

DELPHACODES NIGRIFACIES
(HOMOPTERA: DELPHACIDAE): FIELD BIOLOGY,
LABORATORY REARING AND DESCRIPTIONS OF
IMMATURE STAGES

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ABSTRACT

The planthopper *Delphacodes nigrifacies* Muir, a species previously unreported from the United States, was collected in Florida from stands of Bahia grass (*Paspalum notatum* Flüggé) and a mixed stand of St. Augustine grass (*Stenotaphrum secundatum* Kuntze) and Bermuda grass (*Cynodon dactylon* Pers.) from December 1984 to March 1986; it was reared in the laboratory and the immature stages described.

D. nigrifacies feeds and reproduces on *P. notatum* and is apparently polyvoltine. Field collected adults were transferred to the laboratory and allowed to lay eggs on potted *P. notatum*. Upon emergence nymphs were separated and reared to adults. Durations of the five nymphal stadia were 3.95, 4.28, 4.59, 4.63, and 5.50 days, respectively. Nymphal instars differed in body size, number of pit-like sensoria, development of wingpads, number of metatibial and metatarsal spines, and the shape and dentition of the metatibial spur.

RESUMEN

El salta-planta *Delphacodes nigrifacies* Muir, una especie que no se había reportado en los Estados Unidos, se obtuvo en la Florida en la hierba Bahia (*Paspalum notatum* Flüggé) y en una mezcla de la hierba San Agustín (*Stenotaphrum secundatum* Kuntze) y hierba Bermuda (*Cynodon dactylon* Pers.) de Diciembre 1984 a Marzo 1986; se crió en el laboratorio y se describieron las etapas inmaduras.

D. nigrifacies se alimenta y reproduce en *P. notatum* y es aparentemente polyvoltina. Adultos obtenidos en el campo se llevaron al laboratorio y se les permitió poner huevos en plantas *P. notatum* en macetas. Al salir las ninfas se separaron y se criaron hasta llegar a adultos. La duración de los cinco estadios ninfales fue de 3.95, 4.28, 4.59, 4.63 y 5.50 días respectivamente. Los estadios de las ninfas difirieron en el tamaño del cuerpo, número de sensores tipo-fosa (pit-like), desarrollo de los cojinetes de las alas, número de espinas en la metatibia y en el metatarso y en la forma y dentición de la espuela de la metatibia.

Although the genus *Delphacodes* is the largest in the family Delphacidae in North America little information is available on the life histories of the ca. 120 species. The immatures of *D. bellicosa* Muir have been described (Wilson 1985) and aspects of the biology of *D. campestris* (Van Duzee), *D. lutulenta* (Van Duzee) and several other *Delphacodes* spp. have been published (Stoner and Gustin 1980, Giri and Freytag 1983a, b, Giri et al. 1985).

While collecting insects from Bahia grass (*Paspalum notatum* Flüggé) we obtained a large number of specimens of *Delphacodes nigrifacies* Muir, a species previously unreported from the United States. It was first described by Muir (1918) and re-described by Muir and Giffard (1924). *D. nigrifacies* is reported from Martinique, Guyana, Costa Rica (Metcalf 1943); St. Vincent, St. Lucia, Dominica, Montserrat, and Venezuela

(Fennah 1959). Ballou (1936) reported *D. nigrifacies* feeding on Gramineae. Otherwise no information is available for this delphacid.

The present study provides the first record of this planthopper for the United States, summarizes the relationship between it and its host plant Bahia grass, and includes information on laboratory rearing, descriptions and illustrations of immature stages.

MATERIALS AND METHODS

Biweekly sweeps of two grass plots, one a pure stand of Bahia grass and the other consisting of a mixed stand of St. Augustine grass (*Stenotaphrum secundatum* Kuntze) and Bermuda grass (*Cynodon dactylon* Pers.) were made in Fort Lauderdale and Homestead, Florida from December 1984 to March 1986. Insects collected were preserved in 70% isopropyl alcohol for later identification.

Field collected adults of *D. nigrifacies* were placed on potted *P. notatum* and kept at 26.7°C and 12L:12D photoperiod and allowed to lay eggs. Cylinder cages constructed of butyrate tubing were used to keep insects on the host plant (Tsai 1975). Upon hatching the immatures were removed from the plant and placed in 2.5 cm diam. culture tubes each containing a fresh *P. notatum* leaf. The culture tube opening was covered with Parafilm® to prevent escape and desiccation. Plant tissue was replaced every 2 days or when required, Daily observations of nymphs were made and dates of molts recorded.

