

UNUSUAL CADDISFLY (TRICHOPTERA) FAUNA OF
SCHOOLHOUSE SPRINGS, LOUISIANA, WITH
DESCRIPTION OF A NEW SPECIES OF
DIPLECTRONA (HYDROPSYCHIDAE)

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Abstract.—The caddisflies (Trichoptera) of Schoolhouse Springs, Jackson Parish, Louisiana, have been studied since 1959, first by H. H. Ross and some of his colleagues and subsequently by several of his students. At least 43 species of caddisflies have been captured in or beside the spring, one of which (belonging to the genus *Diplectrona*, Hydropsychidae) is described in this paper. The Springs are the type locality for five caddisfly species and one stonefly species. Five of these species of insects are known from nowhere else. *Lepidostoma serratum* Flint and Wiggins occurs here apparently as an isolated population, far removed from populations in Connecticut and North Carolina.

Key Words: Trichoptera, spring faunas, Louisiana, *Diplectrona*

Trichoptera and other aquatic insects have been studied sporadically at Schoolhouse Springs, Jackson Parish, Louisiana (T17N, R1W, about middle of Sec. 12, about 6 miles north of Eros), at least since 1959 by H. H. Ross and several of his colleagues and students. The fauna and flora of the Springs are sufficiently unusual that the Louisiana Nature Conservancy recently purchased the site to help assure perpetual protection for it and its biota.

Schoolhouse Springs are located about a mile west of the community of Indian Village, named for the band of Choctaws which inhabited the area until the 1820's. The Springs were named by Ross in 1973 for Springhill Academy which once stood above them on the hill about 100-200 m east (Brown and Asken 1982). For years the site was relatively unknown and undisturbed except by aquatic entomologists. However, in 1987 the land surrounding the Springs

was sold and slated for logging and development. When the authors urged protection of the area because of its unique aquatic biota, the Louisiana Nature Conservancy immediately launched a thorough investigation and named the Springs a high priority site for acquisition. In September 1988, 30 acres, including the Springs and a portion of the bayhead community along the springbrook, were purchased and designated as a preserve by the Conservancy.

At least five distinct, permanent, small springs of cool, clear water bubble from white sands at the base of moderately steep slopes and converge to form Schoolhouse Branch, a shallow stream averaging less than 10 cm depth. Vegetation surrounding the Springs is primarily a mixed hardwood-pine forest; however, a bayhead swamp community is supported in thick accumulations of peaty muck surrounding the springhead and along Schoolhouse Branch.

At least 43 species of Trichoptera have been recognized from Schoolhouse Springs (Table 1), including three endemics: *Cheumatopsyche morsei* Gordon, 1974; *Hydroptila ouachita* Holzenthal and Kelley, 1983; and *Chimarra holzenthali* Lago and Harris, 1987. Herein, JCM adds a fourth endemic caddisfly species, belonging to the genus *Diplectrona*. The stonefly *Leuctra szczytkoi* Stark and Stewart, 1981 (Plecoptera, Leuctridae) apparently is endemic to the Springs, also. In addition, Schoolhouse Springs is the type locality for *Agarodes libalis* Ross and Scott, 1974.

The range of the sister species of each of the endemic caddisflies lies to the east or north of Schoolhouse Springs. The sister species of the new *Diplectrona* species is *D. modesta* Banks, whose range includes eastern North America from Florida to New Hampshire and Quebec to Illinois to western Arkansas, northern Louisiana (Schoolhouse Springs), and southern Mississippi. The sister species of *C. holzenthali* is *Chimarra feria* Ross (Lago and Harris 1987), a species whose range includes eastern Texas, northwestern Louisiana, the Ouachita and Ozark Mountains, and the Great Lakes region. Speaking of *C. holzenthali* Ross (1965) noted that "it is possible that [this] local endemic species originated from wind-blown vagrants. It is also possible that during the glacial maxima some of the connecting streams from the Ouachita Mountains were cool enough to afford avenues of dispersal by which caddisflies reached their present spring habitats." The sister species of *C. morsei* is *Cheumatopsyche virginica* Denning (Gordon 1974), from Coastal Plain localities in New Jersey, Delaware, Virginia, South Carolina, Georgia, Florida, and southern Mississippi (Gordon 1974, Morse et al. 1980, Harris et al. 1982, Lago et al. 1982, Lake 1984). That of *H. ouachita* is *Hydroptila poirrieri* Holzenthal and Kelley, from Mississippi and southeastern Louisiana (Holzenthal and Kelley 1983). Thus it appears likely that the endemic species of

Schoolhouse Springs evolved in isolation here after having arrived either as extensions of ranges of their ancestors from the North during Pleistocene glaciation (*D. rossi* and *C. holzenthali*) or as relict populations near the edge of the Mississippi Embayment and southeastern Coastal Plain (*C. morsei* and *H. ouachita*).

