

## CULEX (CULEX) DECLARATOR, A MOSQUITO SPECIES NEW TO FLORIDA

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**ABSTRACT.** One specimen of a mosquito new to Florida, *Culex declarator*, was first found in 1998 in Indian River County. A 2nd specimen was collected in 2002. Beginning in September 2003, *Cx. declarator* adults were regularly encountered in routine mosquito surveillance sampling, with more than 300 specimens appearing in 45 collections. Prior to our find, the U.S. distribution was thought to be restricted to south Texas. The full extent of this species' distribution in Florida has yet to be determined.

**KEY WORDS** *Culex declarator*, Florida

### INTRODUCTION

Florida has more species of *Culex* than any other state or province in North America, north of Mexico, except Texas, with 16. Six of them are found only in Florida. A recently discovered species, *Culex (Culex) declarator* Dyar and Knab, is being reported here for the 1st time from Florida. Before this find, *Cx. declarator* was known in the USA from Cameron, Bexar, and Gonzales Counties, Texas (Fisk and LeVan 1941, Breland 1953 as *Culex virgultus* Theobald). As far as can be determined, Dyar (1928) was the 1st to report this species in the USA. Breland (1954) further elucidated its presence in Texas and described the adult male and larva. According to Knight and Stone (1977), it is widely distributed in the Neotropical Region, south to Uruguay.

Older literature, such as Matheson (1944) and Carpenter and LaCasse (1955), have named this species *Cx. virgultus* Theobald. Stone (1956) explained that Lane (1953) examined the types of this species, two males from Rio de Janeiro, Brazil, and found them to be conspecific with *Cx. declarator* and synonymized it under *Cx. virgultus*, the older name, but when Stone examined the same type, he could find only one male and it was *Culex nigripalpus* Theobald. He concluded that it was best, under the circumstances, to consider *Cx. virgultus* an unrecognized species and resurrect the name *declarator* for *virgultus*. Furthermore, Knight and Stone (1977) listed 7 synonyms for *Cx. declarator*, indicating that it must be a very variable species. In fact, the character used by Darsie and Ward (1981) to separate *Cx. declarator* from the other Nearctic *Culex*, pale bands on the hind tarsi, may not be the best character to distinguish it. A study of 50 females from Florida found that only 68% had complete bands on the joints of the hindlegs, 29% had patches instead of complete bands, and 2% had no pale scales on the hindtarsi.

There are other species with similar U.S. distri-

butional patterns, i.e., southern counties of Texas and Florida, for example, *Anopheles albimanus* Wiedemann and *Mansonia titillans* (Walker); see Darsie and Ward (1981).

Various life stages of this species have been described by Bonne and Bonne-Wepster (1925), Dyar 1928, Matheson (1944), Yamaguti and LaCasse (1951), Lane (1953), Breland (1954), Carpenter and LaCasse (1955 as *Cx. virgultus*), Forattini (1965), Bram (1967), and it was included in identification keys by Texas State Health Department (1944), Breland (1953), Dodge (1963, 1966, 1st instar), Darsie and Ward (1981), Clark-Gil and Darsie (1983). The bionomics of the species was discussed by Kumm et al. (1940), Kumm and Zuniga (1942), Arnett (1948), Galindo et al. (1951), Breland (1954 as *Cx. virgultus*), Aitken (1967), and Stone (1969).

### MATERIALS AND METHODS

The majority of all *Cx. declarator* collections were incidental to routine surveillance activities of the Indian River Mosquito Control District. Specimens were captured by 4 different attractant trap methods: 1) CDC or American Biophysics Corp. light traps baited with dry ice; 2) plastic lard-can traps baited with dry ice; 3) exit traps (based on an unpublished design of R. L. Frommer, Manatee Mosquito Control District, Palmetto, FL) affixed to sentinel chicken coops used for arbovirus surveillance; and 4) American Biophysics Corp. counterflow geometry trap baited with dry ice (Kline 1999). In addition, adults were also obtained by sweeping ground vegetation in diurnal resting habitats typical of *Cx. nigripalpus*, using a mechanical aspirator.

