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MORPHOLOGICAL VARIANTS OF *AEDES SOLLICITANS* FROM NEW JERSEY

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ABSTRACT. Morphological variants showing differences in length of median white scaled bands on the proboscises of female *Aedes sollicitans* (Cape May County, NJ) are described from F1 progeny of wild-caught mosquitoes. The length of the white-scaled band was classified into 5 categories: 1) large (0.53–0.60 mm), 2) medium (0.40–0.47 mm), 3) small (0.27–0.33 mm), 4) very small (0.13–0.20 mm) band to a patch of scales on the lateral aspect, and 5) a black proboscis Misidentification of adults during surveillance can be avoided by using other species-specific characters for *Ae. sollicitans* lacking a white-scaled band on the proboscis.

KEY WORDS *Aedes sollicitans*, morphological variants, Diptera, Culicidae

INTRODUCTION

The salt-marsh mosquito, *Aedes sollicitans* (Walker) is an epidemic vector of eastern equine encephalitis and Highlands J viruses in New Jersey (Hayes et al. 1962, Crans 1977, Andreadis et al. 1998) and is experimentally shown to be a competent vector of Venezuelan equine encephalomyelitis (Turell et al. 1992). *Aedes sollicitans* is widely distributed along the Gulf and Atlantic coasts of North America and breeds mostly in coastal salt marshes and brackish-water swamps of the inland states (Carpenter and LaCasse 1955). *Aedes sollicitans* prefers cooler temperatures and is most abundant from May to October in northeastern United States, where at times its high population becomes detrimental to the tourism industry. The adults are found throughout the year on the wing in the warmer southern United States, where its population never reaches nuisance levels.

During a laboratory colonization attempt, morphological variants in the length of the median white-scaled band on proboscis of *Ae. sollicitans* were observed. Few biochemical variants of *Ae. sollicitans* are described in the literature (Joslyn 1981) and description of morphological variants is lacking because of difficulties in maintaining a self-mating colony in the laboratory.

MATERIALS AND METHODS

More than 2,000 females were collected with the use of an ABC light trap in the last week of October from a salt hay marsh at Jakes Landing (Cape May County, NJ). Females were kept in a 1-cubic-foot [30 × 30 × 30 cm] cage and artificially blood fed on heparinized cow's blood through a biomembrane (washed, commercially available salted hog intestine casings) (Rutledge et al. 1964, Mahmood 1999, Mahmood et al. 2004). Blood-fed females were separated and provided 10% sucrose solution and Petri dishes containing wet cotton for oviposition. Eggs were conditioned for 72 h postoviposition and stored in an airtight plastic box containing a wet sponge in an environmental chamber at 25°C, 16:8 light:dark photoperiod and 85% relative humidity (RH). Eggs were hatched in deoxygenated water prepared by the addition of brewer's yeast (Mahmood 1999). Larvae were reared in large enamel trays containing deionized water and fed brewer's yeast. All stages of F1 mosquitoes were kept and reared in the above-mentioned environmental conditions.

Females were identified with the use of a dissecting microscope and photographed on a Nikon high-resolution SMZ-U stereoscope, equipped with a digital camera. Length of the median white band was recorded from 128 randomly selected F1 females with the use of an ocular micrometer. Measurements of the bands were classified into 5 different categories to ease explanation of the degree of variability.

RESULTS

The following percentages were observed in each band category: 1) A large band (0.53–0.6 mm in length) was present in 9.4% of females. The band was covered with white scales on the dorsal as well as lateral aspects (Fig. 1A). 2) A medium (0.40–0.47 mm) band was found in 46.9% of females. Such females showed a band with completely white scales on all aspects (Fig. 1B). Two females in this category had a

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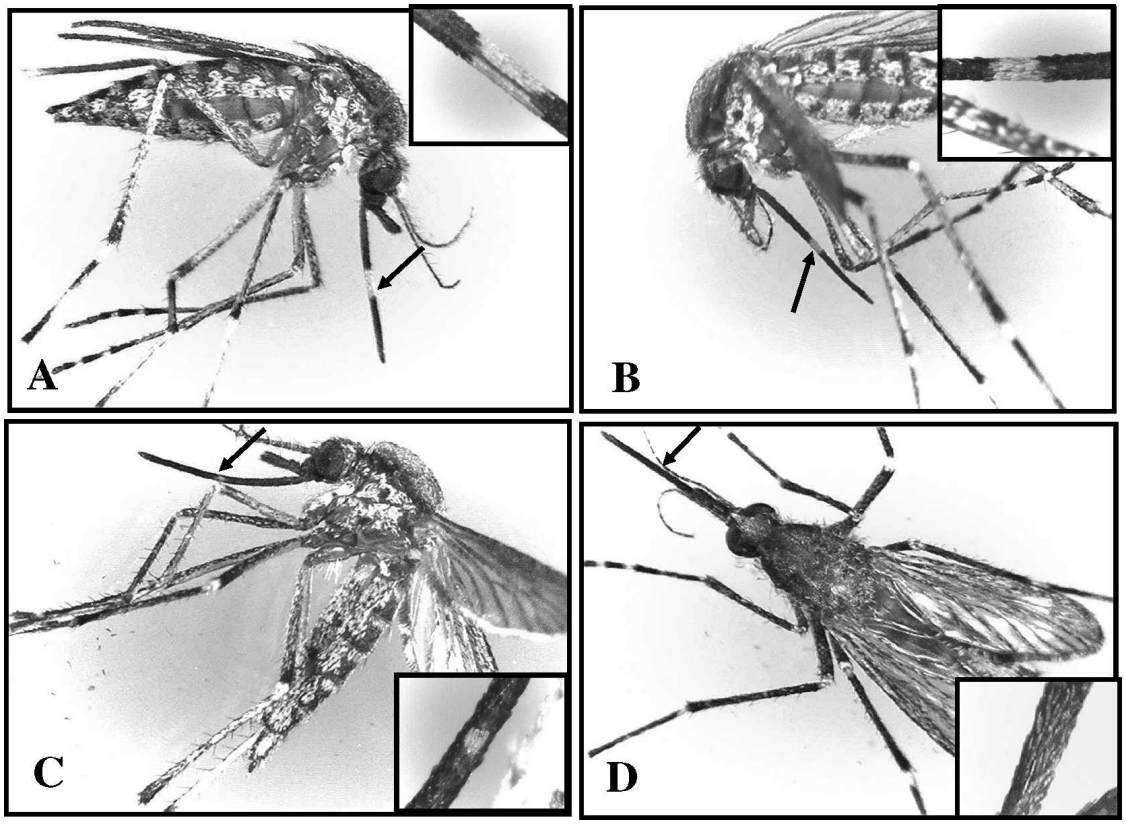

