

Redescription of *Cyphochilus niveosquamosus* (Blanchard, 1851) (Coleoptera, Scarabaeidae, Melolonthinae) with notes on two species of the genus from India

K.V. Prakash^{1*} and H.M. Yeshwanth²

¹All India Network Project on Soil Arthropod Pests, Department of Entomology, University of Agricultural Sciences, G.K.V.K., Bengaluru 560065, Karnataka, India.

²Collection Facility, National Centre for Biological Sciences, TIFR, G.K.V.K., Bengaluru 560065, Karnataka, India.

Email: kvpento@gmail.com

ABSTRACT: *Cyphochilus niveosquamosus* (Blanchard, 1851) from India is redescribed. The habitus and parameres of *C. candidus* (Olivier, 1789) and *C. septentrionalis* Waterhouse, 1867 redescribed by Sabatinelli (2020) are also illustrated. The species are also redescribed based on the newly examined specimens in this study. A checklist with distribution of eight species of *Cyphochilus* from India is provided.

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KEY WORDS: *Cyphochilus candidus*, *C. septentrionalis*, habitus, parameres, checklist

INTRODUCTION

The genus *Cyphochilus* Waterhouse, 1867 is characterized by the strongly asymmetric labrum among Scarabaeidae. The beetles possess an exceptional ability to scatter visible light from their scales to produce brilliant whiteness (Vukusic *et al.*, 2007). Sabatinelli, (2020) revised the “Section II” of the genus defined by Waterhouse (1867) as “the species having the mesosternum armed by a spur” and redescribed *C. candidus* (Olivier, 1789) and *C. septentrionalis* Waterhouse, 1867 for the first time and recognised two new species *viz.*, *C. gandhii* Sabatinelli, 2020 and *C. satyarthii* Sabatinelli, 2020 from north India. So far, 64 species of the genus *Cyphochilus* have been described worldwide (Sabatinelli, 2020a, b, c; Sabatinelli and Pham, 2021; Zhao, 2021) and no information on the south Indian species except for the original

description of species is available. Despite, being a melolonthine beetle, hitherto none of the members of this genus have been reported as pest of any crop. In this paper, *C. niveosquamosus* (Blanchard, 1851) is redescribed from south India along with new locality record and notes of the two north Indian species, *C. candidus* (Olivier, 1789) and *C. septentrionalis* Waterhouse, 1867.

MATERIALS AND METHODS

The specimens were examined under a Nikon SMZ-1000 stereo binocular microscope for the study of the external morphology. For the study of male genitalia, the abdomen was separated from the rest of the body, cleaned in hot water and later macerated in hot KOH (10%), washed in distilled water and placed in glycerine for separating genitalia and further observation and imaging. The dissected

* Author for correspondence

genitalia and the rest of the specimen were suitably marked to ensure their association.

Images were made using Canon 7D camera with 100 mm and MPE65 mm lenses, series of images were taken at different depths and were subsequently stacked using Zerene Stacker software 1.04 to obtain high resolution images and grouped in plates using Adobe Photoshop CS2. All the specimens studied are deposited in the Department of Entomology, University of Agricultural Sciences, Bengaluru, abbreviated in the material examined section as UASB.

Abbreviations: Characters, measurements, mensural procedures, and ratios are those used by Sabatinelli (2020).

BL: Body length (from anterior margin of clypeus to apex of elytra, in dorsal view)

BW: Body width (across the elytral humeri, in dorsal view)

BWX: Greatest body width (across the elytral maximal width, in dorsal view)

CW/L: Clypeal ratio (width measured along clypeo-frontal suture divided by greatest length of clypeus)

F/O: Interocular ratio (minimum frons width across eyes divided by transverse compound eye diameter in dorsal view)

A2-7L/CL: Antennal ratio (derived from length of basal segments 2-7 divided by antennal club length)

PnW/L: Pronotal ratio (pronotal greatest width divided pronotal length along midline in dorsal view)

MstL: Mesosternal process length, in lateral view

RESULTS AND DISCUSSION

Genus *Cyphochilus* Waterhouse, 1867

Type species: *Melolontha candida* Olivier, 1789 by subsequent designation by Medvedev, 1951: 231.

Diagnosis: Principal diagnostic characters of *Cyphochilus* are: Labrum strongly asymmetric and

body surface covered with scales.

Cyphochilus niveosquamosus (Blanchard, 1851)
Figs. 1A-D, 2 A-D

Leucopholis niveosquamosa Blanchard, 1851: 158.

Waterhouse, 1867: 142 (*Cyphochilus*)

Material examined: INDIA: Tamil Nadu: 4♂, 1♀, Valparai: Near UPASI, Tea Research Station, 1062m, 10°16'N; 76°58'E, 02.vii.2014, leg. H.M. Yeshwanth (UASB).

