



## Descriptions of *Danielsia* Theobald, a genus recently resurrected from synonymy (Diptera: Culicidae: Aedini), and its type species *Dn. albotaeniata* Leicester

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### Abstract

A detailed morphological description of the recently reestablished genus *Danielsia* and its type species, *Dn. albotaeniata*, are provided. An extensive list of previous literature pertaining to the genus is included. Genus *Danielsia* includes three species, *Dn. albotaeniata*, *Dn. harperi* and *Dn. lepchana*. Distribution, bionomics, distinguishing features of each life stage and background information for the genus are provided.

**Key words:** Culicidae, Aedini, *Danielsia*, *Dn. albotaeniata*, *Dn. harperi*, *Dn. lepchana*, mosquitoes

### Introduction

Reinert *et al.* (2008) resurrected *Danielsia* Theobald from synonymy with subgenus *Finlaya* of *Ochlerotatus* as a genus in tribe Aedini of family Culicidae. This action was the result of cladistic analyses of tribe Aedini (Reinert *et al.*, 2004, 2006 and 2008) and was based on morphological data from all life stages of all previously recognized genera, subgenera, and major species groups of the tribe.

The original description of *Danielsia* by Theobald (1904) was very brief: “Head covered with small flat scales, with truncated ends, loosely and rather raggedly placed on the head, a few long narrow-curved ones behind, and small upright forked ones with them. Scutellum with small narrow-curved scales; mesothorax with narrow-curved scales. Palpi short in female, densely scaled; in the male as long as the proboscis, the two apical joints short, the apical rather shorter than the penultimate, hair-tufts scanty; fork-cells rather short.” Since the original description included only a few adult characters and did not include features of the female and male genitalia and immature stages, all known stages of *Danielsia* and its type species, *Dn. albotaeniata*, are described in detail below.

Morphological terminology used in the descriptions follows Harbach & Knight (1980, 1982) except for terms proposed by Reinert (1990, 1999, 2000b and 2008a). A previous usage section is provided for tracking the published generic-level history of species included in *Danielsia*.

### Genus *Danielsia* Theobald, 1904

**Type species:** *Danielsia albotaeniata* Leicester, 1904

#### Previous usage

*Danielsia* Theobald (1904) of Brunetti (1907, 1912), Leicester (1908), Reinert *et al.* (2008), Reinert (2008b, 2008c).

*Danielsia* in part of Theobald (1907, 1910).

*Culex* in part of Brunetti (1914).

*Aedes* (*Ochlerotatus*) Group *Finlaya* in part of Edwards (1917).

*Ochlerotatus* in part of Brunetti (1920), Senior-White (1923, 1927).

*Finlaya* in part of Barraud (1923a, 1923b, 1924).

*Aedes* (*Finlaya*) in part of Edwards (1922a, 1922b, 1928), Brug (1931), Brug & Edwards (1931), Barraud (1934), Brug & Bonne-Wepster (1947), Chow (1949), Carter (1950), Chow & Mattingly (1951), Knight & Hull (1951), Chow *et al.* (1954), Horsfall (1955), Macdonald (1957), Feng (1958), Stone *et al.* (1959), Scanlon & Peyton (1965), Gould *et al.* (1968), Basio (1971), Stone & Delfinado (1973), Baisas (1974), Knight & Stone (1977), Jayasekera & Chellian (1981), Lu & Li (1982), Apiwathnasorn (1986), Tsukamoto *et al.* (1987), Lu & Su (1987), Lu *et al.* (1988), Harrison *et al.* (1990), Townsend *et al.* (1990), Ward (1992), Darsie *et al.* (1993).

*Aedes* (*Finlaya*) Group F (*albotaeniata*-group: *Danielsia*) in part of Edwards (1932).

*Aedes* (*Finlaya*) Group F, Division I--*albotaeniatus* s.str. in part of Knight (1948).

*Aedes* (*Finlaya*) Group F (*alboannulatus*-group: *Danielsia*), Subgroup I, *Albotaeniatus* in part of Knight & Marks (1952).

*Aedes* (*Finlaya*) Group F (*alboannulatus*-group) of Macdonald & Traub (1960), Lee *et al.* (1982).

*Aedes* (*Finlaya*) *albotaeniatus* group in part of Lu & Ji (1997).

*Ochlerotatus* (*Finlaya*) in part of Reinert (2000a), Kaur (2003).

'*Ochlerotatus*' ('*Finlaya*') *sensu auctorum* in part of Reinert *et al.* (2004, 2006).

#### Generic description

**FEMALES.** *Head:* Vertex nearly covered with broad, decumbent scales, specimens of some species also with few narrow, curved scales along coronal suture, few semi-erect to erect, forked scales posterior to ocular setae; occiput with several narrow, curved, decumbent scales and numerous erect, forked scales which may extend slightly onto posterior part of vertex; postgena with broad, decumbent scales; ocular line with pale scales and several setae on posterior margin; interocular space with pale scales and few setae; eyes above antennae contiguous to separated by less than 1 ocular facet; antenna dark, pedicel with moderate-sized patch of partially overlapping, moderately broad, pale scales on mesal surface; maxillary palpus dark-scaled, relatively short; proboscis dark-scaled, with pale-scaled area near midlength, longer than forefemur; clypeus without scales. *Thorax:* Integument dark brown; scutum covered with narrow, curved scales, median, prescutellar area bare, background scales dark with pale-scaled areas; acrostichal setae absent; dorsocentral setae present, 1 or 2 on caudal part of anterior area and several on posterior area; prescutellar area with several setae on lateral margins; scutellum with narrow, curved scales on all lobes (except *Dn. harperi* (Knight) with broad scales on mid-lobe); parascutellar area, mesopostnotum and paratergite without scales; antepronota widely separated, with broad scales and several setae; postpronotum with scales and few posterior setae; postspiracular area with scales (absent in *Dn. harperi*) and few setae; subspiracular area with small patch of scales (absent in *Dn. harperi*); proepisternum with broad scales and several setae on upper area, lower area bare; mesokatepisternum with broad, pale scales and several setae; prealar area with patch of broad, pale scales below knob and extending dorsally onto lower part of knob, with few to several setae; mesepimeron with patch of broad, pale scales and several setae on upper area, lower area bare; mesomeron bare, with dorsal margin well above base of hindcoxa; metameron bare. *Wing:* Dorsal and ventral veins dark-scaled except for pale-scaled patch on anterior surface at base of costa; alula with narrow scales on posterior margin; dorsal tertiary fringe scales present, dark; upper calypter with several dark setae on margin. *Legs:* Ante- and postprocoxal membranes bare; coxae with broad scales and several setae; femora dark-scaled with some pale-scaled areas; tibiae dark-scaled with basal, pale-scaled area; mid- and hindtarsi dark-scaled with basal, pale-scaled bands on at least tarsomeres 1 and 2; fore- and midungues toothed, hindungues simple. *Abdomen:* Terga dark-scaled, lat-

