

An Evaluation of Morphological Characters for Separating Females of
Aedes (Ochlerotatus) atlanticus Dyar and Knab and *Aedes (Ochlerotatus)*
tormentor Dyar and Knab (Diptera: Culicidae)¹

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ABSTRACT. Morphological characters for separating females of *Aedes (Ochlerotatus) atlanticus* Dyar and Knab and *Ae. (Och.) tormentor* Dyar and Knab were evaluated with reared taxonomic series and 1,858 field collected specimens. The characteristics of the median longitudinal stripe on the scutum were useful for identifying pristine specimens and these characters in combination with differences in coloration of the white basolateral scales and scales on the sterna of the abdominal segments could be useful for identifying partially rubbed specimens.

INTRODUCTION

This paper presents results from efforts to detect and evaluate characters for separating females of *Aedes (Ochlerotatus) atlanticus* Dyar and Knab, 1906 and *Ae. (Och.) tormentor* Dyar and Knab, 1906 from the vicinity of Houston Texas. The species are easily identified as males and as immatures, but the females have generally been considered indistinguishable (Carpenter and LaCasse 1955 and King et. al., 1960). A morphological character for separating the females was first reported by Scanlon and Yates (1970). It was their observation that the median longitudinal stripe on the scutum was useful for species identification (Fig. 1). Evaluation of this and other features was undertaken with laboratory-reared and field-caught specimens as part of a larger ecological investigation on selected woodland mosquitoes.

METHODS

Larvae for laboratory rearing were collected from temporary woodland and field pools at the University of Houston Gulf Coast Research Station

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located 72 km southeast of Houston in Hitchcock, Texas. The larvae were brought to the laboratory for individual rearing and were placed in covered, wide-mouth vials. The specimens were checked daily and exuviae were removed and preserved in 70% alcohol. The adults were killed and pinned upon emergence.

In addition to studies with reared specimens, a systematic evaluation of morphological characters was made with specimens obtained from man-biting collections at the University of Houston Gulf Coast Research Station. The specimens had been placed on dry ice immediately after collecting and subsequently stored at -70°C . The morphological characters were rated and the specimens were identified on a cold table with a stereoscopic binocular microscope. A fluorescent desk lamp with 2 bulbs served as the source of white light necessary for detecting subtle differences in scale coloration.

RESULTS

Reared specimens of both species were systematically checked for morphological features for distinguishing the females of *Ae. atlanticus* and *tormentor*. The only obvious character was the pattern of the median longitudinal stripe described by Scanlon and Yates (1970). The scutum of these species is clothed with narrow dark scales and a broad median longitudinal stripe, of white to cream colored scales, that reaches from the anterior margins and posteriorly encompasses the prescutellar space (Fig. 1). The stripe tapers posteriorly and forks at the beginning of the prescutellar space in specimens of *Ae. tormentor*. The prescutellar space is bordered by white scales but mostly bare of white scales centrally. The stripe in *Ae. atlanticus* does not taper posteriorly or noticeably fork to border the prescutellar space. Only a small central part of the prescutellar space is bare of white scales. Although within species variation in stripe patterns were observed, the median longitudinal stripe patterns were sufficiently distinct for species separation.

Specimens from biting collection were routinely identified with this feature. Since the median longitudinal stripe had frequently been rubbed on the majority of light-trap collected material, it was not a reliable character for these specimens. However, while processing biting collection specimens, subtle differences in abdominal scale coloration were observed to correlate with differences in the median longitudinal stripe pattern. In general, specimens with a stripe pattern characteristic for *Ae. tormentor* had basolateral (sub-basolateral) scales and scales on sterna of segments that were distinctly white, and specimens with a stripe pattern characteristic for *atlanticus* had cream to almost bronze colored scales. These differences were not easily detected in laboratory reared specimens.

Three morphological features were evaluated against each of approximately 1,858 field collected specimens of *Ae. atlanticus* and *tormentor*. Each marker was assigned a value of 1 if it were characteristic of *Ae. tormentor*, 2 if the character were intermediate and 3 if characteristic of *atlanticus*. Two of the morphological characters related to the appearance of the median longitudinal stripe (Fig. 1). One (Character A) was the general appearance

of the stripe, e.g., width, distinctness of borders, density of scales and whether the stripe tapered anterior to the beginning of the prescutellar space. The 2nd character (Character B) described the degree of divergence of the stripe to border the prescutellar space and absence of scales in the prescutellar space. The 3rd feature (Character C) was the coloration of scales on the sterna and the base of the abdominal terga. The color of the abdominal scales was rated first, followed by a careful rating of the pattern of the median longitudinal stripe. On the basis of this combination of characters, each specimen was designated as either *atlanticus* or *tormentor*.

A frequency distribution was calculated for the character ratings for each species (Table 1). Approximately 97% of the specimens had consistent 3 ratings or consistent 1 ratings. Specimens designated as *tormentor* demonstrated the greatest variation in pattern of the median longitudinal stripe (> 2%). Conversely, specimens designated as *atlanticus* showed greatest variation (> 2%) in scale color. The subtle differences in coloration were not easily detectable if non-white light were used or if specimens were dried. It is not known why the subtle color differences between species were more noticeable for wild caught specimens than laboratory-reared specimens; but it may have been due to larval nutrition, or to bleaching of the pinned specimens. The lateral aspect of the thorax (scales and integument), was found to be a more reddish-brown in specimens of *atlanticus*, but an objective evaluation of that feature was not conducted.

