertical/post orbital setae. Trichodium long, narrow, tapering to point; cervical, pump broad, with small cor- nia (Fig. 1F). Antenna with 13 flagellomeres and well-developed plate: sensilla trichodea (*sensillum chaeta*) of Oliver and Dillon (1989) present on flagellomeres 2, 3 and subapically on last segment; apes clubbed, pointed, without rosette of short setae (Fig. 1E). Pair well de- veloped; broom of palpomere 3 (Fig. 1G) with numerous setae, 5-8 short, stout setae apically, and 2 sensilla clavate ventrally near attachment point of palpomere 3 to pit present. Thorax (Fig. 227) with bright orange vitta in life. Antennal styles well developed, slight-
ly narrowed dorsally; narrowly separated or touching medially; with lateral setae. Acrosti- 
chal setae absent; dorsoventral setae bi- or tri-
serial, becoming uniseri al posteriorly, preseral se-
tae in one group; 1 suprasellar seta present; scu-
tellar setae in transverse row, uniseri al.
Wing membrane without setae, with fine 
punctuation. Anallobe well developed (Fig. 1A).
Fracticium with 1 seta; sensilla campaniformia 
3 anterior to seta and 7 at distal tip. Costa api-
cally fused with Rs and R,, forming a thick 
ove: slightly proximal; to wing midventral; a 
weak false vein of variable width and devel-
opment runs from SM to inner apex. Cu, slightly 
sinusous: ICu. costal to RM; postcubitus (vi
eal) fold of Scharer [1980]) and anal vein end near 
Cu. Vena, except costs, without setae; squama 
bare. Wing with complete fringe of simple se-
tae; anterior margin of wing from costa to apex 
with single length setae, near apex setae be-
come finer and attenuate in length. Wing mar-
gin slightly sinuate at claval.
Fore leg trochanter with moderately devel-
oped dorsal keel. Fore tibia with single spur; 
mid tibia with 2 unequal spurs, hind tibial apex 
(Fig. 10) scarcely widened and without modi-
ified setae; with comb and two unequal spurs.
Hind margin of tarsomeres 1-3 with double row 
of shorter, thicker, bluntly tipped setae; most 
distant of these setae on each tarsomere larger; 
this double row best developed on mid and 
hind legs. Legs with tarsomere 4 weakly cor-
diform. Sensilla chaetica present on tarsomere 
1 of mid leg; pulvilli absent.
Abdomen (Fig. 22) with distinctive dorsal 
pattern; with a few scattered setae on tergite I: 
tergins II-V with a mixed, medium circular group 
of setae and few lateral setae; tergites VI-VIII 
with transverse rows of setae.
Propygium (Fig. 2C) without well devel-
oped apex and point, but posterior margin of tergite 
IX with slight medial protrusion. Superior vol-
elsa vestigial; inferior volеля well developed.
Geometry without costa dorsalis; with simple 
meagaster. Transverse sternopleurale straight, 
with strong anterolateral projections; phallal-
pleurale broad, strongly curved posteriad. Vagina 
absent.
Adult female.—Generally similar to male ex-
cpt for usual sexual differences, with following 
exceptions:
Head with several inter vertical and outer
vertical/postorbital setae. Antenna with 5 flagellomeres; pedicel with 1-2 setae; apical club more pointed and with numerous sensilla trichodeae.

Wing with sinuate margin at clavus; clavus longer than in male, extending to midpoint of wing (Fig. 1B).

Tarsomere 1 of mid leg with double row of sensilla chaetica; tarsomere 1 of hind leg with single row.

Genitalia (Fig. 2A) with gonocoxite IX well developed. Two seminal capsules present; large, dark, spherical with well developed neck; spermathecal ducts essentially straight, with special secretory cells. Labia fused basally and medially, split into two triangular processes caudally. Dorsal lobes sclerotized, separate, with a well sclerotized, spatulate structure between them; epidieme lobe well sclerotized (Fig. 2B).

Pupa —Small, length less than 3 mm. Exuviae infuscate.

Frontal setae absent. Occipital field with 2 postorbital setae, vertical setae absent. Thorax with 2 median antenopinal setae; 3 unequal preconal setae (Fig. 3C); 4 dorsoventral setae arranged in two pairs. Thoracic horn absent. Humeral callus with broad spine (Fig. 3C). Dorsum of thorax with small, sharply pointed tubercles along eclosion line. Wing sheath usually with weak preal row, without rows 1-3 rows are not apparent on some specimens; this might be due to variation or partial decomposition of the exuviae.