erotergite of tergum I with broad, pale scales, terga II–VIII each with basolateral, pale-scaled patch and narrow, basal, pale-scaled bands on at least terga IV and V; segments VII and VIII laterally compressed; intersegmental membrane between terga VII and VIII relatively short.

**FEMALE GENITALIA.** *Tergum VIII*: Width greater than length; covered with minute spicules; moderately pigmented; base very gently concave to nearly straight; apex broadly rounded, with several moderately long to long setae; setae present on distal 0.47–0.64 (rarely extending onto distal 0.66); basolateral seta very short; numerous broad scales densely covering distal 0.71–0.85; VIII-Te index 0.61–0.74; VIII-Te/IX-Te index 2.22–2.74; length 0.22–0.28 mm; width 0.33–0.46 mm. *Sternum VIII*: Width greater than length; covered with minute spicules; moderately pigmented; base relatively straight; apex gently sloping from apicolateral corners to midline, with several short, slightly curved setae and few slightly longer, nearly straight setae laterally; setae on distal 0.79–0.91; setae 1–5-S moderately long to long, in more or less angular or diagonal line extending from basomesal area to apicolateral area, seta 1-S inserted moderate distance from basal margin; basolateral seta normally absent; moderate number to numerous broad scales on distal 0.86–0.90; VIII-S index 0.76–0.94 (usually 0.85–0.94); length 0.28–0.38 mm; width 0.33–0.46 mm. *Tergum IX*: Moderately long and moderately wide; comprised of single, moderately pigmented sclerite, with pair of rounded apical lobes; covered with minute spicules; normally 1–3 (range 0–4, rarely absent on one side) short setae distally on each lobe, 1–7 total setae; IX-Te width/length ratio 0.85–1.17; length 0.09–0.12 mm; width 0.09–0.14 mm. *Insula*: Liplike; somewhat U-shaped (depressed) transversely; covered with minute spicules; moderately pigmented; with 3–5 (usually 3 or 4) moderately long setae laterally on each side, 6–10 (usually 6–8) total setae. *Lower vaginal lip*: Covered with minute to short spicules; lightly pigmented; narrow; hinge moderately wide; without lower vaginal sclerite; ventral tuft present, small. *Upper vaginal lip*: Covered with minute to short spicules; moderately pigmented; narrow laterally and curved outward, caudal part somewhat broader and flattened; upper vaginal sclerite moderately pigmented, small. *Spermathecal eminence*: Membranous; ill-defined. *Postgenital lobe*: Covered with short spicules; relatively narrow; apex flat; basal mesal apodeme weakly developed; few to several setae on distal 0.30–0.38 of ventral surface; PGL ventral index 2.50–2.81 (rarely 2.82); PGL ventral width/Ce dorsal width ratio 0.67–0.82. *Proctiger*: Membranous; with scattered minute spicules. *Cercus*: Covered with minute to short spicules; moderately long; moderately wide; apex gently oblique, with few moderately long, nearly straight setae and several short, gently curved setae; dorsal surface without scales (rarely with 1 adventitious scale on one cercus in *Dn. harperi* (Knight)); setae on distal 0.68–0.76 of dorsal surface; mesal margin broadly and gently concave; cercus index 2.50–2.95; Ce/dorsal PGL index 2.41–2.83; length 0.16–0.18 mm; width 0.06–0.07 mm. *Spermathecal capsules*: One large and 2 slightly smaller ones; heavily pigmented; spherical; with few small, spermathecal capsule pores near orifice. *Accessory gland duct*: Basal area lightly to moderately pigmented, short.

**MALES.** Differ from females primarily as follows. *Head*: Antennal flagellomeres with numerous long setae directed dorsally and ventrally, apical 2 flagellomeres with few short setae, both elongate but penultimate flagellomere noticeably longer; maxillary palpus dark brown-scaled, slightly shorter to slightly longer than proboscis, entire length slender, palpomere 1 very short, palpomeres 2 and 3 long, palpomeres 4 and 5 short but 4 longer than 5, distal part of palpomere 3 and entire length of palpomere 4 with numerous moderately long to long setae, palpomere 5 with several short setae ventrolaterally and at apex (*Dn. harperi* with fewer setae on distal part of palpomere 3 and on palpomeres 4 and 5); proboscis dark-scaled with pale-scaled area near midlength or entirely dark brown-scaled. *Thorax*: Scutellum with narrow, curved, white scales on midlobe (*Dn. harperi* with broad, white scales on midlobe). *Wing*: Dorsal tertiary fringe scales absent. *Legs*: Fore- and midtarsi each with 2 unguis, unequal in size, larger unguis with 2 teeth, smaller unguis with 1 tooth, hindtarsus with 2 unguis, equal in size, both simple.