Description: *Size* – BL: 17.74mm, BW: 7.81mm, BWX: 8.8mm at mid-point of elytra. *Colour* – Integument dark reddish brown including antennal club and legs; dorsal surface with uniformly pale white lanceolate scales each originating from a small puncture, scales denser along lateral margins of pronotum and elytra. *Head* – CW/L: 2.72; clypeus subrectangular, anterior margin straight, slightly reflexed; clypeo-frontal suture distinct; eyes prominent (F/O: 3); frons with an indentation behind the clypeo-frontal suture; antennal club longer than antennomeres 2-7 combined (A2-7/CL: 0.54). *Pronotum* – Transverse (PnW/L: 2), strongly convex, anterior margin concave, posterior margin arched at middle, anterior angles slightly obtuse, posterior angles angularly rounded, lateral margin angularly protruded almost at midlength, anterior half of the lateral margin devoid of scales. *Scutellum* – Semi-circular, covered with scales of varied size usually smaller than scales on elytra. *Elytra* – Elongate, parallel sided, irregularly punctate, stria not recognizable, suture raised, each elytron with two distinct and one feeble costae running parallel to each other. *Pygidium* – Broad, apex arched, dorsal surface with uniform small scales, apex and sides with a series of short hairs. *Thoracic sterna* – With long yellowish brown pubescence and sparse spiniform scales; prosternal process tubercular; mesosternal process peg-like, narrowed and rounded anteriorly, ventral surface slightly convex with a median longitudinal carina extending from a short distance before apex to midlength and dorsal apical surface flat (MstL: 1.18mm), ventrally glabrous. *Abdomen* – Ventrites with sparse scales,

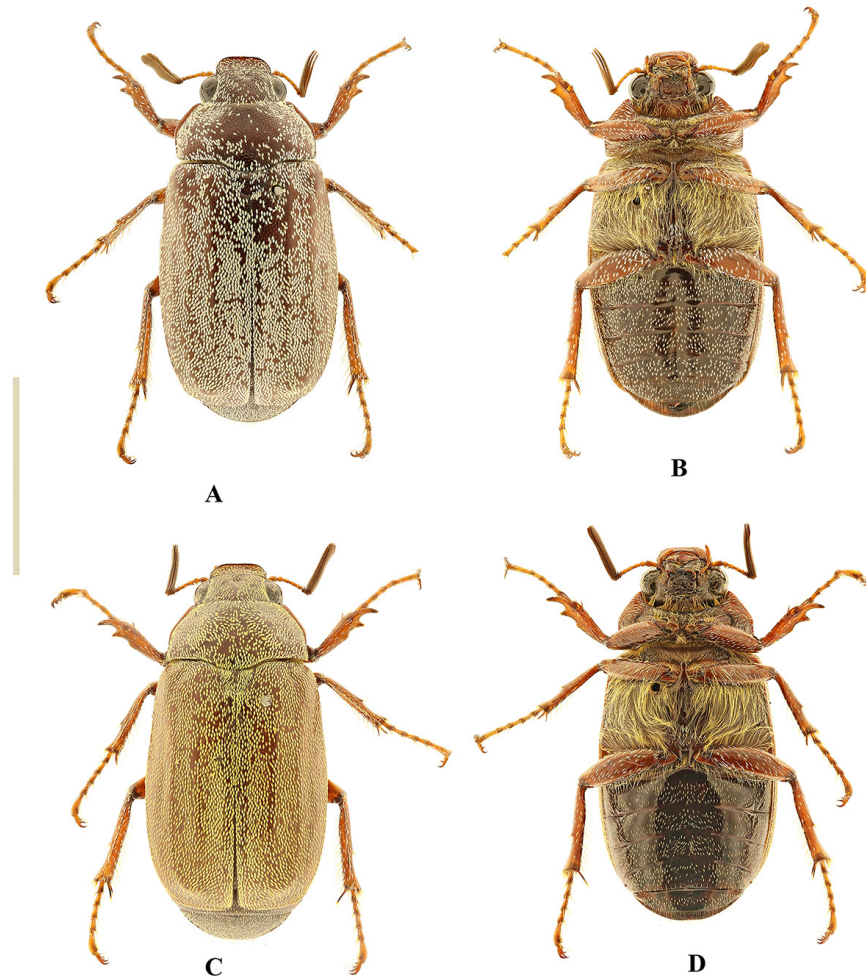


Fig.1 *Cyphochilus niveosquamosus* (Blanchard, 1851), A-B: Male with white scales; A: Dorsal view, B: Ventral view, C-D: Male with yellow scales; C: Dorsal view, D: Ventral view

intersegmental suture prominent, border of 5th sternite with a row of short hairs, 1-4 ventrites glabrous. *Legs*—Protibia tridentate, apical tooth acute; subapical tooth triangular and positioned at same level as inner apex of protibia. *Aedeagus*—Basal piece 1.4× longer than paramere, medially longitudinally keeled, basi-dorsal angle smoothly curved, in lateral view gradually widened distally, lateral ventral margin in distal 1/3rd curved dorsally. Parameres fused till very close to apex, symmetrical, in lateral view gradually narrowed distally in basal 0.8 length then widened, distal apex bifid in lateral view, ventro-apical angles of lower branch projected and pointed, dorso-apical angle of upper branch rounded.