Tergite I without shagreen, T II-VIII and anterior portion of anal lobe with shagreen of fine spines (Fig. 3D). Stermites I without shagreen, S II-VIII with shagreen of fine spines. Posterior margin of T II-VIII with transverse row(s) of 1 to many pointed tubercles (T II sometimes lacks this row); posterior margin of T IV-VII with transverse row(s) of smaller pointed tubercles. Conjunctives II/III-VI/ VII with trans-

Larva — Small; length about 4–7 mm.

Fiddle capsule about 1½ times as long as wide (Fig. 4B). Dorsum with few toecorps from toecorps above. Antenna about ¼ length of head capsule; 5 segmented, with ring organ on proximal third and 2 antennal "setae" on distal third of first segment; antennal blade slightly longer than flagellum; small Lateral organs and well-developed style present at apex of segments 2 (Fig. 4D). Labrum (Fig. 4A) with walled antennal median margin; S I bold; S II large, rising from small pedicle; S III thin, situated posteriorly to S I and anterior to S II; S IV present adjacent to S II, S IV apparently absent or vestigial. Pecten epipharyngis consists of 3 spines, adjacent first pair of chaetulae laterales on similar shape; one pair of chaetulae laterales widely expanded base and pectinate margin with apical blade narrower than others; 2 additional smaller, broadly pectinate pairs of chaetulae laterales. Chaetulae basales absent. Pectinideal with simple apex, with well-developed brush near apical point. Mandibles with 4 inner teeth and with apical tooth usually longer than inner teeth; seta subdentalis extends forward to apex of proximal inner tooth; seta interna with 6–7 plumose branches (Fig. 4D). Mentum (Fig. 4E) with 3 median teeth and 5 pairs of lateral teeth, first pair of lateral teeth closely appressed to outer median teeth; ventralmental plate vestigial, without broad hindwets; seta submedian slightly shorter than mentum length. Maxilla with laterale chaetae adorbiculare, with smooth or hinged inner margins; setae maxillaries simple; gates with group of short setae, without pecten palpebralis.

Anterior parapods separate, longer than wide, each with some long claws basing one to several inner spines/teeth; some shorter, stouter.

Curved claws with inner teeth, and a pair of dark, well-adapted, hooked claws with expanded bases (Fig. 4C); a single longer seta near base of each parapod. Body with second and third segments fused; salivary gland large (280–330 μm long). Process small, bearing 4 large apical setae and 2 weak mesal setae. Posterior parapods separate, longer than wide, bearing a strong, simple subbasal seta; with simple hooked claws. Anal tubules shorter than posterior parapods. Body segments with 0–2 pairs of longer (75–90 μm) setae, setae longer on posterior segments.

Remarks

Tremipququites features several adults and pupal characters previously described to other Conyrmemites or Thienemaniella (the Conyrmemites group, also referred to by some authors as the "Conyrmemites"). The genus also possesses several characters unique for the group. In the adult these include: wings with well-developed anal lobe, setae present on female antenatal pedi-
ic, palpiomere 3 with numerous dorsal setae, abdominal tergites II-V with a raised, median circular group of setae, male sternapodeme transverse, with strong anterolateral projections (sterapodeme transverse with weak anterolateral projections in *Thermaestacilla*); in *Cor-}

gonome the sternapodeme is an inverted U- or V-shape and without anterolateral projections); female genitalia with sclerotized apodelate structure between dorsomesal lobes of pupa; (frontal) setae absent, humeral calyx with broad spine. Abdomens with reduced lateral setae; none of which are lanceoliform; anal maculose and setae of inner margin of anal lobe absent; larva 5 1-3rd, antennae short and anterior pereopods with two well sclerotized large hook-like claws. Some of these characters, such as the broad spine on the humeral calyx and reduced lateral setae of the pupa, the modified anterior pereopods claws, and (perhaps) the short antennae of the larva,
are probably related to the symphotic life style of the immature stages and would be regarded as apomatous.