**MALE GENITALIA.** *Tergum IX*: Covered with minute spicules; lightly to moderately pigmented; narrow mesal area separating moderately broad, lateral areas with outer parts projecting caudally presenting broad V-shaped appearance, each lateral part with very small, somewhat flattened, sclerotized, submedian lobe bearing

1 or 2 short, slender setae. *Gonocoxite*: Covered with minute spicules; moderately pigmented; moderately long; relatively narrow; broad, spatulate scales on outer dorsal, lateral and ventral surfaces; dorsal surface with basomesal area bearing compact patch of several to numerous relatively slender setae, some setae longer; lateral surface with long, stout setae; ventral surface with number of short to relatively long setae, mesal area near midlength bearing patch of long, moderately broad to broad, lanceolate scales, some lanceolate scales narrower and some shorter, some scales may be fusiform; mesal surface membranous. *Gonostylus*: Attached to apex of gonocoxite; relatively short; relatively narrow with distal part somewhat narrower; single, long, narrow, gonostylar claw attached at apex. *Claspette*: Comprised of single, moderately long, relatively narrow, columnar stem with few short setae, with several minute spicules on most of surface; claspette filament attached at apex, moderately long, flattened, expanded postbasally and tapering to narrow, bluntly rounded apex. *Proctiger*: Paraproct narrow, apex heavily pigmented, curved; cercus membranous with few minute cercal setae. *Phallosome*: Aedeagus moderately pigmented, simple, somewhat scoop-like, approximately proximal 0.75 broadly ovoid, distal part noticeably narrower; paramere heavily pigmented, narrow, shorter than aedeagus length. *Sternum IX*: Covered with minute spicules; moderately long; few short to moderately long setae on posteromesal area.

PUPAE. *Cephalothorax*: Seta 1-CT shorter than 3-CT; 2-CT shorter than 1,3-CT; 4-CT longer than 5-CT; 6-CT short; 7-CT long; 11-CT long, stout, single. *Trumpet*: Moderately long to long; tracheoid area at base of trumpet, poorly developed. *Abdomen*: Seta 1-I with several brush-tipped branches; 1-II with 2 slender branches; 2-II shorter than and inserted lateral to 1-II; 2-VI inserted mesal to 1-VI; 3-I very long, stout, single, longer than 6-I; 3-II single, longer than 6-II, inserted mesal to 2-II; 3-III stout, single, longer than 5-III; 3-VI inserted lateral to 1-VI; 5-II shorter than 3-II, inserted lateral to 4-II; 5-V very long, longer than mid-dorsal length of tergum VI; 6-III single; 6-VII shorter than and inserted posterior to 9-VII; 9-VIII with 6–12 stout, aciculate branches. *Paddle*: With apical margin rounded; without fringe of hairlike spicules; midrib extending to apex of paddle; seta 1-Pa 0.30–0.42 length of paddle; 2-Pa absent.

FOURTH-INSTAR LARVAE. *Head*: Seta 4-C branched, moderately long, inserted anterior and mesal to 6-C; 5-C long, single (rarely with 2–4 branches in *Dn. albotaeniata*), inserted posterior and mesal to 6-C; 6-C moderately long, with 2–4 branches, inserted mesal and anterior to 7-C; 7-C moderately long, with 3–6 branches, inserted lateral and anterior to 5-C; 12-C branched, inserted mesal and posterior to 13-C; 13-C single; 14-C with 4–11 short, stellate branches; ventromedian cervical sclerite present. *Antenna*: Relatively short; without spicules; seta 1-A short, single to 3-branched. *Thorax*: Setae 1–3-P inserted on pigmented, common, setal support plate, 1,3-P branched, 2-P single; 4-P equal to or longer than 3-P; 5-P branched, longer than 6-P; 1-M 3.81–4.00 length of 2-M; 4-M single; 5-M longer than 7-M; 1,4-T stellate; 2,6-T single; 7-T long, stout, single, slightly longer than 6-T. *Abdomen*: Setae 1,2,5-I multiple-branched, stellate; 6-II with 2–4 branches, longer than 6-III; 6-III with 2 or 3 long branches; 7-II long, stout, single or 2-branched; 8-II branched; 1-VII relatively long; 2-VII branched, inserted relatively near 1-VII; 3-VII single to 3-branched, inserted mesal and anterior to 1-VII; 10-VII stellate; 12-VII single, inserted posterior to 13-VII; 1-VIII with 5–12 branches; 2,4-VIII single; comb comprised of 10–30 scales in patch (*Dn. albotaeniata*) or 6–8 scales in curved row (*Dn. harperi*); segment X with saddle incomplete ventrally, with well-developed spicules on posterior margin, acus absent; 1-X long, stout, single (rarely 2-branched), inserted on saddle; 2-X with 2 branches, 0.68–0.70 length of 3-X; 3-X single; ventral brush (seta 4-X) with setae borne on boss (*Dn. albotaeniata*) or grid with transverse bars (*Dn. harperi*), 2 shorter preboss/precratal setae. *Siphon*: Moderately long to relatively long; acus attached; pecten with distal 1–3 spines more widely spaced; seta 1-S with 2–6 branches, inserted distal to pecten; 2-S single; 9-S short, relatively straight.

EGGS. Unknown.

**Included species.** *Danielsia albotaeniata*, *Dn. harperi* and *Dn. lepchana* (Barraud).

**Material examined.** *Danielsia albotaeniata*: female and genitalia, male and genitalia, pupa and fourth-instar larva; *Dn. harperi*: female and genitalia, male and genitalia, pupa and fourth-instar larva; and *Dn. lepchana*: male and genitalia. Material from the type series of each species was examined.

