

An unusual larval habitat for
Culicoides arboricola (Root & Hoffman) (Diptera: Ceratopogonidae)
in the Florida Keys, USA

Необычное местообитание личинок
Culicoides arboricola (Root & Hoffman) (Diptera: Ceratopogonidae)
на островах Флорида Киз, США

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КЛЮЧЕВЫЕ СЛОВА: *Culicoides arboricola*, Ceratopogonidae, местообитания личинок, новые находки, Флорида

ABSTRACT. Larvae of the biting midge *Culicoides arboricola* Root & Hoffman which normally develop in tree holes were detected in an unusual habitat (artificial containers) in the Florida Keys, USA. Specimens from Key Largo and Plantation Key represent new locality records for this species. Possibilities for tree-hole *Culicoides* to colonize other habitat types are discussed.

РЕЗЮМЕ. Личинки кровососущего мокреца *Culicoides arboricola* Root & Hoffman, обычно проходящие развитие в дуплах деревьев, были обнаружены в необычном искусственном местообитании (контейнеры) на островах Флорида Киз (Флорида, США). *C. arboricola* впервые отмечен с островов Ки Ларго и Плантейшн Ки. Обсуждаются возможности заселения видами *Culicoides*, развивающимися в дуплах, других типов биотопов.

Introduction

The biting midge (Diptera: Ceratopogonidae) fauna of Florida is diverse, with 212 species reported from the state [Wilkening et al., 1985; Hribar & Grogan, 2005; Grogan & Hribar, 2006; Borkent & Grogan, in press]. Fifty-eight of them belong to the genus *Culicoides* that contains many human-biting species [Blanton & Wirth, 1979]. The Florida Keys are a chain of islands that lie east and south of the Florida Peninsula, being part of the South Florida rockland ecosystem, with a flora derived from both temperate and tropical components [Stern & Brizicky, 1957; Snyder et al., 1990]. The Florida Keys Mosquito Control District regularly collects adult and larval mosquitoes (Diptera: Culicidae) as part of routine surveillance. Larval mosquitoes, along with a sample of water, are collected daily from their habitats by

use of half-pint (236.59 ml) dippers or turkey basters [Hribar et al., 2004].

Along with larvae of mosquitoes, larvae of ceratopogonid species such as *Dasyhelea pseudoincisurata* Waugh & Wirth, 1976 and *Forcipomyia bromelicola* (Lutz, 1914) commonly are collected in artificial and natural container habitats [Hribar et al., 2004; Grogan & Hribar, 2006]. Occasionally larvae of another ceratopogonid species were seen in artificial container habitats. These larvae were believed to be a species of *Culicoides* based on their swimming behavior. Comparison with material recovered from tree hole has allowed their identification as *Culicoides arboricola* Root & Hoffman, 1937.

Material and methods

MATERIAL. USA, Florida, Monroe County: 2 larvae — Plantation Key, 6.VIII.2007, G. Bynum coll., ex: tree hole; 2 larvae — Key Largo, 7.VIII.2007, J. Davis coll., ex: bird bath; 1 larva — Key Largo, 20.VIII.2007, D. Miller coll., ex: tree hole; 10 larvae — Key Largo, 22.VIII.2007, D. Miller coll., ex: metal container.

A total of 15 *Culicoides* larvae were detected in water samples taken from a bird bath and a discarded metal container, as well as from two tree holes. Four larvae were removed for microscopic study. The remaining larvae were placed into plastic mosquito rearing chambers and allowed to develop in a laboratory. Almost all of them died in the pupal stage, except for one adult male that emerged. Larvae, pupae and the sole adult were slide-mounted according to Wirth & Marston [1968] and Epler [2001]. Larvae and pupae were identified to species by use of the keys and illustrations in Blanton & Wirth [1979], Linley [1970], and Murphree & Mullen [1991]. The adult male was compared to illustrations in

Wirth & Blanton [1967] and Blanton & Wirth [1979], and to specimens in the author's collection.

The *Culicoides* larvae collected from the metal container were observed to feed on cadavers of mosquito larvae (*Aedes aegypti* Linnaeus, 1762). Voucher specimens of *C. arboricola* were deposited in the Peabody Museum of Natural History at Yale University, New Haven, Connecticut, USA.

Results and discussion

Culicoides midges are common in tree holes in eastern United States [Barrera, 1996], but they are not common in artificial containers [Mullen & Hribar, 1988]. *Culicoides arboricola* normally is found in tree holes and stump holes in the southern United States [Snow, 1958]. Linley [1970], however, collected *C. arboricola* from enamel bowls filled with dead leaves and water and placed in an oak hammock in Vero Beach, Indian River County, Florida. *Culicoides dendrophilus* Amosova, 1957 has been collected from tree holes, bamboo stumps and artificial containers [Wada, 1990]. However, the tree hole species *Culicoides rabauli* Macfie, 1939 did not colonize artificial container habitats in Australia [Jenkins et al., 1992 (as *C. angularis* Lee & Reye, 1953)], nor did *C. insinuatus* Ortiz & León, 1955 and *C. paraensis* (Goeldi, 1905) [Mercer et al., 2003] in Brazil.

Tree holes differ from artificial containers, especially in nutrient input; e.g., Daugherty & Juliano [2001] reported that abandoned tires receive mainly leaf litter, whereas tree holes also receive nutrients via stemflow. This may provide a more nutrient-rich environment in the tree hole habitat. Specimens of *Culicoides arboricola* in the laboratory fed on cadavers of mosquitoes, a feeding habit long known for tree hole *Culicoides* [Ryckman, 1952]. *C. arboricola* is widespread in Florida [Beck, 1952]. However, it was not previously known from Key Largo or Plantation Key [Blanton & Wirth, 1979; Hribar & Vlach, 2001].

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