Characters shared with *Thermannella* include: adult, transverse portion of sternum narrow, hind femur spines not modified; pupa: prothoracic setae arranged in two pairs; larva: antennae five-segmented, simple subanal seta at posterior parapod. Following the analysis of Schlee (1968), these characters are apomatous or polymorphic. The arrangement of the pupal dorsal centrale setae, which are not included in Schlee's analysis, would also be considered as polymorphic or character state. In *Corynomma*, the anteriormost dorsal centrale setae are displaced ventrally. Characters shared with *Corinomma* include: adult, dorsal keel present on fore trochantor; bare eyes; pupa: weak pearl rows present (however, one species aligned to *Thermannella* has pearl rows, see below). The fore trochantor keel was considered by Schlee (1968) to be a derived character state. The wings of Tempiopseudomma bore a well developed anal lobe. Reduction of this lobe was considered apomorphic by Schlee (1968); the anal lobe is most reduced in *Corinomma*. With the exception of the fore trochantor keel, the adults of Tempiopseudomma are morphologically plesiomorphic in members of the *Corinomma* group.

Ferrington and Sather (1995) describe a new Neotropical genus, including two species, which they tentatively place in the *Corinomma* group. This genus possesses a dorsal keel on the prothorax and wing venation somewhat similar to one other members of the *Corinomma* group (R, and R2+R3, are apically indicated). The wing lacks an anal lobe and the sternum is transverse, without oral projection. However, unlike *Corinomma*, *Tempiopseudomma*, or *Thermo-

menna*, the genus has a weak, rounded anal point, a phallopodeme with a rounded, blunt anepisternal lobe (other *Corinomma* genera generally have a pointed, recurved anepisternal lobe), the ventromedian margins of the gonocoxite bears a line of strong setae not found in other members of the group, and the fourth tarsomeres are not differentiated. Because only the males are known, it is not possible to accurately assess this taxon's position. It may not belong in the *Corinomma* group.

Numerous pupal types occur in Neotropical members of the *Corinomma* group which may represent new genera (W. P. Collin, University of Pittsburgh, personal communication).
Templiquaiona larva bear noticeably large salivary/silk glands. Many (most?) Neartic Coryneura and Thienemania also have large glands, but not as large as those observed in Templiquaiona.

The labral setae of the larva is difficult to interpret in the Coryneura group. Coates et al. (1985) stated for Thienemania: "well developed setae on tubercle may be either labral setae 5 I or 5 IV". For Coryneura they stated, "strongly developed setae arising from socket may be either S II or S I setae". Apparently the authors meant to state labral (cephalic) seta 5 I, not 5 I Sether (1981:35). In his description of the larva of Thienemania seminexvia, stated "labral setae 5 I visible vertically and appearing as a strong 5 I seta on a tubercle". It is clear that the enlarged seta is not labral (cephalic) seta 5 I (figs. 4A, B), it is not 5 I. Our interpretation of the labral setae of Templiquaiona (and Neartic Thienemania) prob. seta (Roback) used for comparative purposes follow figures 67 in Sether (1985), where this large seta should be interpreted as 5 II. It appears that 5 IV B is absent or vestigial, or may be what we have called the labral seta. A similar situation is apparent in Coryneura, as can be seen in fig. 9.3 in Hervonen and Hervonen (1886). Templiquaiona is the only member of the Coryneura group with a bilobed 5 I (the S I was not observed on specimens of Thienemania seminexvia).

Etymology
Named for the Rio Tempiquiao in northwestern Costa Rica, where most of the specimens were collected.

Templiquaiona merillorum Eppler, new species
Thienemania sp. nov. de la Rua 1992:316.

Type locality: COSTA RICA: Guanacaste: Quebrada Pedregal, 2 km south of Estacion Cerro El Hacha. 10°58'35"N, 83°52'31"W, elevation 300 m.