**Distribution.** India, Indonesia, Malaysia, Nepal, People's Republic of China, Philippine Islands, Sri Lanka and Thailand.

**Bionomics.** *Danielsia albotaeniata* adults were reported by Leicester (1907) as bred from larvae collected in cut bamboos. Barraud (1934), Chow (1949), Macdonald (1957) and Gould *et al.* (1968) reported the occurrence of immature stages of this species in bamboos. Macdonald & Traub (1960) collected the immature stages of *Dn. albotaeniata* in Malaysia from treeholes and bamboos, i.e., bamboo pots, stumps, fallen, split, and large, moderate and small holes. Darsie *et al.* (1993) collected immature stages of this species from a reservoir with clear, fresh water at an elevation of 2,200 meters in Nepal. Macdonald (1957) reported that females of *Dn. albotaeniata* bite humans during the day in forested areas. Knight (1948) indicated that adults of *Dn. harperi* were reared from larvae collected in cut bamboo and bamboo stumps, Basio (1971) collected larvae from a bamboo stump, and Baisas (1974) reported the presence of immature stages in bamboos and the females as apparently zoophagous. Barraud (1923a) indicated that males of the type series of *Dn. lepchana* were reared from larvae taken from bamboo stumps.

**Discussion.** Theobald (1904) described the genus *Danielsia* and included a single species, *Danielsia albotaeniata* Leicester. The genus was later synonymized with other generic-level taxa as noted in the previous usage section above. Reinert *et al.* (2008) restored *Danielsia* to generic rank and included three species, i.e., *albotaeniata*, *harperi* and *lepchana*. Reinert (2008c) provided a generic description of the female genitalia and described and illustrated the female genitalia of the type species.

*Danielsia albotaeniata* was described by Leicester (in Theobald, 1904) from females and males, and later redescribed the species in 1907. Theobald (1907) provided a description of the male and female and included a partial illustration of the latter. Barraud (1934) described and illustrated the male and part of the genitalia and provided a brief description of the larva of this species. Chow & Mattingly (1951) illustrated the male genitalia and partially illustrated the pupa. Edwards (1922a) described *mikiranus* as a new species and provided information on only two adult characters. Edwards (1922b) and Barraud (1923) considered it a valid species and the latter author described and illustrated the female, but Barraud (1934) reduced it to a variety of *albotaeniata*. Subsequent authors considered it a variety of *albotaeniata*, including Chow & Mattingly (1951) who described the fourth-instar larva and pupa and partially illustrated these life stages. Lu & Su (1987) and Lu & Ji (1997) illustrated the male genitalia and fourth-instar larva of *mikiranus* (as a subspecies of *albotaeniata*). Harrison *et al.* (1990) considered *mikiranus* as nothing more than a clinal variation of *albotaeniata* and formally synonymized it with *albotaeniata*.

Knight (1948) described *Dn. harperi* (as *Aedes harperi*) based on the male and its genitalia, the female, and the fourth-instar larva. Also, he included illustrations of the head and terminal segments of the larva, and male genitalia. Illustrations of the female and descriptions of the female, larva and pupa were given by Baisas (1974).

*Danielsia lepchana* was briefly described originally from males by Barraud (1923a) but he later (1934) listed this species as a synonym of *albotaeniata*. Knight (1948) listed it as a valid species, but noted it was possibly a synonym of *albotaeniata*. Knight & Marks (1952) and Knight & Stone (1977) listed both *albotaeniata* and *lepchana* as valid species. Reinert (2008b) redescribed the holotype male and genitalia of *Dn. lepchana* in detail.

The following combination of morphological features is most distinctive for *Danielsia*: females with occiput bearing numerous erect, forked scales, eyes contiguous to separated by less than diameter of one ocular facet, scutum with narrow, curved scales, white-scaled patch on anterior portion of acrostichal area or expanded and covering acrostichal and dorsocentral areas, acrostichal setae absent, paratergite without scales, mesepimeron without lower setae, costa with white-scaled patch at base of anterior surface, mid- and hindtarsi

dark-scaled with basal, pale-scaled bands on at least tarsomeres 1 and 2, and abdominal segments VII and VIII laterally compressed; female genitalia with insula liplike, somewhat U-shaped (depressed) transversally and with 3–5 moderately long setae laterally on each side, lower vaginal lip lightly pigmented which sharply contrasts with moderately pigmented insula, cercus moderately long, moderately wide, apex gently oblique, sternum VIII with moderate number to numerous scales on most of surface, apex gently sloping from apico-lateral corners to midline, and upper vaginal sclerite small; males with maxillary palpus dark-scaled, slightly shorter to slightly longer than proboscis, entire length slender, palpomeres 4 and 5 short, fore- and midtarsi each with two unguis, unequal in size, larger unguis with two teeth, smaller unguis with one tooth, hindtarsus with two simple, equal unguis; male genitalia with tergum IX comprised of narrow, median area separating moderately broad, lateral areas with outer parts projecting caudally and presenting V-shaped appearance, one or two short, slender setae inserted on very small, somewhat flattened, sclerotized, submedian lobe on posterior margin of each side, gonocoxite relatively narrow, dorsal surface with basomesal area bearing compact patch of relatively slender setae, some setae noticeably longer, ventral surface with mesal area near midlength bearing patch of long, moderately broad to broad, lanceolate scales, claspette comprised of single, moderately long, columnar stem and bearing apically one moderately long, flattened filament that is expanded postbasally and tapered to narrow apex, cercal setae present, and aedeagus simple, somewhat scooplike with approximately proximal 0.75 broadly ovoid, distal part noticeably narrower; pupae with seta 1-CT shorter than seta 3-CT, seta 4-CT longer than seta 5-CT, seta 6-CT noticeably shorter than seta 7-CT, seta 1-II with two slender branches, inserted mesal to seta 3-II, seta 3-I very long, stout, single and longer than seta 6-I, seta 3-VI inserted lateral to seta 1-VI, seta 9-VIII with 6–12 stout, aciculate branches, and paddle with apical margin rounded, without fringe of hairlike spicules, midrib extending to apex; fourth-instar larvae with seta 4-C branched, moderately long, inserted anterior and mesal to seta 6-C, seta 5-C long, normally single, inserted posterior and mesal to seta 6-C, seta 6-C with 2–4 moderately long branches, inserted mesal and anterior to seta 7-C, seta 13-C single, antenna relatively short, without spicules, setae 1–3-P inserted on common, setal support plate, setae 2,6-T single, numerous stellate setae on thorax and abdomen, seta 6-II, III branched, seta 7-II long, stout, single or 2-branched, setae 12-VII, 2,4-VIII single, segment X with saddle incomplete ventrally, with well-developed spicules on posterior margin, acus absent, seta 1-X long, stout, single (rarely 2-branched), seta 2-X moderately long, 2-branched, and siphon with attached acus, pecten with distal 1–3 spines more widely spaced, seta 1-S with 2–6 branches, inserted distal to pecten. The above data is based on adults and immatures of *Dn. albotaeniata* and *Dn. harperi*, but only the male of *Dn. lepchana*.