A progeny rearing was also accomplished from blooded/gravid females collected at the Florida Medical Entomology Laboratory in a chicken-baited lard-can trap. The field-collected females were isolated for oviposition in 25- × 70-mm vials containing 5 ml distilled water. Eggs obtained were allowed to hatch and most larvae were reared to adulthood. Twenty-five whole 4th instars were preserved in 80% ethanol. Another 23 larvae were isolated and reared individually, saving the larval and

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Table 1. Timeline of *Culex declarator* collections in Indian River County, FL.

	Cumulative number positive		
	Sites	Collections	Specimens
September 28, 1998	1	1	1
November 12, 2002	2	2	2
September 18–30, 2003	5	9	16
October 1–15, 2003	6	15	28
October 16–31, 2003	7	28	98
November 1–15, 2003	7	36	142
November 16–30, 2003	7	45	327

pupal exuviae, along with the corresponding adults. Immatures were preserved and mounted in Canada balsam for study. Adults were affixed to card points, and the genitalia of several males were dissected and mounted on slides.

The initial group of specimens was collected as follows: Indian River County: Vero Beach, Florida Medical Entomology Laboratory compound (27.58738°N, 80.37363°W), IX-28-98, 1 ♀, ex CDC miniature light trap with dry ice (J. Knight); Vero Beach, Lockwood Hammock (27.57553°N, 80.43592°W), XI-12-02, 1 ♀, ex mechanical aspirator (P. Morgan); Vero Beach, Indian River County Mosquito Control District compound (27.66565°N, 80.44339°W), IX-12-03, 1 ♀, IX-18-03, 1 ♀, X-20-03, 1 ♀, ex exit trap; X-6-03, 6 ♀, X-7-03, 5 ♀, X-11-03, 2 ♀, ex ABC trap (D. Shroyer); Wabasso, Vickers Grove (27.78354°N, 80.44816°W), IX-18-03, 1 ♀, IX-22-03, 1 ♀, IX-30-03, 4 ♀, 1 ♂, X-20-03, 1 ♀, ex exit trap (P. Baffino); Wabasso, Hobart Park (27.73660°N, 80.44298°W), IX-22-93, 1 ♀, IX-30-03, 4 ♀, X-13-03, 1 ♀, X-16-03, 1 ♀, X-20-03, 17 ♀, ex exit trap (P. Baffino); Sebastian, Graves Swamp (27.44657°N, 80.92130°W), X-7-03, 1 ♀ (P. Baffino). They are in the reference collection of the Florida Medical Entomology Laboratory; Monroe County: Key Largo, Crocodile Lake (25.1428°N, 80°W), X-23-03, 2 ♀, XI-13-03, 2 ♀, XI-20-03, 9 ♀ (D. DeMay); Big Pine Key (24.6678°N, 81.3563°W), XI-25-03, 1 ♀; Long Key (24.7217°N, 61.0832°W), XI-25-03, 1 ♀, ex ABC trap (L. Hribar).

More than 300 adults of *Cx. declarator* in 45 separate collections have been recorded in Indian River County, Florida, as of XI-30-2003; see Table 1.

In the various collections summarized in Table 1, *Cx. declarator* has been associated with the following species: *Anopheles crucians* Wiedemann, *Anopheles quadrimaculatus* Say sl, *Aedes albopictus* (Skuse), *Aedes vexans* (Meigen), *Coquillettidia perturbans* (Walker), *Culex erraticus* (Dyar and Knab), *Cx. nigripalpus*, *Culex pilosus* (Dyar and Knab), *Culex quinquefasciatus* Say, *Culex salinarius* Coquillett, *Deinocerites cancer* Theobald, *Mansonia dyari* Belkin, *Heinemann* and Page, *Mansonia titillans* (Walker), *Ochlerotatus atlanticus* (Dyar and Knab), *Ochlerotatus infirmatus* (Dyar and

Knab), *Ochlerotatus taeniorhynchus* (Wiedemann), *Psorophora ciliata* (Fabricius), *Psorophora columbiae* (Dyar and Knab), *Psorophora ferox* (von Humboldt), *Psorophora howardii* Coquillett, *Uranotaenia lowii* Theobald, and *Uranotaenia sapphirina* (Osten Sacken).