These data indicated that the characters were adequate for separating wild caught female *atlanticus* and *tormentor* from the area of Houston, Texas. The pattern of the median longitudinal stripe (Characters A and B) could be used in combination with the color of abdominal scales for identifying rubbed specimens. The characters, as delineated, make it possible to separate the 2 species, but it is not known whether these characters are applicable to populations from other geographical areas. Use of the described characters resulted in the detection of notable differences in the ecology and behavior of these woodland mosquitoes (Roberts and Scanlon, 1975).

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Table 1

Frequency Distribution of Ratings* for 3 Morphological Characters** Employed to Separate 1858 Specimens of *Aedes atlanticus* Dyar and Knab and *Aedes tormentor* Dyar and Knab Obtained in Collections from Human Bait Conducted in the Area of Houston Texas.

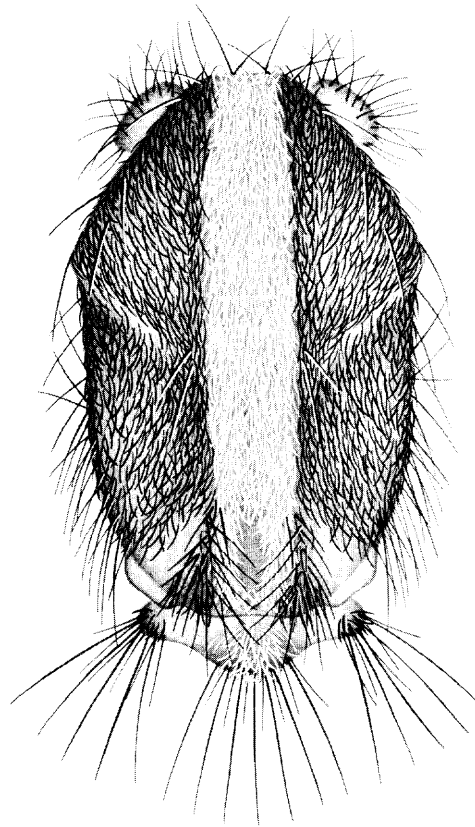
Species Designation	Ratings for 3 Morphological Characters			Number of Specimens
	A	B	C	
<i>Ae. atlanticus</i>	3	3	3	1,032
<i>Ae. atlanticus</i>	3	3	2	18
<i>Ae. atlanticus</i>	3	3	1	2
<i>Ae. atlanticus</i>	3	2	3	2
<i>Ae. atlanticus</i>	3	2	1	1
<i>Ae. atlanticus</i>	3	1	3	1
<i>Ae. tormentor</i>	2	2	2	1
<i>Ae. tormentor</i>	2	3	1	2
<i>Ae. tormentor</i>	2	2	1	3
<i>Ae. tormentor</i>	1	3	1	1
<i>Ae. tormentor</i>	1	2	1	13
<i>Ae. tormentor</i>	1	1	3	1
<i>Ae. tormentor</i>	1	1	2	7
<i>Ae. tormentor</i>	1	1	1	774
Total				1,858

*1 = *Ae. tormentor*, 2 = intermediate rating, 3 = *Ae. atlanticus*.

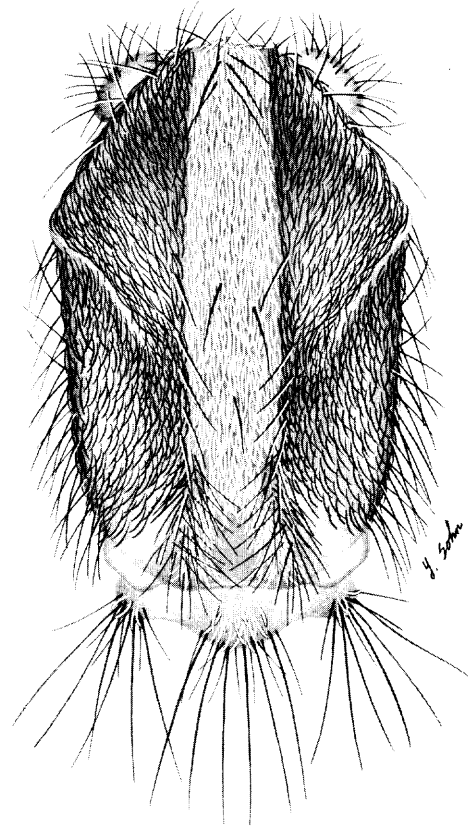
**A = General appearance of median longitudinal stripe.

B = Degree of divergence of the stripe to border the prescutellar space and absence of scales in the prescutellar space.

C = Color of scales on the sterna and at the base of the abdominal terga.



atlanticus



tormentor

Fig. 1. Scutum of females of *Aedes atlanticus* and *Ae. tormentor*.