#### **Description of the type species, *Danielsia albotaeniata* Leicester, 1904**

**FEMALE.** *Head:* Vertex with broad, dark brown scales laterally and separated medially by triangular-shaped patch of broad, white scales, few narrow, white scales along coronal suture, several semi-erect, forked, dark scales posterior to ocular setae, patch of broad, white scales lateral to dark-scaled patch and located more or less anterior to antepnotum; occiput with narrow, decumbent, white scales and large patch of dark brown, erect, forked scales that extend slightly onto posterior part of vertex; postgena with broad, white scales and small, median, anterior patch of broad, dark brown scales; ocular line narrow, with narrow, white scales and several dark brown ocular setae; 4–6 interocular setae, upper ones golden, lower ones shorter and brown; eyes above antennal pedicels separated by approximately width of 1 ocular facet or less; antennal pedicel pale brown, with mesal surface darker and bearing patch of partially overlapping, moderately broad, white scales, flagellomere 1 with several, moderately broad, dark brown scales mesally and dorsally, flagellum 0.83–0.87 length of proboscis; maxillary palpus dark brown-scaled, 0.23–0.25 length of proboscis; proboscis dark brown-scaled with small to moderate-sized band of white scales near midlength, 1.16–1.18 length of forefe-mur; clypeus brown, bare. *Thorax:* Scutum covered with narrow, curved scales, background scales dark red-

dish-brown, with white scales on following areas: large, rectangular patch on approximately anterior 0.64 of scutum covering acrostichal and dorsocentral areas, posterior acrostichal area with narrow stripe approximately 2 or 3 scales wide extending caudally from posterior margin of acrostichal-dorsocentral patch to prescutellar area where it splits and extends along lateral margins (mesad of prescutellar setae) to scutellum, similar narrow stripe on posterior dorsocentral area extending from posterior margin of acrostichal-dorsocentral patch laterad of prescutellar setae to near scutellum, elongate patch on supraalar area extending anteromesal to and connected with posterior part of acrostichal-dorsocentral patch and lateral part extending caudally above base of wing; scales absent from median part of prescutellar area and from narrow, elongate, median, posterior strip of supraalar area; setae present as follow: 3 or 4 anterior promontory, few antedorsocentral, 1 or 2 anterior and 3–5 posterior dorsocentral, 9–11 prescutellar, scutal fossal (3–5 anterior, 1 or 2 lateral and 1 posterior), few prealar, several supraalar, 1 parascutellar; scutellum with narrow, curved, white scales on all lobes, median lobe also with narrow, curved brown scales on basal area, median lobe with 4 long and 1 or 2 short setae, lateral lobe with 3 or 4 long and 2 or 3 short setae; mesopostnotum brown, bare; paratergite narrow, bare; pleural integument brown; antepronotum with numerous broad, white scales and several dark setae; postpronotum with patch of narrow, curved, white scales on upper area and patch of moderately broad to broad, white scales on lower caudal area, posterior area with 3 or 4 setae; postspiracular area with patch of narrow to moderately broad, white scales and 3 or 4 setae; subspiracular area with small patch of broad, white scales; upper proepisternum with patch of broad, white scales and 7–10 setae, lower area bare; mesokatepisternum with upper and lower posterior patches of broad, white scales and 2–5 upper and several posterior and lower setae; prealar area with patch of broad, white scales on lower area and extending dorsally onto lower part of upper area (knob), 6–8 setae on upper area; mesepimeron with large patch of broad, white scales covering median and upper areas, 7–12 setae on upper area, lower setae absent. *Wing*: Costa with elongate, white-scaled patch on anterobasal area; vein  $R_2$  longer than vein  $R_{2+3}$ ; alula with row of narrow, dark scales on posterior margin; remigium with 1 or 2 setae on distal area; halter pedicel pale, capitellum white-scaled. *Legs*: Forecoxa with broad scales on anterior surface, scales dark brown except for small dorsal and ventral white-scaled patches; midcoxa with broad scales on anterior surface, upper ones white and small, lower patch of brown ones; hindcoxa with broad, white scales in small, dorsal patch and with elongate patches on anterior and posterior surfaces; fore-, mid- and hindcoxae with several setae; fore-, mid- and hindtrochanters each with white scales and few short setae; forefemur with narrow, basal, white-scaled band, anterior surface dark brown-scaled with short, narrow, ventral stripe of white scales on approximately proximal 0.20 but not reaching base, posterior surface dark brown-scaled with median, longitudinal, white-scaled stripe extending to apex but not reaching base; midfemur with narrow, basal, white-scaled band, anterior surface dark brown-scaled with narrow, ventral stripe of white scales on approximately proximal 0.55 but not reaching base, posterior surface with longitudinal, white-scaled stripe reaching base dorsally and to near apex, stripe broad on approximately proximal 0.50 but basoventral area brown-scaled; hindfemur dark brown-scaled with narrow, basal, white-scaled band, anterior and posterior surfaces each with white scales forming broad, subbasal stripe extending slightly beyond midlength, and short apicoventral, elongate patch of white scales on approximately distal 0.23 but not reaching apex, apex with narrow band of brown scales; foretibia dark brown-scaled with narrow, elongate, ventral, white-scaled stripe from base to near apex, few white scales at apex; mid- and hindtibiae dark brown-scaled with basoventral, white-scaled patch; foretarsus dark brown-scaled, with tarsomeres 1–3 with few white scales dorsobasally or with white scales forming narrow, basal band; midtarsus dark brown-scaled with moderately wide, basal, white-scaled bands on tarsomeres 1 and 2, tarsomere 3 with dorsobasal white-scaled patch or narrow, basal band; hindtarsus dark brown-scaled with moderately wide, basal, white-scaled bands on tarsomeres 1–4, bands becoming progressively wider on distal tarsomeres; fore- and midungues equal in size, each with 1 tooth, hindungues equal in size, simple. *Abdomen*: Terga dark brown-scaled, tergum I with laterotergite white-scaled, terga II–VIII each with small, basolateral, white-scaled patch, patches on terga II, VI and VII larger, terga II, VIII and sometimes VI with small, median, basal,