While adult females of *Cx. declarator* resemble those of *Cx. nigripalpus*, these species can be separated as indicated below. *Culex declarator* adult females are recognized by the proboscis usually with a more or less distinct, long, pale area on lower surface; scutum clothed with dark brown, narrow, curved scales; thoracic pleuron with a large upper mesokatepisternal scale patch, a large upper mesepimeral scale patch and a small lower mesokatepisternal scale patch all of broad, white scales; also the pleural integument white to yellow to tan with dark spots appearing as two stripes, the lower one on the lower mesepimeron and adjoining mid-mesokatepisternum, and the upper one small dark spots on upper mesepimeron and prealar area, on the anterior 0.5 of anterior mesanepisternum, entire postpronotum; posterior surface of femora and tibiae pale, tarsal segments either dark-scaled or with very narrow white bands; abdominal terga dark-scaled dorsally or with basal, very narrow, white bands, (Fig. 1A). By contrast, *Cx. nigripalpus* females have a few scales only on the lower mesokatepisternum, the pleural integument is uniformly creamy or tan without dark stripes, abdominal terga rarely have narrow, basal, pale bands (Fig. 1B) and hindtarsi are dark-scaled.

The male genitalia of *Cx. declarator* have been studied. The appendicula of the subapical lobe of the gonocoxite has 3 rods (setae a, b, c), a flattened filament, a leaf, and a long, slender seta (setae f, g, h); furthermore, the lateral plate of the phallosome has 1–4 large, very robust teeth with rounded apices. In the male genitalia of *Cx. nigripalpus*, the subapical lobe has 3 rods (a, b, c), a leaf, and a strong seta (setae g, h) but lacks the extra flattened filament (seta f). Also, the lateral plate of the phallosome has 2–6 smaller teeth, more slender and pointed apically. The pupa of *Cx. declarator* is darkly pigmented and setae 5-V, VI are longer than the following segment. *Culex nigripalpus* pupae are light tan with some darker brown spots and setae 5-V, VI are shorter than the following segment. The larvae of *Cx. declarator* are unique in having only 3 pairs of siphonal setae and seta 1-M much longer than seta 2-M, while *Cx. nigripalpus* larvae have 4 pairs of siphonal setae and seta 1-M is subequal to seta 2-M.

The public health importance of *Cx. declarator* in other areas of the Americas has been reported. Aitken et al. (1964 as *Cx. virgultus*, 1969 as *Cx. declarator*) have recorded 4 separate isolations of St. Louis encephalitis virus from pools of *Cx. declarator* in Trinidad, along with 1 isolation of Turlock virus. At least 1 St. Louis encephalitis virus isolate has been made from *Cx. declarator* in Brazil



**A**



**B**

Fig. 1. Adult females of (A) *Culex declarator* and (B) *Culex nigripalpus*, showing thorax and abdomen.

(Monath et al. 1980). Isolates of an unidentified Corriparta serogroup orbivirus have reportedly been obtained from *Cx. declarator* in Brazil (Gorman et al. 1983).

The authors are aware of only 1 experimental evaluation of this species as a potential arbovirus vector. Turell (1999) attempted to evaluate vector competence for Venezuelan equine encephalitis, epizootic subtype IC. In contrast with more susceptible species tested, only 1 of 28 females feeding on viremic hamsters was infected, and that infection was limited to midgut tissues. This suggested that *Cx. declarator* was essentially refractory to infection with this virus by the oral route.

Labarthe et al. (1998) considered *Cx. declarator* to be a potential vector of *Dirofilaria immitis*, dog heartworm, as it was among the 4 most common mosquito species attracted to dog-baited traps in the state of Rio de Janeiro, Brazil. They also found that host-seeking females were attracted to feline and human baits.

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