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DESCRIPTION OF DASYHELEA CHANI NEW SPECIES (DIPTERA: CERATOPOGONIDAE) FROM LEAVES OF THE WATER LETTUCE (PISTIA STRATIOVES IN FLOIRDA

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ABSTRACT

Dasyhelea chani new species (Diptera: Ceratopogonidae), whose immature stages are found on leaves of the water lettuce, Pistia stratiotes L., is described in the pupal and adult stages.
RESUMEN

Se describe en el estado pupal y adulto a Dasyhelea chani nueva especie (Diptera: Ceratopogonidae), cuyas etapas inmaduras se encuentran en hojas de la lechuga de agua, Pistia stratiotes L.

Biting midges of the genus Dasyhelea Kieffer are common and widespread, found in all regions of the world and in a wide variety of habitats. The larvae are aquatic or semi-aquatic, requiring at least a thin film of water in which to live. They are unable to swim, so they move by climbing or hitching their way along, using their mouthparts and posterior hooks. Their preferred habitats are wet moss or algae along shores of streams, lakes, ponds, puddles and other bodies of water, or in wet rotting materials such as sap oozing from trees, wet bark and tree holes. Some species are found in unusual habitats such as rock pools, thermal water in hot springs, or water with high mineral or salt content. They have successfully invaded the tidal zone along seashores, where many species breed on algae-covered rocks or in algae growing on mud exposed to tidal action in salt marshes. Most larvae spin tubular cases in the last instar.

Adult Dasyhelea midges may be found in habitats near the breeding sites. Some species are found among shrubs, on plants near water, or at flowers. Little is known about the feeding habits of adults. As far as known, adults feed on honeydew and sweet secretions of plants, or they visit flowers for nectar. Blood-sucking habits are not known to have been developed in this genus. Some species are important pollinators of cacao and other tropical tree crops.

Approximately 500 species of Dasyhelea have been described worldwide, of which only 42 are known from North America. Waugh & Wirth (1976) listed only 18 species in the genus from the Eastern United States north of Florida, and Wilkening et al. (1985) recorded 15 species for the state of Florida. Thus only a small fraction of the existing North American Dasyhelea species have been described, and there are thousands of specimens in the collection of the National Museum of Natural History of the Smithsonian Institution in Washington awaiting study and description.

MATERIALS AND METHODS

The material forming the basis of the present study was collected by Dr. Kai Lok Chan during studies on the biology of the ceratopogonid midges associated with water lettuce plant (Pistia stratiotes L.) at Chinese Farm, an abandoned aquaculture project adjacent to Old Dixie Highway, about 3 miles south of the Florida Medical Entomology Laboratory at Vero Beach, Florida.

Our taxonomic material was killed by immersion in hot water and preserved in 70% ethanol. Adults were dissected and mounted on microscope slides in phenol balsam according to the technique of Wirth & Marston (1968). Terminology used in description of the adult midges follows that of Waugh & Wirth (1976) and Downes & Wirth (1981). Terminology for the pupal description follows that used for Culicoides by Blanton & Wirth (1979). The holotype and allotype and a portion of the paratypes are deposited in the National Museum of Natural History in Washington; additional paratypes are in the collections of the authors and the Florida State Collection of Arthropods in Gainesville, Florida.

Dasyhelea chani Wirth and Linley, new species (Fig. 1-14)

Diagnosis. A small brownish species with yellowish or pale brown scutellum, dark halteres and pale yellowish to brownish legs; wing whitish with sparse, coarse, sharp,
Fig. 1-8. *Dasyhelea chani*; 1, 6, 8, male; 2-5, 7, female: 1, 2, antenna; 3, palpus; 4, wing; 5, spermatheca; 6, parameres; 7, female distal abdominal segmente, ventral view; 8, male genitalia, parameres omitted.

spinellike macrotrichia in linear arrangement. Pupa pale yellowish; abdominal tubercles small; respiratory horn tapering to sharp point apically, with slitlike spiracular openings on distal portion; last segment with two pairs of long, slender, spinellike terminal processes.

Female Holotype. Wing length 0.90 mm, breadth 0.42 mm; costal ratio 0.48.