white-scaled patch, terga III–V each with narrow, basal, white-scaled band connected to small, basolateral, white-scaled patch, terga I–VIII each with several short and few moderately long, golden-brown setae along posterior and lateral margins, tergum I also with several long setae dorsally on each side of midline; sterna II–VII dark brown-scaled with basolateral, white-scaled patches narrowly connected mesally.

**FEMALE GENITALIA.** *Tergum VIII:* Moderately long; base very gently concave; numerous broad, overlapping, spatulate scales covering distal 0.79–0.85; several setae on distal 0.57–0.64 (rarely on distal 0.66); apical margin broadly rounded, with 68 moderately long, stout setae and few short setae; VIII-Te index 0.61–0.65; VIII-Te/IX-Te index 2.52–2.74; length 0.25–0.28 mm; width 0.38–0.46 mm. *Sternum VIII:* Numerous short, curved setae and few moderately long, straight setae on apical margin, moderately long setae tend to increase slightly in length laterally; base narrower than apex, nearly straight; numerous short and few moderately long setae on distal 0.78–0.82; setae 1–5-S in more or less diagonal line; numerous broad, partially overlapping, spatulate scales on distal 0.86–0.90 and covering much of lateral and subbasal areas; VIII-S index 0.76–0.92; length 0.33–0.38 mm; width 0.36–0.46 mm. *Tergum IX:* Comprised of single, moderately long sclerite; apex with median emargination separating rounded lobes; with 1 short seta distally on each lobe (on at least one lobe), 1 or 2 total setae; IX-Te width/length ratio 1.07–1.17; length 0.09–0.11 mm; width 0.11–0.12 mm. *Insula:* Liplike; with 3–5 moderately long, closely set setae laterally on each side of midline; 6–10 total setae. *Postgenital lobe:* Moderately long; relatively narrow; apex flat; setae on distal 0.30–0.33 of ventral surface; 2 moderately long and 3–5 short setae distally on each side of midline, 9–13 total setae; PGL ventral index 2.50–2.83; ventral length 0.11–0.13 mm; PGL ventral width/Ce dorsal width ratio 0.69–0.82. *Cercus:* Moderately long with mesal margin slightly concave; dorsal surface without scales, with several short setae on distal 0.72–0.76, 1 long and 3 or 4 moderately long, stouter setae on distal margin; ventral surface with 3 or 4 short, slender setae on lateral margin and 1 or 2 short, slender setae on distal area; cercus index 2.63–2.95; Ce/dorsal PGL index 2.41–2.63; length 0.16–0.18 mm; width 0.06–0.07 mm.

**MALE.** Differs from female primarily as follows. *Head:* Antenna 0.68–0.70 length of proboscis; maxillary palpus dark brown-scaled, 0.91–0.96 length of proboscis, palpomere 3 with distal part and entire length of palpomere 4 with numerous moderately long to long, ventrolateral setae, palpomere 5 with several short, ventrolateral and apical setae; proboscis entirely dark brown-scaled, 1.15–1.19 length of forefemur. *Thorax:* Scutum with large, rectangular, white-scaled patch on acrostichal-dorsocentral area longer than in female and on approximately anterior 0.67–0.69 of scutum; white-scaled stripe on posterior acrostichal area wide; scutellum with only narrow, curved, white scales on midlobe. *Abdomen:* Terga with numerous moderately long setae on lateral margins.

