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Occasional transport of *Leptohyphes apache* Allen (Ephemeroptera: Tricorythidae) on *Corydalus texanus* Banks (Megaloptera: Corydalidae)

Many of us, at least some from former generations, remember and have anecdotes of "the good old guys": scientists that are generous, supportive, knowledgeable, and approachable. Unfortunately, the hunt for the precious gold of points for evaluations, such as number of publications, has often altered that harmony and made generous scientists a scarce resource for future generations of biologists. We are lucky to have met and still have around active entomologists of that valuable generation, like Dr. Santiago Zaragoza-Caballero. We, gladly and respectfully, dedicate this modest contribution to him.

Phoresy is defined as a symbiotic relationship in which one organism is merely transported on the body of another organism of a different species (Lincoln *et al*., 1998). Among the aquatic insects this kind of association has been recorded in several groups. Chironomids (Diptera: Chironomidae) have been studied widely regarding the phoretic, commensalistic, and parasitic association their larvae establish with different insect groups like Ephemeroptera, Hemiptera, Megaloptera, Odonata, Plecoptera, and Trichoptera (Callisto *et al*., 2006). Megaloptera larvae or hellgrammites have been reported as substrate of phoretic association only with chironomids (Hilsenhoff, 1968; Benedict and Fisher, 1972; Gotceitas and Mackay, 1980; Furnish *et al*., 1981; Tracy and Hazelwood, 1983; De la Rosa, 1992; Epler and De la Rosa, 1995; Pennuto 1997, 1998, 2000, 2003; Hayashi, 1998; Pennuto *et al*., 2002; De Oliveira *et al*., 2004; Hayashi and Ichiyanagi, 2005; Callisto *et al*., 2006) and entoprocts (Entoprocta: Urnatellidae; Tracy and Hazelwood, 1983). Here we present the case of occasional transport of a mayfly larva, *Leptohyphes apache* Allen (Tricorythidae: Leptohyphinae) on a dobsonfly larva, *Corydalus texanus* Banks, in a river in central Mexico. Although this might not be a case of an established phoretic association, we believe it represents a behavior that involves transport of the mayfly on the hellgrammite with a certain frequency, and not merely an accidental interaction.

During a collecting trip, on the first through the third of November of 2008 to Tehuixtla (Jojutla municipality) in Morelos state, central Mexico, several larvae of Megaloptera were collected in the Amacuzac River. Tehuixtla is a little town in the Sierra Madre del Sur physiographic province at 870 m of altitude, within the Río Balsas basin, where a warm sub-humid climate and low tropical deciduous forest prevail. The Amacuzac River is a permanent and large lotic system, flowing on the southern part of Morelos. At the study site the streambed is approximately 40 m wide. Collecting of hellgrammites was done with a benthos dip net in a riffle section of the stream, where water depth was about 0.5 m with a strong current. Stream substrate consisted mainly of cobble, with boulders, gravel, and sand in less proportion (Figs. 1, 2).

A total of 22 *Corydalus texanus* larvae was collected, 11 of which were carrying phoretic chironomid larvae. During host inspection, we noticed that one of the dobsonfly larvae was carrying a mayfly larva, further identified as *Leptohyphes spiculatus* Allen and Brusca (Allen, 1978), now considered a junior synonym of *Leptohyphes apache* Allen (Baumgardner, 2008). The mayfly larva was positioned on the metanotum of the hellgrammite, which was transferred into a glass vial with water from the river to observe the unusual association (Fig. 3). During almost an hour the larva was observed crawling around on the metanotum, mesonotum, and dorsum of the first and second abdominal segments. Also, the larva reached the lateral region of the mesonotum and metanotum near the leg base of each segment. Throughout observation, movement of the mayfly larva was slow and it seemed to be resting. Also, the mayfly did not leave the dobsonfly body at any time while they were maintained alive. Because of the unique incidence in the study site, as well as lack of previous published records, we considered that the association of a mayfly larva on a hellgrammite required further exploration. In order to elucidate whether the association was a random event or perhaps a behavior that occurs with some frequency, a second sampling expedition was effected.

In a second trip to the river, on the 28th of April of 2009, a total of 40 hellgrammites was collected and inspected for carrying of mayfly larvae. Water level of the river was low, around 20 cm deep, so hellgrammites were obtained softly from cobbles without kicking or any disturbance to substrate. Hellgrammites drifted spontaneously as cobbles were lifted, then they were carefully placed in a small aquarium where they could be observed in detail. Of the 40 inspected dobsonfly larvae, three were carrying *Leptohyphes apache* larvae, one each. We believe it is unlikely that the mayfly larva ended up on the dobsonfly larva as a product of manipulation. The collecting process was gently performed and the inspection for transported mayfly larvae was done immediately. We believe the encountered mayfly larvae were already on the hellgrammite.

Mayfly larvae of *Leptohyphes* Eaton have been described as poor swimmers (Edmunds *et al*., 1976), and the occasional association with a dobsonfly larva could help them to move across their habitat and to protect them against the water current in the river. At this time, it would be difficult to conclude that occurrence of the mayfly larvae on hellgrammites is merely accidental or represents a somewhat frequent behavior. From our observations, we believe this transport may not be simply a random event (e.g., the hellgrammite is like any other

substrate). Further observations and experiments are required to safely elucidate this question. If a pattern of fixed frequency and behavior of transportation is demonstrated, this may be a case of facultative phoresy.