Showing a pattern similar to the latter two species, although yet without allopatric speciation, *Agarodes libalis* occurs throughout the southern Coastal Plain from Delaware to Florida to Louisiana; Schoolhouse Springs, its type locality, is at the western edge of its range (Ross and Scott 1974, McEwan 1980, Holzenthal et al. 1982, Lake 1984).

Lepidostoma (Mormomyia) serratum Flint and Wiggins apparently is the only species of this large genus occurring in the Springs. According to Weaver (1983, 1988), the only other populations known for the species are found in Connecticut and North Carolina. Collections of adults were made from 30 March through 19 May in the Springs; three prepupae taken on 24 August suggest that a second generation may appear here in the autumn.

Diplectrona rossi Morse NEW SPECIES

Mature Larva: Length 9.0–15.0 mm; head capsule width 1.08–1.33 mm. Similar to *D. modesta* in general structure. Head (Fig. 1) generally dark brown to near black with three conspicuous reddish yellow regions on frontoclypeus, including pair of regions in its lateral broadened areas and single region at its dorsal apex, variably light brown regions in center and anterior margin of frontoclypeus not as conspicuous. Occipital region and dorsolateral areas light brown. Frontoclypeus evenly convex anteriorly, broadened laterally at mid-length to level of eyes, and with pair of variably obtuse angles near anterior tentorial pits. Mandibles resembling those of *D. modesta*, left mandible without high thumb-like dorso-

Table 1. Adult Trichoptera of Schoolhouse Springs, Louisiana. * = Species for which the type locality is Schoolhouse Springs.

Hydropsychidae		
<i>Cheumatopsyche</i>	<i>burksi</i> Ross	3 Jun–14 Sep
	* <i>morsei</i> Gordon	27 May–3 Jun
<i>Diplectrona</i>	<i>pasella</i> Ross	3 Jun
	<i>pettiti</i> (Banks)	30 Mar–24 Aug
	<i>modesta</i> Banks	14 Apr–24 Aug
	* <i>rossi</i> Morse, n. sp.	14 Apr–7 Jul
<i>Hydropsyche</i>	<i>decalda</i> Ross	14 Apr
	<i>orris</i> Ross	8 May–24 Aug
<i>Potamyia</i>	prob. <i>placoda</i> Ross	3 Jun
	<i>flava</i> (Hagen)	7 Jul
Hydroptilidae		
<i>Hydroptila</i>	<i>novicola</i> Blickle & Morse	14 Apr
	<i>remita</i> Blickle & Morse	3 Jun–24 Aug
	* <i>ouachita</i> Holzenthal & Kelley	30 Mar–24 Aug
	<i>waubesiana</i> Betten	3 Jun–24 Aug
	spp. nr. <i>consimilis</i> Morton	7 Jul
<i>Orthotrichia</i>	sp. <i>maculata</i> (Banks) Group	3 Jun
	<i>aegerfasciella</i> (Chambers)	3 Jun–24 Aug
<i>Oxyethira</i>	<i>novasota</i> Ross	14 Apr–24 Aug
Lepidostomatidae		
<i>Lepidostoma</i>	<i>serratum</i> Flint & Wiggins	30 Mar–19 May
Leptoceridae		
<i>Ceraclaea</i>	<i>cancelata</i> (Betten)	3 Jun
	<i>protonepha</i> Morse & Ross	14 Apr
	<i>spongillovorax</i> Resh	3 Jun
	<i>transversa</i> (Hagen)	14 Apr
<i>Leptoccrus</i>	<i>americanus</i> (Banks)	8 May–7 Jul
	<i>ocetis</i>	14 Apr–24 Aug
<i>Oecetis</i>	<i>cinerascens</i> (Hagen)	14 Apr
	<i>ditissa</i> Ross	14 Apr
	<i>inconspicua</i> (Walker)	14 Apr–24 Aug
	<i>nocturna</i> Ross	8 May–3 Jun
	<i>ochracea</i> (Curtis)	24 Aug
	<i>ostenti</i> Milne	14 Apr–27 May
	<i>ignitus</i> (Walker)	14 Apr–24 Aug
Limnephilidae		
<i>Pycnopsyche</i>	spp.	(larvae only)
Molannidae		
<i>Molanna</i>	<i>blenda</i> Sibley	14 Apr–8 May
	<i>tryphena</i> Betten	23–28 Apr—pupae
Philopotamidae		
<i>Chimarra</i>	<i>aterrima</i> Hagen	8 May–24 Aug
	* <i>holzenthali</i> Lago & Harris	7 Jul–14 Sep
Polycentropodidae		
<i>Neureclipsis</i>	sp.	3 Jun
<i>Nyctophylax</i>	<i>affinis</i> (Banks)	8 May–3 Jun
<i>Polycentropus</i>	<i>crassicornis</i> Walker	30 Mar
<i>Phylocentropus</i>	<i>lucidus</i> (Hagen)	24 Aug
	<i>placidus</i> (Banks)	30 Mar
Psychomyiidae		
<i>Lype</i>	<i>diversa</i> (Banks)	30 Mar–24 Aug
Sericostomatidae		
<i>Agarodes</i>	* <i>libalis</i> Ross & Scott	19 May–7 Jul