**MALE GENITALIA.** *Tergum IX:* Lateral areas moderately broad, separated by narrow mesal area, posterior margin broadly V-shaped with very small, sclerotized lobe on submedian area bearing 1 short, slender seta inserted on posterior margin. *Gonocoxite:* Dorsal surface with small, compact patch of several moderately long, slender and few long, somewhat stouter, nearly straight setae on basomesal margin, remainder of mesal margin with several short, slender setae extending along much of length, outer margin with several stout setae from near base to apex, median area with several short, slender setae from near base to apex, setae increasing in length on distal area; lateral surface with several long, stout setae from near base to apex; outer part of dorsal, lateral and ventral surfaces with numerous broad, spatulate scales; ventral surface with several short, slender setae on mesal area from base to near apex, mesal area also with small, compact patch of moderately long, narrow, lanceolate scales approximately 0.40 from apex, ventrolaterad of these is longer, elongate row of several long, broad, fusiform scales with 2 moderately long and 2 long, narrow, fusiform scales distally, few long, stout setae on approximately distal 0.50; mesal surface membranous. *Gonostylus:* Lightly to moderately pigmented; narrow with approximately distal 0.22 narrower and slightly curved mesad; 2 short, slender setae subapically; gonostylar claw approximately 0.40–0.42 of gonostylus length, narrow, with apex truncate. *Claspette:* Comprised of moderately long, narrow, columnar stem bearing 1 short, slender seta near base mesally and 2 longer, somewhat stouter setae subapically; base of stem connected mesally with its mate



by narrow, spiculate aedeagal guide; claspette filament moderately pigmented, moderately long, proximal area broad and tapering to curved, elongate, narrow, bluntly rounded apex. *Proctiger*: Paraproct narrow, moderately pigmented with apex heavily pigmented and terminating in 2 or 3 short, curved, beaklike teeth; with 2 or 3 minute, cercal setae subapically. *Tergum X*: Narrow; moderately pigmented; extending from base of paraproct dorsomesally to near middle of tergum IX. *Phallosome*: Aedeagus somewhat scoop-like, with approximately proximal 0.76 broadly ovoid, distally constricted into short, narrow extension with apex expanded into small T-shaped area; paramere approximately 0.88 of aedeagal length; basal piece heavily pigmented, moderately long, narrow. *Sternum IX*: Lightly to moderately pigmented; with 4 short to moderately long setae on posteromesal area.

**TABLE 1.** Observed branching of setae on pupae of *Danielsia albotaeniata* (5 specimens).

Seta No.	Cephalothorax	Abdominal Segments			
	CT	I	II	III	IV
0			1	1	1
1	2–4 (2)*	13–19 (15)	2–4 (2)	2–5 (2)	2–4 (2)
2	2–4 (3)	1	1	1	1
3	2,3 (2)	1	1	1	2,3 (3)
4	2–4 (3)	3–8 (5)	3–9 (6)	2–7 (5)	1–5 (1)
5	2–4 (3)	1–5 (3)	1–3 (2)	1–5 (2)	1
6	1	1	1	1,2 (1)	1
7	1–3 (1)	1,2 (1)	1,2 (2)	1–3 (2)	1–3 (1)
8	2–4 (4)			2–4 (2)	2–5 (2)
9	1,2 (2)	1	1	1	1
10	1–5 (3)	1		1–3 (2)	1,2 (1)
11	1	1–4 (3)	1	1	1
12	3–6 (5)				
14			1	1	1

  

Seta No.	Abdominal Segments				Paddle
	V	VI	VII	VIII	Pa
0	1	1	1	1	
1	1–4 (3)	1–3 (1)	1,2 (1)		3–6 (4)
2	1	1	1,2 (1)		
3	1	1,2 (2)	1–3 (1)		
4	3–9 (6)	2,3 (2)	1,2 (2)	1,2 (1)	
5	1	1	1		
6	1–3 (1)	1,2 (1)	2–5 (2)		
7	2–7 (4)	1,2 (1)	1,2 (1)		
8	1–4 (2)	2–4 (2)	1–3 (2)		
9	1	1	3–6 (4)	9–13 (10)	
10	1,2 (1)	1–4 (2)	1–3 (1)		
11	1	1	1		
14	1	1	1	1	

\* Range of setal branching is followed by mode in parentheses.

PUPA. See Table 1 for setal branching. *Cephalothorax*: Setae 1,3-CT very long, 3-CT longer than 1-CT; 2-CT short; 4,5-CT moderately long, 4-CT longer than 5-CT; 6-CT short; 7-CT very long, lightly aciculate; 10, 12-CT branched, noticeably shorter than 11-CT; 11-CT long, stout; dorsomentum comprised of 2 elongate sclerites connected mesally by membrane. *Trumpet*: Long; very narrow throughout length but distal 0.16–0.19 slightly wider; moderately pigmented; pinna short, 0.06–0.09 of trumpet length; trumpet index 15.63–22.27; tracheoid area at base, very poorly developed. *Abdomen*: Terga II–VII each with strong, subbasal, transverse ridge; sterna IV–VII each with strong, curved, subbasal ridge; seta 1-I fanlike, basal 0.25 with 13–19 stout, aciculate, brush-tipped branches; 1-II–VII with slender branches; 2-II lateral to 1-II and lateral to or at approximately same level as 3-II; 2-II–VII mesal to or approximately same level as 1-II–VII and mesal to 3-II–VII; 3-I–III very long, stout; 3-VII inserted far anterior to 1,2-VII; 5-III–VII very long, each noticeably longer than following tergum; 6-I–III noticeably longer than 7-I–III; 6-VII with stout, aciculate branches, very slightly shorter than 9-VII; 8-VI, VII inserted far anterior; 9-VII, VIII with stout, aciculate branches; 10, 11-I occasionally present; 10-VII inserted noticeably anterior to 11-VII. *Paddle*: Ovoid; relatively narrow; midrib well developed, narrow, extending to apex; outer margin with small serrations on approximately proximal 0.54–0.55; paddle index 1.61–1.93; seta 1-Pa with 3–6 branches.