Fig. 1. Morphological variants of the proboscis of *Aedes sollicitans*. (A) Large band, insert is dorsal view of the band; (B) medium band, insert is lateral view of the band; (C) small band, insert is lateral view with a patch of scales; (D) black band, insert is dorsal view. Arrows show characteristics discussed, inserts show bands at higher magnifications.

grey-scaled band instead of white scales. 3) A small (0.27–0.33 mm) band was seen in 36.0% of females. Such females had a small band with mixed white and dark scales on the lateral sides and white scales on the dorsal surface of the proboscis. 4) A very small band (0.13–0.20 mm) to a lateral patch of scales was observed in 6.3% of females. Such females showed white scales intermingled with black scales on the lateral aspect and lacked white scales on the dorsal surface (Fig. 1C). 5) A completely black proboscis or a black proboscis with a single white scale was observed on 1.6% of females on the lateral side of the proboscis (Fig. 1D). The rest of the morphological characteristics were similar in all 5 categories of females (Carpenter and LaCasse 1955).

Fifteen randomly selected F1 4th instars from the same population were also checked with the use of Carpenter and LaCasse (1955) to assure that they were all *Ae. sollicitans* and not *Ae. nigromaculis* (Ludlow) (a western North American species with black proboscis in some females). Fourteen individuals had a single upper head hair and 1 specimen had a bifurcated upper head hair. Comb scales ranged from 16 to 25 and the number of pectin teeth ranged from 14 to 29. No specimen had apically detached barbed pectin teeth with smaller number of barbs like *Ae. nigromaculis*.

DISCUSSION

In the most commonly used identification keys (Stojanovich 1961, Means 1979, Darsie and Ward 2005), females lacking a band on the proboscis keyed out as *Ae. nigromaculis* (Ludlow). According to the identification key by Darsie and Ward (2005) the median white and/or pale band on 1st hind tarsomere may be present in some *Ae. nigromaculis* with banded proboscis. In this key females with a completely dark proboscis, a median abdominal stripe, and completely black palpi keyed out as *Ae. nigromaculis* (in part). Addition of a bifurcation in this key for females with a black proboscis, a dorsal median band on the abdomen, and completely dark scaled palpi compared to palpi with white scales at the tip will lead to separation of *Ae. nigromaculis* from *Ae. sollicitans*, respectively. In Means (1979) only

females with a dark scaled proboscis with a middle white band are recognized as *Ae. sollicitans*.

In Stojanovich (1961), females with banded proboscis and completely white 5th hind tarsomere are identified as *Ae. sollicitans*, whereas specimens with largely dark 5th hind tarsomere key out as *Ae. nigromaculis*. In the present study all females had a completely white 5th hind tarsomere irrespective of the variations in the band on the proboscis. In this key female lacking a white-scaled band on proboscis but possessing a definite pale longitudinal stripe on the upper surface of abdomen keyed out as *Ae. nigromaculis*. An additional dichotomy using the black palpi in *Ae. nigromaculis* and black palpi with apical white scales for identification of *Ae. sollicitans* will help in separation of both species.

Two variants of banding pattern, individuals with and without a white band on the proboscis, were also observed in *Ae. nigromaculis* populations from California (Bohart and Washino 1978). *Aedes nigromaculis* is closely related to *Ae. sollicitans* and both species have hypostigmal scales. Both species have been identified and show partial and/or complete overlap in Arizona, Arkansas, New Mexico, Texas, parts of Louisiana, Missouri, Kansas, Oklahoma, Nebraska, South Dakota, and North Dakota (Darsie and Ward, 2005). A definite identification of each species is necessary to determine their roles as vectors of various diseases and to direct larval and adult control measures in the proper breeding habitats in areas where both species are found in light-trap collections.

Fukuda and Woodward (1974) successfully produced hybrids of these species in the laboratory with the use of induced mating, but no naturally occurring hybrids have been reported from the areas of overlap of these 2 ecologically distinct species. Laboratory hybrids of both species showed larval characteristics that were similar to 1 of the parents in the cross. The wing scales of *Ae. sollicitans* are broad, whereas the wing scales of *Ae. nigromaculis* are narrow. Females from all 5 categories of *Ae. sollicitans* had broad dark- and light-colored scales on the wing margins, and mixed narrow and broad wing scales were present on the wing veins. Thus a revision of the key identification characteristics is required to include females lacking a band on the proboscis for identification of *Ae. sollicitans* from New Jersey, and areas where both the above species share habitats.

Because all specimens in the present study were progeny of mosquitoes from light traps, in-depth ecological and genetic investigations from geographically distinct and overlapping areas of both species in northeastern USA are required to relate larval characters to adults and to their breeding habitats.

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