lateral projection. [Left mandible of *D. modesta* with dorso-mesal brush of setae present but not illustrated by Ross 1944, fig. 286.]

Pupa: Length 9.0 mm. Similar to *D. modesta* in general structure. Left mandible with five teeth, basal tooth as far from others as next most basal tooth is from apex; right mandible with four teeth. Mesal fork of each apical process $1.5\times$ as long as lateral fork.

Male: Length 8.8–9.5 mm; forewing 7.6–7.9 mm. Similar to male of *D. modesta* in general structure. Warts and other structures on dorsum of head (Fig. 3) similar in size and shape to those of male of *D. modesta* (Fig. 4), except with diagonal lines of posterior vertex behind pair of conical protuberances ending on epicranial stem (ep.su.), antieriad of transverse postoccipital sulcus (po.oc.). Antennae each with scape and pedicel usually at least as dark as, or darker than, flagellum. Eyes not unusually large; in dorsal view, ratio of greatest width of one eye to narrowest width of vertex (eye : vertex ratio) about 0.475; malar space (Fig. 5) slightly broader than for male of *D. modesta* (Fig. 6). Extreme lateral corners of pronotum, laterad of lateral warts, each with generally conspicuous pale cream-colored spot (Fig. 5, spt).

Male genitalia (Figs. 7–10): Similar to those of *D. modesta* in general structure. Anterolateral corners of sternum V each with long slender glandular structure. Tergum IX divided anteriorly (Fig. 8, IX), with pair of rugose patches. Superior appendages not distinct, represented by region of setae on pair of dorsolateral lobes (do.lat., = terga IX–X?), each lobe with apex truncate in lateral view (Fig. 7), acute dorsally. Tergum X divided longitudinally on meson, each half tapered in dorsal view (Fig. 8, X), rounded in lateral view (Fig. 7, X), lightly sclerotized and setose apically. Inferior appendages each with basal segment bent slightly caudad near apex in lateral view (Fig. 7, inf.app.), curved mesad and clavate in caudal view (Fig. 9), apical segment curved mesad and spatulate

in caudal view. Phallus simple (Fig. 10), similar to that of *D. modesta*.