The descriptions and illustrations of the egg and each nymphal instar and a key to nymphal instars are based upon laboratory reared individuals. The 5th instar is described in detail but only major differences are described for 4th through 1st instars. Measurements are given in mm as mean \pm SD. Length was measured from apex of vertex to apex of abdomen, width across the widest part of the body, and thoracic length along the midline from the anterior margin of the pronotum to the posterior margin of the metanotum. Eggs were obtained by removing them from host plants by inserting a needle under each egg and teasing it free.

RESULTS AND DISCUSSION

Field Study

D. nigrifacies adults were collected from the mixed grass stand and adults and immatures from the pure stands of *P. notatum* from December 1984 to March 1986. Despite a partial winter die back of *P. notatum* the population of *D. nigrifacies* remained constant. This may indicate that *nigrifacies* is polyvoltine as adults (macropters and brachypters) were collected throughout the study. Adults and immatures were observed feeding on all parts of *P. notatum* leaves. Eggs were found inserted singly along the midribs of leaves. The duration of nymphal development for *D. nigrifacies* was ($\bar{x} \pm$ SD) 20.8 \pm 2.44 days. Duration of nymphal stadia are given in Table 1.

Descriptions of Nymphal Instars

Fifth Instar. (Fig. 1). Length 1.6 \pm 0.06; thoracic length 0.6 \pm 0.03; width 0.8 \pm t.03. N=10.

Form elongate, subcylindrical, slightly flattened dorsoventrally, widest across mesothoracic wingpads. Body and legs yellow orange and cream in color.

Vertex quadrate, length ca. 0.75X width at base, posterior margin almost straight; carina on each side extending anteromedially from posterolateral corner and continuing

TABLE 1. DURATION (IN DAYS) OF THE NYMPHAL INSTARS OF *D. NIGRIFACIES*.

Nymphal Instar	No. Beginning	No. Completing	Days	
			Range	Mean \pm SD
1st	25	20	2-7	3.95 \pm 1.43
2nd	20	18	2-7	4.28 \pm 1.27
3rd	18	17	2-10	4.59 \pm 2.18
4th	17	16	2-10	4.63 \pm 2.19
5th	16	12	3-8	5.50 \pm 1.38

onto frons as inner carina. Frons subrectangular; widest in middle, slightly longer than wide; carinate lateral margins convex, these outer carinae extending from vertex to near clypeal border and paralleled by pair of inner carinae; 9 pits between each inner and outer carina (occasionally 10) and 5 pits between each outer carina and eye. Clypeus narrowing distally, consisting of subconical basal postclypeus and cylindrical distal anteclypeus. Beak 3-segmented, segment 1 obscured by anteclypeus, lengths of segments 2 and 3 subequal; apex of segment 3 black. Eyes gray. Antennae 3-segmented; scape short, cylindrical; pedicel subcylindrical, ca. 3X length of scape, with ca. 10-12 pitlike sensoria; flagellum bulbous basally, with elongate, bristle-like extension distally, bulbous base ca. 0.3X length of pedicel.

Thoracic nota divided by middorsal line into three pairs of plates. Pronotal plates subrectangular, appearing triangular in dorsal view; anterior margin following posterior