FOURTH-INSTAR LARVA. *Head*: Seta 1-C stout, spinulate, single; 3-C very short, slender, single; 4-C moderately long, moderately stout, with 2–4 branches, inserted far cephalad, anterior and mesal to 6-C; 5-C long, moderately stout to stout, aciculate, single to 4-branched, inserted posterior and mesal to 6,7-C; 6-C moderately long, with 3–7 branches, inserted anteromesal to 7-C and more or less at same level as 5-C; 7-C moderately long, with 4–9 branches, inserted lateral to 5,6-C and slightly posterior of antennal base; 8–10-C slender, with few branches; 11,12,14-C stellate, with numerous branches; 13-C single, inserted lateral to 12-C; 14-C inserted next to anterior margin of lateralial and anterolateral margin of hypostomal suture; 15-C short, slender, single; 18-C minute, single; 19-C absent; labiogula slightly longer than distance between posterior tentorial pits. *Mouthparts*: Lateral palatal brush with comb-tipped filaments; dorsomentum with 19–21 stout teeth; seta 6-Mx stellate, multiple-branched. *Antenna*: Relatively short, moderately pigmented, spicules absent; seta 1-A with 2 branches (rarely single or 3-branched), tips not reaching apex of antennal shaft, inserted approximately 0.45 from base; 2–6-A inserted at apex; 4-A approximately 0.80 length of 2-A. *Thorax*: Setae 0,1,3,4,8,9,14-P, 1,11,13,14-M, 1,3–5,8,11,13-T stellate, multiple-branched, most of these setae inserted on single, pigmented tubercle; 1–3-P inserted on pigmented, common, setal support plate, 2-P single, longer than 1-P; 1-P longer than 3-P; 5-P long, aciculate, with 2 or 3 branches, longer than 6-P; 6-P long, aciculate, single; 7-P long, aciculate, with 2–4 branches; 10,12-P moderately long, aciculate, single; 11-P short, slender, with 2 or 3 branches; 1-M moderately long, multiple-branched; 2-M short, with 2 slender branches; 3,4-M long, moderately stout, single; 5-M very long, stout, aciculate, single, longer than 7-M; 6-M long, stout, aciculate, with 3 or 4 branches, inserted on common tubercle with 7-M; 7-M long, stout, aciculate, single; 8-M long, moderately stout, aciculate, with 3 branches; 9-M long, stout, aciculate, with 3 or 4 branches; 10-M very long, stout, aciculate, single; 11-M short; 12-M long, moderately stout, aciculate, single; 1-T moderately long, multiple-branched; 2,6-T long, moderately stout, aciculate, single; 3,5,8,13-T moderately long, multiple-branched, 5-T posterior to 1–3-T; 7,9-T moderately long, moderately stout, aciculate, with 3 branches; 10-T very long, moderately stout, aciculate, single; 11-T short, with 5 or 6 branches, 12-T moderately long, moderately stout, aciculate, single. *Abdomen*: With numerous, well-developed, multiple-branched, stellate setae, e.g., 1-I–VIII, 2,4-I–VII, 5-I–VIII, 6-IV–VII, 7-III–VI, 8-VII, 9,13-I–VII, 10-II–VII, 11-I; many setae inserted on pigmented tubercles; 0-II–VIII minute, single; 2-I–VII inserted far anterior and slightly mesal to 1-I–VII; 3-I–VII, 4-VI long, lightly aciculate, single, 3-VII rarely 2-branched, inserted on dark tubercle; 4-I–VI moderately long, stout, aciculate, multiple-branched; 5-I–VI inserted far anterior to 6-I–VI; 6-I–III long, aciculate, with 3 (occasionally 4) branches; 6-I > 6-II > 6-III length; 7-I,II long, aciculate, single (rarely 2-branched); 7-III–VI moderately long, stout, aciculate, multiple-branched; 8-II moderately long, 8-III–VI long, single, 8-VI displaced dorsally; 10-I, 12-I–VI long, aciculate, single; 10-II inserted posteromesal to 11,12-II; 11-II–VI

short, slender, single; 12-VII long, stout, aciculate, single; 14-II–VI minute, single; 2,4-VIII single; 2-VIII inserted approximately equal distance from 1,3-VIII; 4-VIII inserted close to 3-VIII; 3-VIII with 4–7 branches; comb with 10–30 scales in patch, several anterior scales shorter, with median 1 or 2 longer, smooth, straight spine(s) attached to somewhat elongate, dark, basal plate and with 1–4 short spines lateral to median spine(s) on plate, posterior scales long, stout, slender, pointed, usually curved with several short, slender spicules on proximal area; segment X with moderately large saddle, incomplete ventrally, covered with minute spicules, but with patches of several long, stout, dark spicules on upper and lower areas of posterior margin, patches separated at point of attachment of seta 1-X, ventral margin with numerous long, slender spicules; seta 1-X long (at least 2.2 times dorsal saddle length), dark, stout, single (very rarely 2-branched); 2-X with 3 branches; 3-X long, single; ventral brush (seta 4-X) with 8 long, 2- or 3-branched setae with moderately long stems attached to heavily pigmented, medium-sized boss and 2 shorter, 6–8-branched preboss setae; 4 anal papillae, moderately long, gently tapered to pointed apex. *Siphon*: Relatively long, relatively narrow but slightly wider near insertion of seta 1-S; covered with minute spicules; moderately pigmented; acus attached on ventrobasal area; spiracular apodeme long, narrow, anterior tip dark; pecten comprised of 10–30 spines, proximal 2–4 spines shorter and with 1–3 short, ventrobasal spicules, remainder of spines long, slender, slightly curved and normally smooth, distal 2 or 3 spines more widely spaced than remainder; seta 1-S moderately long, stout, dark, lightly aciculate, with 3–6 (rarely 2) branches, inserted distal to pecten; 2-S short, single, inserted near posterodorsal margin of siphon; 6, 8-S short, single.

**Distribution.** India, Indonesia, Malaysia, Nepal, People's Republic of China, Sri Lanka and Thailand.

**Bionomics.** See information for the genus above.

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