Description
As in the generic diagnosis, with the following additions:

Adult male (n = 5).—Thorax length 0.77-0.92, 0.82 mm; abdomen length 0.9-1.19, 1.12 mm; total length 1.80-2.10, 1.94 mm

Color (in alcohol): Apex of antennae and pedicel dark brown, palps light brown except palpi 5 white with brown band, remainder of haltere with brown, apical knob light. Legs (Fig. 2C) steleminose with following brown markings: fore leg—base of trochanters; apical 1/3 of femur except for small pale preapical area, proximal tibial apes and band at about 1/3 length; apices of tarsomeres 1, 2, and entire tarsomeres 3-5 with pale brown; mid leg—trochanter; band at mid-tibial; proximal apes of tibia; with slight darkening at distal tibial apes and apices of tarsomeres 1, 2, and entire tarsomeres 3-5; hind leg—base of trochanter, distal 1/3 of femur; tibial apes; apices of tarsomeres 1, 2, and entire tarsomeres 3-5 with pale brown. Thorax and abdomen pattern as shown in Figures 2D, E, sternites IV-VII with anterior brown band, VIII mostly brown; hypopygium pale. Head: inner vertical setae 1-2, 1, outer vertical/posttibial setae 2-5, 3; clumped setae 17- 24, 21; cibarial setae 1-3, 2. Tentorium length 130-140, 130. Length of palpiomes 1-3 (n = 4): 25-38, 33; 40-45, 43, 72-88, 79; 90-100 (e = 3); 165 (e = 1). AR 0.38-0.55 (e = 3).

Thorax: Antennal setae 5-6, 6; dorsocentral setae 15-21, 18; prealar setae 7-5, 5; acrosternal setae 7-11, 9. Anapleural suture length 108-152, 155, about 1/3 as long as preepipleuron.

Wing: Length 360-400, 375. Width 330-375, 352. M 265-295, 283. Cu 440-452, 475. VR 1.57-1.78, 1.60; Cw/wing length 0.37-0.40, 0.38. Cw/wing length 0.49-0.54, 0.52.

Legs: Lengths and proportions of legs are shown in Table 1. Length of tibial spurs: fore 33-40, 37, mid 15-17, 16 and 22-38, 28; hind 15-23, 19 and 38-50, 43. Hind tibial comb with 12-13, 12 setae. Numbers of blusted tipped setae on hind margin of tarsomeres 1-3: fore 11-13, 12; 10-12, 11; 2-4, 6; mid 22-29, 26; 14-21, 18; 6-11, 9; hind 37-46, 42; 17-24, 21; 8-19, 9. Mid leg tarsomere 1 with 2-3, 2 serrula chaetae.

Abdomen: Number of setae in circular groups on tergites II-V: 13-22, 17; 19-16, 14-18, 16; 9-20, 14-9, 7. Hypopygium (Fig. 2C) with 22-28, 25 dorsocentral setae. Transverse sternumPomere width 53-75, 64. Genoviscous length 158-175, 166; genoviscous length 30-48, 36.
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<tr>
<td>Male</td>
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| Female | Femur | 470-485, 450 | 410-450, 437 |
|        | Tibia  | 470-520, 485 | 470-540, 502 |
|        | Tarsus | 300-330, 313 | 300-340, 310 |
|        | Tarsus | 140-160, 149 | 160-190, 171 |
|        | Tarsus | 45-55, 55    | 75-85, 79   |
|        | Tarsus | 25-30, 25    | 25-30, 25   |
|        | Tarsus | 50-50, 50    | 60-50, 48   |
|        | LR     | 0-6, 0-6     | 0-6, 0-6    |
|        | SV     | 4-6, 4-6     | 3-5, 3-5    |
|        | SV     | 2-3, 2-3     | 2-3, 2-3    |

Afadil (female n = 5).—Thorax length 0.72-0.93, 0.84 mm; abdomen length 0.95-1.28, 1.11 mm; total length 1.67-2.18, 1.95 mm.

Color (in alcohol): similar to male.

Head. Inner vertical setae 2-5, 3, outer vertical, postorbital setae 5-10, 6; clypeal setae (n = 4) 27-39, 30; clypeal setae (n = 3) 2-3; TEMEn orum length (n = 4) 103-130, 123; Length of palpomeres 1-3 (n = 2) 38-40, 40-45; 4-55, 88-103, 152-170 AR 0.39-0.49, 0.45.

Thorax. Apexnotal setae 7-14, 9, dorsocentral setae 16-24, 22; prealar setae 3-5, 4; scutellar setae 11-12, 11. Anepisternal setae length (n = 3) 160-170.

Wing. Lengths 60-1120, 998; width 410-460, 441; C 445-505, 400; M 285-315, 302; Cu 450-510, 476; V 150-162, 150; C wing length 0.45-0.55, 0.48; Cu wing length 0.46-0.49, 0.48.