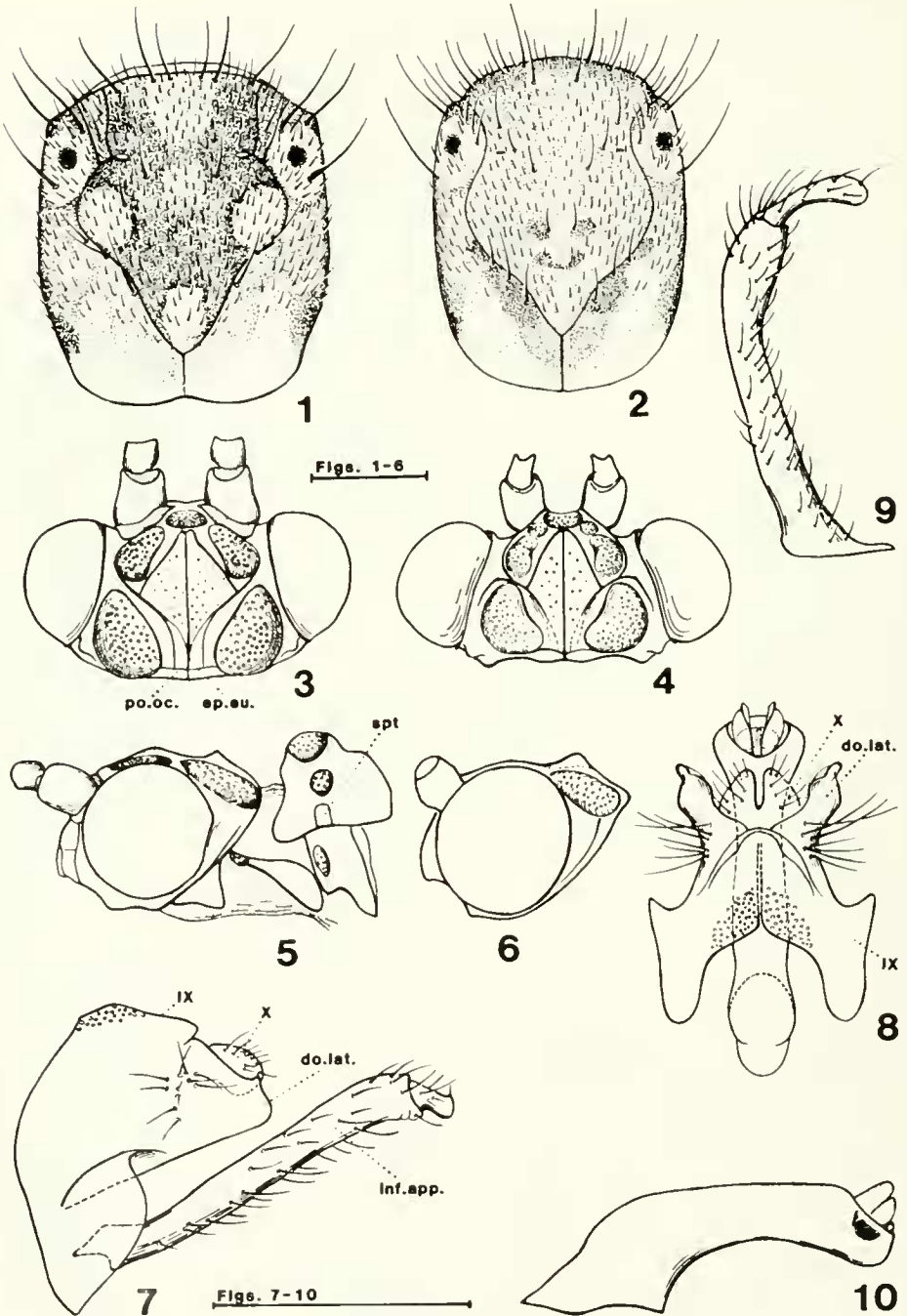
Female: Length 9.4–11.1 mm, forewing 8.0–9.2 mm. Similar to female of *D. modesta* in general structure. Warts and other structures on dorsum of head (Fig. 11) similar in size and shape to those of female of *D. modesta*, except with diagonal lines of posterior vertex behind pair of conical protuberances ending on epicranial stem, antieriad of transverse postoccipital sulcus. Eyes not unusually large. Extreme lateral corners of pronotum, laterad of lateral warts, without conspicuous pale cream-colored spots.

Female genitalia: Generally resembling those of *D. modesta* very closely. Median plate (Figs. 12–13) spatulate anteriorly, without longitudinal dorsal carina.

Holotype: Male, LOUISIANA: Jackson Parish; Schoolhouse Springs; R1W, T17N, Sec. 12; 6 miles north of Eros; 14 April 1988, mercury vapor and ultraviolet lights, C. B. Barr. Deposited in U.S. National Museum of Natural History (USNM).

