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Bridging the gap: the first record of the diving beetle subfamily Hydrodytinae Miller, 2001 in Guadeloupe

(Coleoptera, Dytiscidae)

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Several specimens of *Hydrodytes opalinus* (Zimmermann, 1921) were found in a coastal wetland on Basse Terre island in Guadeloupe. This is the first record of the subfamily Hydrodytinae Miller, 2001 from the Caribbean Basin north of Trinidad. This finding sheds light on the biogeographical history of the subfamily by bridging the gap between its main distribution area in continental Central and South America and the isolated occurrence of *Hydrodytes dodgei* (Young, 1989) in Florida. The habitus and some female reproductive structures of the specimens are illustrated.

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Introduction

The subfamily Hydrodytinae Miller, 2001 was erected by Miller (2001) for three species formerly placed in the genus *Agaporomorphus* Zimmermann, 1921 in the subfamily Copelatinae. This new classification was mainly based on the structure of the female reproductive structures (Miller 2001). Within the Hydrodytinae there are at present two recognized genera: *Hydrodytes* Miller, 2001 with three described species and *Microhydrodytes* Miller, 2002 with one species (Miller 2002, Miller & Bergsten 2016, Nilsson & Hájek 2018).

Hydrodytinae are Neotropical and are mainly distributed from central Argentina in the south to Belize and Trinidad in the north. In addition, one isolated species occurs in Florida. Miller (2002) gives records for both *Hydrodytes inaciculatus* (Guignot, 1957) and *H. opalinus* (Zimmermann, 1921) from Honduras as result of misinterpretation of the label data. The corresponding locality (Cayo district) is in fact in Belize, which was formerly known as "British Honduras".

Because of the presence of *Hydrodytes* in South America in the south and in Florida in the north, a more connected distribution is expected to have occurred in the past. However, no records of this subgenus were known from Central America north of Belize nor from the Caribbean region north of the island of Trinidad.

During a survey of the Hydradephaga of Guadeloupe, nine specimens of *Hydrodytes opalinus* were collected by the first author in the étang du Vieux-Fort in the north of Basse-Terre. This is the first record of this subfamily for Guadeloupe and from the Caribbean basin north of the island of Trinidad.

Results

Studied material. 9 ♀, 20.III.2017, étang du Vieux-Fort, Basse-Terre, Guadeloupe, 16°21'8.2"N, 61°45'14"E, leg. K. Scheers, det. K. Scheers & M. Manuel. The specimens are deposited in following collections: 8 ♀ in CKS (collection of Kevin Scheers, Sint-Niklaas, Belgium), 1 ♀ in CMM (collection of Michaël Manuel, Paris, France).

Note. We identified these specimens as *Hydrodytes opalinus* using Miller (2002), based mainly on size, habitus and colour (Fig. 1) and morphology of the gonocoxosternum (Fig. 2), gonocoxa (Fig. 3) (notably without transverse rows of short striae) and bursa (Fig. 4). However, *H. opalinus* in the current sense is most probably a species complex (Miller 2002) and would deserve revision using genetic methods.

Description of the sampling site

The "étang du Vieux-Fort" is a large freshwater pond situated along the northern coast of Basse-Terre island. As mentioned previously (Manuel 2015a), it contains an exceptionally rich and interesting assemblage of water beetle species. At the étang du Vieux-Fort, all *H. opalinus* specimens were taken with the sieve from underneath the submerged root system of a small dead tree in the marsh. The vegetation surrounding the tree consisted of grasses and herbs standing at a water depth of about 30 cm. The water was clear and not coloured due to humic acids. In this microhabitat the species was found together with *Celina* sp. (only larvae), *Copelatus caelatipennis* Sharp, 1882, *Derovatellus lentus* (Wehncke, 1876), *Desmopachria* sp., *Laccomimus bordoni* Toledo & Michat, 2015 and *Pachydrus* sp. The étang du Vieux-Fort was more intensively sampled by the second author in 2012 and 2013, however, without finding this species. Probably *H. opalinus* is very rare and localized, even within this site making it an easily overlooked species.

Discussion and conclusion

The presence of *Hydrodytes* in Guadeloupe indicates that the genus is probably also present on other Caribbean islands. Especially the bigger islands like Cuba, Hispaniola and Puerto Rico, where there is more likelihood for stable, suitable habitats, would have a high potential.

This new record is very important for understanding the biogeographic history of the subfamily and sheds light on the occurrence of the endemic *Hydrodytes dodgei* (Young, 1989) in Florida. Apart from *Hydrodytes* there are many other Neotropical genera of aquatic Adephaga that reach the Nearctic region by means of island hopping through the Caribbean such as *Derovatellus* Sharp, 1882, *Laccomimus* Toledo & Michat, 2015, *Megadytes* Sharp, 1882, *Mesonoterus* Sharp, 1882, *Notomicrus* Sharp, 1882 and *Pachydrus* Sharp, 1882. This indicates that the Caribbean islands were, and probably still are, the main migration pathway for Neotropical Hydradephaga towards the Nearctic region, rather than the mainland of Central America. This is in contrast with Nearctic taxa (e. g. *Agabus* Leach, 1817, *Boreonectes* Angus, 2010, *Dytiscus* Linnaeus, 1758, *Neoporus* Guignot, 1931, *Platambus* Thomson, 1859, *Sanfilippodytes* Franciscolo, 1979 and *Stictotarsus* Zimmermann, 1919) that penetrate the Neotropical region through the mountains of Central America (e. g. Hendrich et al. 2018). An exception is the distribution of the Neotropical genus *Vatellus* Aubé, 1837, which reaches the Nearctic region in southern Texas by means of a distribution extending along the Mexican coast (Knight Jasper & Challet 2002).

Young (1989) and Miller (2002) suggested that some of the species of Hydrodytinae may be parthenogenetic. This assumption was based on the absence of males in three of the four known species. Hendrich et al. (2015) recently presented the first record of a male of *H. opalinus*. Males are still unknown for *Microhydrodytes elachistus* Miller, 2002 and *H. dodgei*. There are only very few records of *Hydrodytes* specimens collected in their habitats and nearly all records are from light traps. It is possible that only females come to lights. For example, large series of *Pachydrus* sp. in which only females are present can be taken at light or by collecting with the car net (Scheers, unpublished data). Because of this, it is well possible that the lack of males merely reflects the collecting method rather than the actual sex ratio in populations. On the other hand, the nine specimens reported here from Guadeloupe were collected in situ and are all females. Parthenogenesis cannot be rejected in principle and is believed to exist in certain other Hydradephaga (Manuel 2015b, Miller & Short 2015). More research on parthenogenesis in water beetles is necessary. Even if parthenogenesis can only be truly confirmed by breeding experiments, it can nevertheless be indirectly inferred, e. g., from the absence of males in populations for which a large number of individuals have been surveyed, from modifications of the female reproductive tract (such as loss of the spermatheca in some parthenogenetic insects), and by genetic methods.

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Fig. 1. *Hydrodytes opalinus* (Zimmermann, 1921) habitus female in dorsal view (total length 2.75 mm). Scale bar: 1 mm.

Figs 2–4. *Hydrodytes opalinus* (Zimmermann, 1921) female genitalia. **2.** Gonocoxosternum. **3.** Gonocoxa. **4.** Bursa. Scale bars: 50 µm (2 and 3), 100 µm (4).

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