Head. Brown; antenna dark brown, palpus paler at base. Antenna (Fig. 2) with
Fig. 9-14. *Dasyhelea chani*: 9, operculum; 10, prothoracic respiratory horn; 11, abdominal segment 8, dorsal view; 12, abdominal segment 4, dorsal view; 13 same, ventral view; 14, last abdominal segment of female pupa, dorsal view.
lengths of flagellar segments (in microns) 39-26-29-29-31-31-31-43-45-45-43-93; antennal ratio (elongated segments 11-15/shorter segments 3-10) 1.10; proximal segments globular, slightly elongated toward 10; 11-13 about twice as long as basal breadth, slightly tapering; 15 tapering to slender tip; all segments with definite sculpturing. Palpus (Fig. 3) short and slender; segments 1 and 2 incompletely divided, more distinct than normal in the genus; lengths of segments 1 + 2 to 5 (in microns) 36-36-29-44; 3rd segment globular to slightly longer than broad; palpal ratio 1:67 in holotype.

Thorax. Dark brown, scutellum paler brown. Legs stramineous, knee spots slightly darkened, tarsi slightly darker distally; provided sparsely with rather long dark setae; lengths of segments of hind leg from femur distad (in microns) 360-340-232-90-76-51-51. Wing (Fig. 4) with membrane whitish due to well-developed microtrichia; macrotrichia coarse, long, spinelike, and sparse, arranged in lines paralleling veins; 1st radial cell obliterated, 2nd slitlike, end of costa oblique. Halter brownish.

Abdomen. Dark brown; terga deeply pigmented blackish with pale punctures at the bases of the sparse, rather coarse setae; pleura appearing blackish due to dense coarse spicules arranged in close-set, longitudinal rows. Subgenital plate (Fig. 7) a stout, hi-archuete, transverse band bearing a short, broad, slightly bilobed anteromedian projection. Spermathecae (Fig. 5) one; large, moderately pigmented, subspherical to slightly ovoid with a short, slender, slightly oblique neck; measuring 0.072 by 0.061 mm with neck 0.007 mm long.

Male Allotype. Wing length 1.04 mm, breadth 0.38 mm; costal ratio 0.45.


Genitalia (Fig. 8). Ninth segment slightly broader than long; sternum slightly produced caudomesad abutting base of aedeagus with a submedian pair of strongly sclerotized, low prominences; tergum rounded caudad with a small submedian pair of beadlike apicolateral processes, each bearing a short seta. Basistyle about twice as long as broad, with a low setose ventromesal lobe distally, and a strongly sclerotized hooklike process on midway mesal margin as in species of the grisea Group; dististyle about as long as basistyle, only slightly curved, and moderately tapering to slender tip. Aedeagus complicated; with a narrow, transverse, slightly arcuate, strongly sclerotized, basal bar with a low, bluntly pointed, caudomedical expansion; from which posteriorly arise caudoventrally a pair of short winglike plates each with posterior ends divided in two sharp-pointed unequal lobes, from the outer lobe of which a ridged thickening curves arcuate anterolaterally and dorsally toward ends of basal bar; these arcuate sclerites forming a strong ventromesal support for a second pair of more dorsally and laterally located plates which are blunt-pointed caudally and lightly sclerotized, and form the support for a longitudinally wrinkled, hyaline envelope for the distal part of the male genital duct. Parameres (Fig. 6) strongly asymmetrical as usual in the genus; basal apodemes forming nearly straight, moderately broad bands; caudomedical sclerite slightly sinuate and slightly swollen proximally in ventral view, evenly curving and tapering in lateral view, with slender, tapering, distal process directed ventrad apically; an area of numerous setae separates the posteriorly directed portion from the more slender, ventrally directed, distal portion.
Pupa. Length 2.9 mm. Exuviae pale yellowish throughout, last segment amber colored; respiratory horn amber with hyaline tip and pale margin at spiracular openings. Devoid of strong setae; integument smooth except for fine shagreening on abdominal segments, coarser on posterior margins of segments and over all of last segment. Operculum (Fig. 9) rounded ventrally, slightly bilobed dorsally, with a pair of small sharp spinules laterally at widest portion; no octac or scutellum visible. Respiratory horn (Fig. 10) of unusual structure, relatively stout with parallel margins on proximal half, then tapering and curving to a sharp distal point; about 16 inconspicuous sittilike spiracular openings in a loosely arranged row on distal 0.4 of curved dorsal margin and distal 0.2 of ventral margin; internal tracheal chamber divided in two portions, the distal portion bearing tubules leading to the spiracular openings, and proximal portion on proximal third of horn with fine transverse annulations. Abdomen (Fig. 12-13) with 1st segment reduced and 2nd elongated as usual in the genus; segments 3-7 each with 9 pairs of small bluntly-pointed postermarginal tubercles, each with a minute seta, aligned in a nearly straight ring around posterior margin of segment, the ring broadly interrupted on dorsal and ventral midlines of segment, the two lateromost pairs of tubercles enlarged, somewhat thornlike; segment 8 (Fig. 11) with only 5 pairs of such tubercles. Posterior segment (Fig. 14) with unusual modification for the genus, somewhat similar to that of Dasyhelea traverae Thomsen as figured by Waugh & Wirth (1976); instead of the usual broad and flattened terminal processes, these are much elongated in long, slender, minutely fringed, yellowish spines 0.20 mm long (or 1.25 as long as segment); at the base of each terminal spine dorsally arises a much shorter, darker, minutely fringed spine only 0.053 mm long, between these spines arises a minute hyaline seta about 0.005 mm long.