Legs. Lengths and proportions of legs are shown in Table 1. Length of tibia spars fore 35-40, 38; mid 15-20, 18 and 23-25; hind 25-35, 21 and 43-50, 46. Hind tibial comb with 11-13, 12 setae. Mid leg tarsomere 1 with 28-39, 31 setae chaetica. Hind leg tarsomere 1 with 6-15, 10 setae chaetica. Numbers of blunt tipped setae on hind margin of tarsomeres 1- 2: fore 12-16, 14; 11-17, 14; 5-8, 7; mid 24-34, 28, 19-23, 21, 9-11, 10; hind 12-25, 47, 21-24, 22, 10-12.

Abdomen. Number of setae in raised circular groups on tergites II-V: 17-26, 11, 17-23, 19, 15-21, 17, 11-18, 12, 9. Tergite IX with 23-29, 26 setae; gonocoxite IX with 8-11, 10 setae; seminal capsule diameter 38-43, 40. Noursemum length (measured from anteriormost point to bifurcation) 43-68, 61; cercus length (n = 4) 75-88, 80.

Pupa (n = 10).—Cephalothorax length (n = 7) 0.78-0.85, 0.83 mm; abdomen length (n = 8) 1.60-1.90, 1.76 mm; total length 2.53-2.68, 2.61 mm.

Color: Light brown with darker brown inescusations at base and around margin of wing sausaets; V-I, II darker anteriorly and aling laterally, male also with fine, genital sac setae, brown. Cephalothorax (n = 2); Lengths of precoxal setae: anterior 12-22; median 40-49, postmedian 10-15. Lengths of dorsocentral setae; Dv, 13-15.
Holotype.—COSTA RICA. Guanacaste: Quebrada Pedregal, 2 km south of junction Cerro El Madera, 1,930 m, 28.III.1969, collected 27.II.1955, leg. C.L. de la Rosa.

Allotype.—With papil lar and larval worms, same locality and date, collected 23.I.1955.


Ecology and behavior

_Pseudorophryum_ is the interspecific relationship between two insects in which one is carried on the body of the other (Corbet 1987). This relationship does not necessarily imply an interdependence between the two, but that one is merely transported by the other. Symphysiomyia regina shows a symbiotic relationship between the two organisms. Tzibar (1977) and Eppler (1986) described species of _Chironomus_ (Tanytarsini) that had symbiotic relationships with Plecotopus and Sphagmephilus. Because Tempsipera macrophora apparently lives its entire metamorphosis life in a de-
pential association with Corystus; this pheto-
retic relationship can be more precisely defined as synphoretic.

In northernwestern Costa Rica, Tempiquiontena melsoniana is very common in most streams that support a healthy population of Corystus, al-
though few pupal euvases of the chromonomad were found in foam samples. A black-light net-
trap operated at the Rio Tempisque at Hacienda Tempisque on 6 June 1988 produced large
numbers of Chironomidae, but no Tempiquion-
tena adults. Streams with high sediment and sus-
spected organic matter loads tended to sup-
port lower populations of Tempiquiontena. Also, cold streams (~2°C) at high elevations (~700
m a.s.l. and above) supported smaller popula-
tions of Tempiquiontena than warmer streams in the same drainage system.

Tempiquiontena larvae preferred corystalid
larvae with head widths greater than 3 mm; the larger the larva, the greater the number of Tem-
piquiontena supported (de la Rosa 1992). Small Tempiquiontena larvae were usually found em-
bedded in the abdominal gills of the host, while larger larvae preferred positions on the thorax (ventrally between the legs, and dorsally) and the first abdominal segments. Late-instar larvae built a short tube (~5 length of the larva) of sand particles and detritus. A thin silk case was
constructed for pupation, which occurred on the host. Preferred locations for pupation were
laterally on the thorax and first and second ab-
dominal segments. Emergence occurred year
round, with a peak number of pupae found in
June and July.

Tempiquiontena larvae feed on substrate par-
ticles or detritus (determined by examination of gut contents) reached by hanging down onto
the substrate while attached to the host by the rest prolegs. Upon disturbance to the host, lar-
vae retreated to a position close to the host's body, sometimes turning inside their tubes. Larvae also examine the surface of the host for food particles (de la Rosa 1992).

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