The material examined is deposited at the National Insect Collection of Mexico's National University (UNAM), Mexico City, with the following data: México: Morelos: Mpio. Jojutla, Tehuixtla, Río Amacuzac, 18º 33' 51.3'' N, 99º 16' 57.3'' W, 860 m, 3-XI-2008, Reynoso-Velasco and Ruiz-Silva, 1 *Corydalus texanus* Banks (larva) and 1 *Leptohyphes apache* Allen (larva), benthos dip net; same data but 28-IV-2009, Reynoso-Velasco and García, 3 *Corydalus texanus* Banks (larvae) and 3 *Leptohyphes apache* Allen (larvae).

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LITERATURE CITED

Baumgardner, D.E. 2008. Phylogeny and biogeography of the mayfly family Leptohyphidae (Insecta: Ephemeroptera) with a taxonomic revision of selected genera. Ph. D. Thesis, Texas A & M University, College Station.

Benedict, P.R. and G.T. Fisher. 1972. Commensalistic relationships between *Plecopteracoluthus downesi* (Diptera: Chironomidae) and *Chauliodes pectinicornis* (Megaloptera: Corydalidae). *Annals of the Entomological Society of America*, 65: 109-111.

Callisto, M., M.D.C. Goulart, P. Moreno, and R.P. Martins. 2006. Does predator benefit prey? Commensalism between *Corynoneura* Winnertz (Diptera: Chironomidae) and *Corydalus* Latreille (Megaloptera: Corydalidae) in Southeastern Brazil. *Revista Brasileira de Zoologia*, 23: 569-572.

De la Rosa, C.L. 1992. Phoretic associations of Chironomidae (Diptera) on Corydalidae (Megaloptera) in northwestern Costa Rican streams. *Journal of the North American Benthological Society*, 11: 316-323.

De Oliveira, R., S. Trivinho-Strixino, M. Jancso, and E.N. Fragoso. 2004. Records of Chironomidae larvae living on other aquatic animals in Brazil. *Biota Neotropica*, 4: 1-9.

Edmunds, G. F. Jr., S.L. Jensen, and L. Berner. 1976. *The Mayflies of North and Central America*. University of Minnesota Press, Minneapolis.

Epler, J.H. and C.L. de la Rosa. 1995. *Tempisquitoneura*, a new genus of neotropical Orthocladiinae (Diptera: Chironomidae) symphoretic on *Corydalus* (Megaloptera: Corydalidae). *Journal of the North American Benthological Society*, 14: 50-60.

Furnish, J., D. Belluck, D. Baker, and B.A. Pennington. 1981. Phoretic relationships between *Corydalus cornutus* (Megaloptera: Corydalidae) and Chironomidae in Eastern Tennessee. *Annals of the Entomological Society of America*, 74: 29-30.

Gotceitas, V. and R.J. Mackay. 1980. The phoretic association of *Nanocladius* (*Nanocladius*) *rectinervis* (Kieffer) (Diptera: Chironomidae) on *Nigronia serricornis* Say (Megaloptera: Corydalidae). *Canadian Journal of Zoology*, 58: 2260-2263.

Hayashi, F. 2003. *Nanocladius* (*Plecopteracoluthus*) *asiaticus* sp. n. (Diptera: Chironomidae) phoretic on dobsonfly and fishfly larvae (Megaloptera: Corydalidae). *Aquatic Insects*, 20: 215-229.

Hayashi, F. and H.P. Ichiyanagi. 2005. Density dependent shifts in attachment site by the ectosymbiotic chironomid *Nanocladius asiaticus* on its megalopteran host *Protohermes grandis*. *Entomological Science*, 8: 253-261.

Hilsenhoff, W.L. 1968. Phoresy by *Plecopteracoluthus downesi* on larvae of *Nigronia serricornis*. *Annals of the Entomological Society of America*, 61: 1622-1623.

Lincoln, R., G. Boxshall, and P. Clark. 1998. *A dictionary of Ecology, Evolution and Systematics*, 2nd edition. Cambridge University Press, Cambridge.

Pennuto, C.M. 1997. Incidence of chironomid phoretics on hellgrammites in streams of southern Maine. *Northeastern Naturalist*, 4: 285-292.

Pennuto, C.M. 1998. Seasonal position patterns and fate of a commensal chironomid on its fishfly host. *Journal of Freshwater Ecology*, 13: 323-332.

Pennuto, C.M. 2002. Effects of larval movement behavior and density on emergence success and adult body size in a commensal midge. *Aquatic Ecology*, 34: 177-184.

Pennuto, C.M. 2003. Population dynamics and intraspecific interactions of an ectosymbiotic midge in a river in southern Maine, USA. *Journal of the North American Benthological Society*, 22: 249-262.

Pennuto, C.M., C.L. Wooster-Brown, and C.A. Belisle. 2002. Infestation intensity and prevalence of an ectosymbiotic midge under variable environmental and host conditions. *Canadian Journal of Zoology*, 80: 2061-2071.

Tracy, B.H. and D.H. Hazelwood. 1983. The phoretic association of *Urnatella gracilis* (Entoprocta: Urnatellidae) and *Nanocladius downesi* (Diptera: Chironomidae) on *Corydalus cornutus* (Megaloptera: Corydalidae). *Freshwater Invertebrate Biology*, 2: 186-191.

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Figure 1. Río Amacuzac at Tehuixtla, Morelos, the study site. Figure 2. Río Amacuzac at Tehuixtla, riffle section of the stream. Figure 3. *Leptohyphes apache* larva on the metanotum near the hind leg base of larva of the dobsonfly *Corydalus texanus*. Arrow points to head of the mayfly larva (within circle).