Larva. Length 4-5 mm when mature. Pale creamy white; head concolorous. Head capsule 0.324 mm long by 0.200 mm wide; mouthparts and pharyngeal apparatus not studied. Head and body bare of setae. Last segment with 2 dorsal pairs and 4 ventral pairs of slender, inconspicuous hooks with some microscopic spinules interposed between the groups of hooks.

Types. Holotype female, allotype male; paratypes, 9 females, 8 males. FLORIDA, St. Lucie Co., Ft. Pierce, Chinese Farm, 24 July 1987, K. L. Chan, reared from Pistia stratiotes L. Other material: 12 pupal exuviae, 10 larvae, same data.

DISCUSSION

We dedicate this species with pleasure to Dr. Kai Lok Chan of the National University of Singapore, who, spending a sabbatical leave working at the Florida Medical Entomology Laboratory, reared a most unusual variety of ceratopogonid midges from leaves of water lettuce. Ecological studies on the relation of this species to Pistia and its fauna will be reported separately by Dr. Chan and the junior author.

Dasyhelea chani is provisionally placed in the grisea Species Group on the basis of its reticulated antenna with tapering, elongate, slender, last antennal segment; subgenital plate with well-developed anteromedian lobe; male basistyle with well-developed hooklike process on mesal margin; male aedeagus with several pairs of caudomedian processes; and parameres asymmetrical with elongate caudomedian sclerite. The unusual development of the distally pointed respiratory horns and the long spinelike caudal processes of the pupa are found in another species of the grisea Group, Dasyhelea traverae Thomsen. Otherwise, D. traverae does not seem to be closely related, with much different subgenital plate, male genitalia and wing, while the pupa differs in bearing spiracular openings on both edges of the respiratory horn, and lacking the 2nd short pair of spines on the last abdominal segment (Waugh & Wirth 1976). The sharply-pointed, spinelike macrotrichia on the wing of D. chani are a good quick recognition
feature, but this character is shared with *D. spiniforma* Waugh and Wirth, another unrelated and otherwise dissimilar North American species.

A third *Dasyhelea* species (but unnamed) with a pupa similar to that of *D. chani* was described and figured in the pupal stage by Mayer (1934) as a "*Holoconops* sp." The pupa was collected by Feuerborn during the German Limnological Sunda Expedition in Sumatra, where it was found among *Sphagnum* in a large freshwater pool.

The unusual modification of the pupal respiratory horn and apical abdominal segment begs some explanation of its function. In this regard attention should be called to the remarkable pupa of *Stilobezia poikiloptera* Ingram and Macfie described by Ingram and Macfie (1922) from specimens reared from *Pistia stratiotes* at Accra, West Africa. While possessing the slender, sharp-pointed respiratory horn and long spine-like caudal processes, the pupa of *S. poikiloptera* is otherwise quite different, belonging to another subfamily of biting midges, the Ceratopogoninae. It would seem that such a parallelism must serve a real biological function, such possibly as using these sharp processes as spurs to aid in climbing or moving around on the plants.

Another question arises, which cannot be answered until the *Dasyhelea* fauna of the tropics and subtropics worldwide has been more thoroughly sampled and studied. At present our knowledge of the taxonomy and biology of this genus is fragmentary, nearly the least-studied in the entire family of biting midges. Has *Dasyhelea chani* been brought into Florida along with the introduction of its host plant, the water lettuce? Or is it a rare and previously unknown native Florida species that has taken the opportunity to adapt to an immigrant host that becomes locally abundant and dominant in its ecological niche?

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