Paratypes: All same locality: Same data as holotype, 1 male, 3 females, deposited in Louisiana State University Insect Collection (LSUC); 7 May 1987, C. B. and J. E. Barr, 4 females (USNM and LSUC); 27 May 1972, at light, Ross and Smith, 5 females, deposited in Clemson University Arthropod Collection (CUAC); 3 June 1973, J. C. Morse and J. A. Louton, 1 male, 1 female (CUAC); 30 March 1973, H. H. Ross et al., 26 larvae, 1 female pupa (CUAC); 14 April 1988, C. B. Barr, 12 larvae, 1 prepupa (LSUC); 23 April 1982, R. W. Holzenthal and S. W. Hamilton, 4 larvae (USNM); 28 April 1973, J. C. Morse, C. E. Dunn, and J. A. Louton, 5 larvae (CUAC); 8 May 1987, C. B. Barr, 2 larvae (LSUC); 7 July 1973, J. C. Morse and J. A. Louton, 4 larvae (USNM).

Etymology: named for Dr. Herbert H. Ross, founder of modern trichopterozoology in North America, discoverer of the unusual aquatic insect fauna of Schoolhouse Springs and author of their name, and naturalist



Figs. 1-10. Characters of *Diplectrona rossi* and *D. modesta* larvae and males. 1, *D. rossi* larval head, dorsal view; 2, *D. modesta* larval head, dorsal view; 3, *D. rossi* male head, dorsal view; 4, *D. modesta* male head, dorsal view; 5, *D. rossi* male head and prothorax, left lateral view; 6, *D. modesta* male head, left lateral view; 7, *D. rossi* male genitalia, left lateral view; 8, *D. rossi* terga IX and X and phallus, dorsal view; 9, *D. rossi* left inferior appendage, caudal view; 10, *D. rossi* phallus, left lateral view. do.lat. = dorsolateral lobe of male genitalia (paired), ep.eu. = epicranial suture, inf.app. = male inferior appendage (paired), IX = abdominal segment IX, po.oc. = postoccipital sulcus, X = abdominal segment X. Scale lines each 0.5 mm.

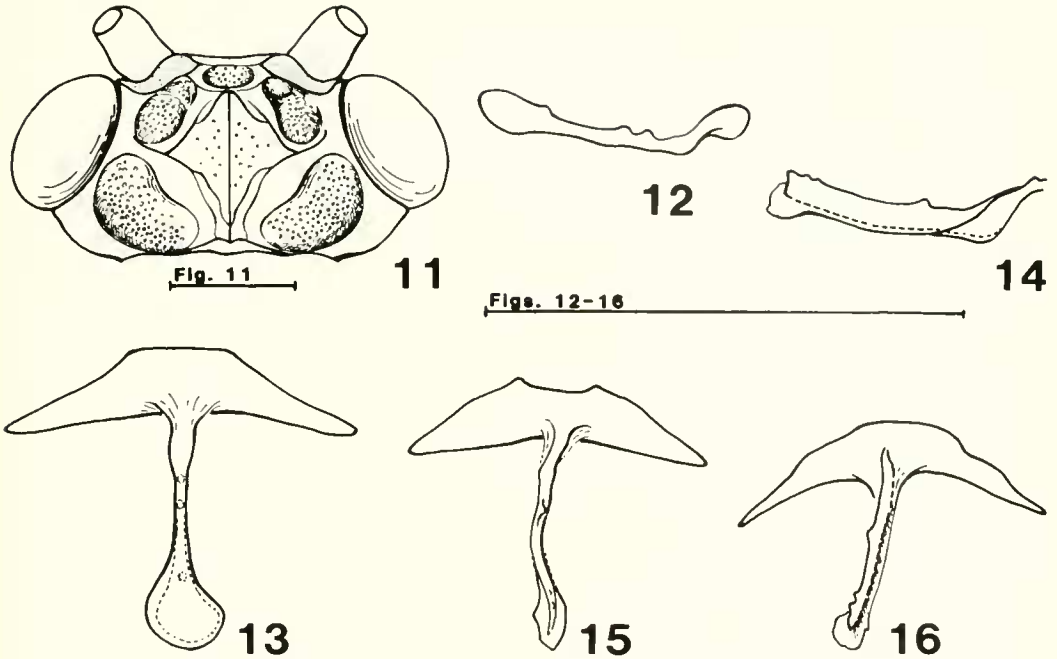


Fig. 11-16. Characters of *Diplectrona rossi* and *D. modesta* females. 11, *D. rossi* head, dorsal; 12, *D. rossi* median plate of genitalia, left lateral view; 13, *D. rossi* median plate of genitalia, dorsal view; 14, *D. modesta* median plate of genitalia, left lateral view; 15, *D. modesta* median plate of genitalia, dorsal view; 16, same, variation. Scale lines each 0.5 mm.

who first brought the senior author's attention to this species.