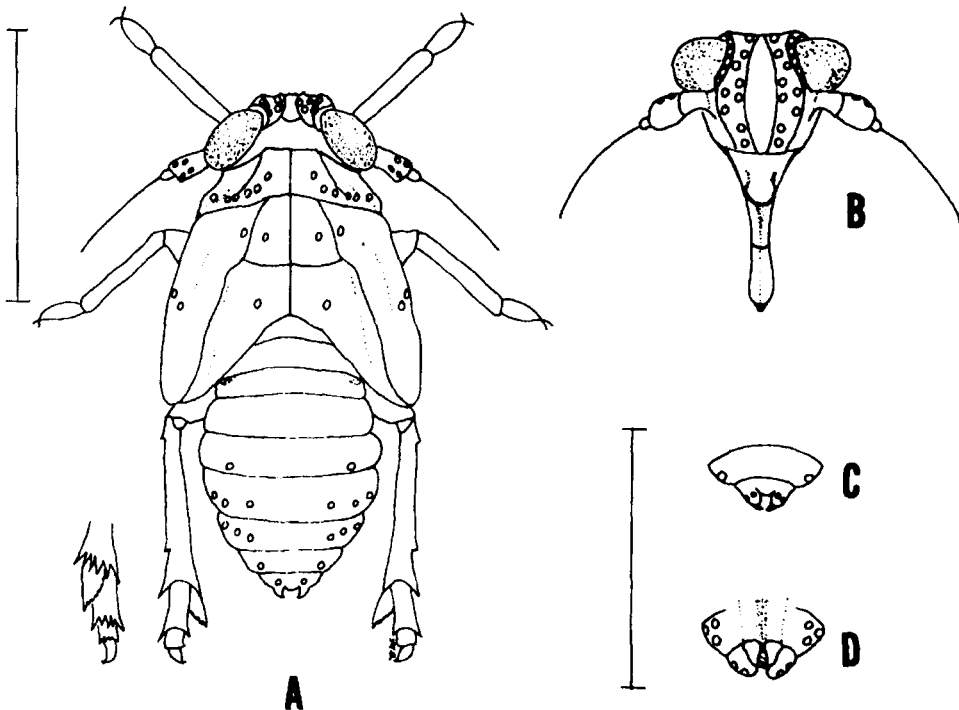


Fig. 1. *D. nigrifacies* fifth instar. A. Habitus. B. Frontal view of head. C. Apical part of venter of male abdomen. D. Apical part of venter of female abdomen. Vertical bar = 1.0 mm.

border of eye, posterior border sinuate; each plate with oblique posterolaterally directed carina originating on anterior margin in median 1/3 and terminating in middle of plate, carina bordered along inner margin by row of 7 pits extending posterolaterally to lateral border of plate (lateralmost pits not visible in dorsal view). Mesonotal median length ca. 1.5-2X that of pronotum; subrectangular. Mesonotal wingpads in macropter elongate lobate, extending to, or nearly to, tip of metanotal wingpad; brachypters with wingpads like those of 4th instars (as in *Megamelus davisii* Van Duzee; see Wilson and McPherson 1981); with posterolaterally directed carina originating on anterior margin in median 1/4 and terminating on posterior margin; 2 pits on either side of carina and 3 pits in lateral 1/3. Metanotal median length slightly shorter than that of mesonotum; each plate bearing an elongate lobate wingpad extending to 4th tergite laterally; weak longitudinal carina originating on anterior margin in median 1/4 and terminating on posterior margin; 1 pit just lateral to carina. Pro- and mesocoxae elongate, posteromedially directed; metacoxae fused to sternum. Pro- and mesofemora and tibiae each with 2 ventral longitudinal rows and 1 dorsal row of setae. Metatrochanter subcylindrical. Metatibiae each with 2 black-tipped spines on lateral aspect of shaft, apical transverse row of 5 black-tipped spines on plantar surface and a subtriangular, flattened movable spur with row of 12-14 teeth on lateral margin. Pro- and mesotarsi each with 2 tarsomeres; tarsomere 1 wedge-shaped; tarsomere 2 subconical, curved, and with pair of apical claws and median membranous pulvillus. Metatarsi each with 3 tarsomeres; tarsomere 1 cylindrical with apical transverse row of 7 black-tipped spines on plantar surface; tarsomere 2 cylindrical, with apical transverse row of 4 black-tipped spines on plantar surface; tarsomere 3 subconical, similar to terminal tarsomere of other legs.

Abdomen 9 segmented; slightly flattened dorsoventrally, widest across segment 4 or 5. Tergite 1 reduced; tergite 5 with 1 pit and tergites 6-8 each with 3 pits on either side of midline (lateralmost pits not always visible in dorsal view due to curving of tergites onto ventral aspect). Segment 9 surrounding anus; with 3 pits on each side; female with 1 pair of acute processes extending caudally from juncture of sternite 8 and segment 9; males lacking processes.

Fourth Instar (Fig. 2E). Length 1.2 ± 0.05 ; thoracic length $0.4 \pm .02$; width 0.6 ± 0.05 . N=12.

Frons with 4 pits between each outer carina and eye. Antennal pedicel with 6-8 sensoria.

Mesonotal wingpad ca. 0.7X length of metanotal wingpad. Metanotal wingpad extending to 3rd tergite. Metatibial spur slightly smaller with row of 8-10 teeth on lateral aspect. Metatarsi each with 2 tarsomeres; tarsomere 1 with 6 spines on plantar surface; tarsomere 2 subconical with 3 spines in middle of tarsomere.

Third Instar. (Fig. 2D). Length 1.2 ± 0.09 ; thoracic length 0.4 ± 0.03 ; width 0.5 ± 0.03 . N=16.

Antennal pedicel with 3-5 sensoria; bulbous base of flagellum ca. 0.5X length of pedicel.

Mesonotal wingpad shorter covering 1/3 metanotal wingpad laterally. Metatibial spur smaller; 3 teeth on margin. Metatibiae each with 4 spines on plantar surface. Metatarsomere 1 with apical transverse row of 5 black-tipped spines on plantar surface; tarsomere 2 without spines in middle.