Diagnosis: Larvae of this species are readily distinguishable from those of *D. metaqui* in that the frons is evenly convex apically (versus notched, cf. Ross 1944, fig. 338, "Genus A") and the left mandible does not have a high thumb-like process (versus with this process, cf. Ross 1944, fig. 282, "Genus A"). The head is relatively broader than that of *D. modesta* (Fig. 2), but relatively narrower than that of *D. metaqui* (Ross 1944, fig. 338). Unlike both *D. metaqui* and *D. modesta*, the frons has a pair of variably obtuse angles near the anterior tentorial pits (Fig. 1; versus evenly curved, Fig. 2), and three conspicuous reddish yellow regions occur laterally and posteriorly on the frontoclypeus, sometimes visible even in the field. The larva of *D. californica* Banks, 1914, is unknown.

The pupa of this species differs from that of *D. modesta* in that the left mandible has

five teeth (four in *D. modesta*, cf. Ross 1944, fig. 316), with the basal tooth as far from the apex; the right mandible has four teeth (five in *D. modesta*); and the mesal fork of each apical process is $1.5 \times$ as long as the lateral fork (subequal in *D. modesta*, cf. Ross 1944, fig. 310A). The pupae of *D. californica* and *metaqui* have not been described.

Males of this species resemble those of *D. modesta* in the relative size of warts on the vertex and in the antennae with flagellum lighter than scape and pedicel (middle wart slightly smaller [Ross 1970, fig. 4B] and scape and pedicel lighter than flagellum in *D. metaqui*). The eyes of *D. rossi* are slightly smaller than those of *D. modesta* (eye: vertex ratio of *D. modesta* between 0.55 and 0.65) and clearly larger than those of *D. metaqui* (e:v = 0.39-0.40). *Diplectrona rossi* differs from both *D. modesta* and *D. metaqui* in having the diagonal lines of the posterior vertex (behind the pair of conical pro-

tuberances) ending on the epicranial stem, anteriad of the transverse postoccipital sulcus (Fig. 3; ending on the postoccipital sulcus in the other two species, Fig. 4). The genitalia of the male of this species differ from those of *D. modesta* and *D. metaqui* in the more nearly truncate apex of each dorsolateral lobe (Fig. 7; cf. Ross 1944, fig. 339). Also, in many specimens of *D. modesta*, the inferior appendage is nearly straight apically in lateral view, but curved posteriad in the three male specimens seen of this species (Fig. 7). The male genitalia of *D. metaqui*, *modesta*, and *rossi* all differ from those of *californica* in the pair of dorsolateral lobes distinct from the more mesal lobes of tergum X, not clearly separated in *californica* (Denning, 1965, as *D. margarita*; Flint 1966).

Females of this species differ from those of both *D. modesta* and *D. metaqui* in the same characters of the head mentioned for the males. Additionally, the pronotum of females of the type series all lack the conspicuous pale, cream-colored spot on the extreme lateral corners, laterad of the lateral warts, present in males of all three species (Fig. 5) and usually in females of *D. modesta*. The median plate of the genitalia (Figs. 12 and 13) lacks a longitudinal carina present on the median plate of *D. modesta* (Figs. 14–16). Characters of the pronotum and median plate of females of *D. californica* and *metaqui* are unknown.

Further comments: Associations of larvae and pupae with adults of this new species are circumstantial. All these life history stages differ from those of known species and occur uniquely in Schoolhouse Springs.

Two larvae of a *Diplectrona* species have been collected in a spring-fed stream in north-central Tennessee by D. Gillis and T. Kollers, students of Dr. S. W. Hamilton. These larvae resemble those of *D. rossi* in the presence of conspicuous light-colored spots on the frons and obtuse angles near the anterior tentorial pits. However, the background color of the head of these spec-

imens is lighter than for *D. rossi*, the lateral spots on the frons are much larger, and a median spot is much more conspicuous than the posterior spot. A fifth North American species of this genus is suspected, but should be confirmed with data from other life history stages.

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