Second Instar. (Fig. 2C). Length 1.0 ± 0.07 , thoracic length 0.3 ± 0.02 ; width 0.4 ± 0.02 . N=16.

Antennal pedicel with 2 sensoria. Frons with 3 pits between each outer carina and eye.

Pronotal plates each with 6 pits. Mesonotum with 2 pits on either side of carina and 2 pits in lateral 1/3. Meso- and metanotal wingpads undeveloped. Metatibial spur smaller, lacking marginal teeth but with 1 black tipped tooth at apex.

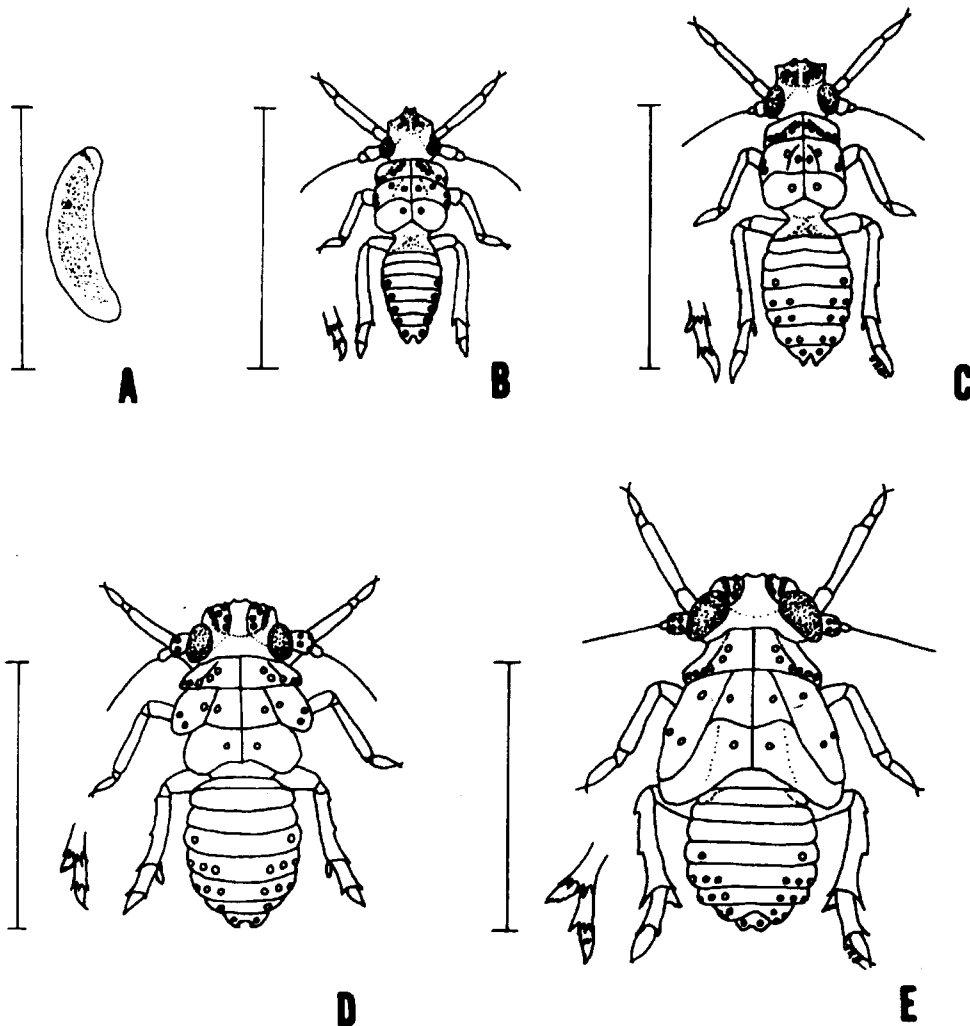


Fig. 2. *D. nigrifacies* immature stages. A. Egg. B. First instar. C. Second instar. D. Third instar. E. Fourth instar. Vertical bars = 1.0 mm.

First Instar. (Fig. 2B). Length 0.8 ± 0.06 ; thoracic length 0.2 ± 0.01 ; width 0.3 ± 0.029 . N=10.

Body cream colored. Antennal pedicel lacking sensoria.

Metatibia lacking spines on shaft; spur greatly reduced, slightly longer than longest metatibial spine, with 1 black-tipped tooth at apex.

Abdominal tergites with pits obscure, tergites 6-8 each with 2 pits on either side of midline (lateralmost pits not visible in dorsal view due to curving of tergites onto ventral aspect).

Egg (Fig. 2A). Length 0.6 ± 0.02 , width 0.2 ± 0.01 . N=10. Eggs laid singly; white; cylindrical; chorion translucent, smooth.

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