Variability: BL; 17.17–19.7mm (x=18.5mm, n=5); vestiture of scales pale yellow.

Remarks: Blanchard (1851) reported *Leucopholis niveosquamosa* from Mysore (erstwhile princely state). Here the species is recorded from Valparai (Tamil Nadu, south India). The specimens collected in this study are much shorter (around 18mm) than the specimens studied by Blanchard (1851) and Waterhouse (1866-67) which ranged from 24–25mm.

***Cyphochilus candidus* (Olivier, 1789)**

Figs. 3 A-E, 4 A-E

Melolontha candida Olivier, 1789: 15.

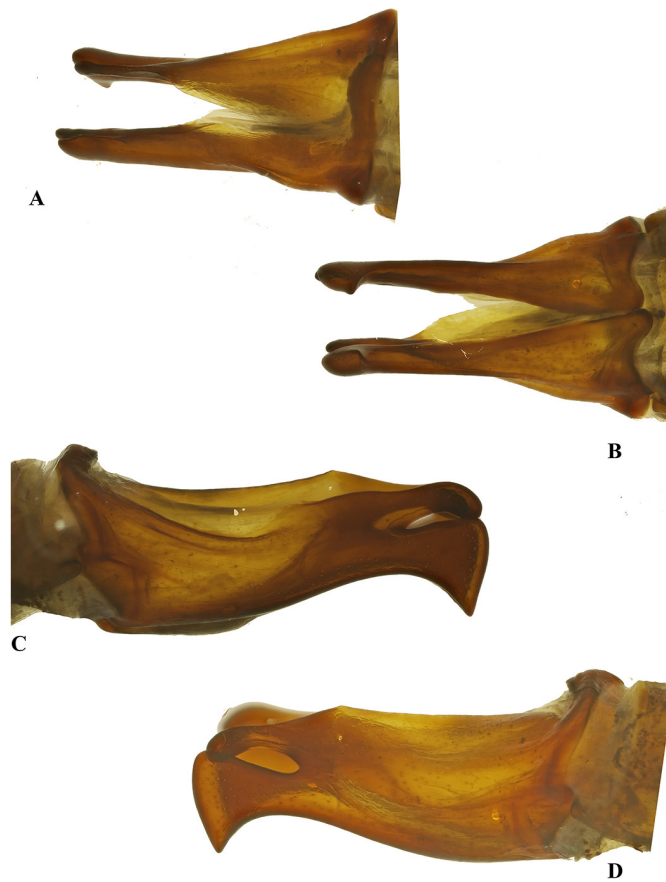


Fig. 2 *Cyphochilus niveosquamosus* (Blanchard, 1851)
Aedeagus - A: Dorsal view, B: Ventral view, C - D: Lateral views of paramere

Material Examined: INDIA: Meghalaya: 4♂, Ri-Bhoi, ICAR-Research Complex for North Eastern Hill Region; Umiam, 1031m, 25°41'N; 91°55'E, 3.vi.2013, leg. H. M. Yeshwanth; 1♂, Shillong, 1996; leg. S.K. Gangwar; 1♂, East Khasi hills: Mawkdok, 6.vi.2013, leg. H.M. Yeshwanth (UASB).

Description: *Size* – BL: 23.6mm, BW: 10.66mm, BWX: 12.08mm at mid-point of elytra. *Colour* – Integument dark reddish brown including antennal club and legs; dorsal surface with pale yellowish scale, each scale arising from a small puncture, denser along pronotal margins and sides of elytra. *Head* – CW/L: 2.67; anterior margin of clypeus straight, slightly reflexed; eyes prominent (F/O: 4.8); frons with a subtriangular depression behind clypeo-frontal suture; antennal club longer than antennomeres 2-7 combined (A2-7/CL: 0.65), one

of the setae on antennomere 7 approximately equal to 1/3 as long as antennal club. *Pronotum*– Transverse (PnW/L: 2), strongly convex, anterior margin concave, posterior margin arched at middle, anterior angles right angled, posterior angles angularly rounded and obtuse. *Scutellum* – Semi-circular densely covered with scales. *Elytra*–No visible stria or costa on elytra. *Pygidium*–Convex, apex deeply notched and apical margin reflexed, dorsal surface covered with scales. *Thoracic sterna* – With long yellowish brown pubescence and sparse scales; prosternal process tubercular; mesosternal process well developed (MstL: 2.4mm), acute, ventrally glabrous. *Abdomen* – Sternites with sparse scales, medioapical part of 8th sternite glabrous. *Legs* –Protibia tridentate, apical tooth acute; subapical tooth triangular and positioned at same level as inner apex of protibia.



Fig. 3 *Cyphochilus candidus* (Olivier, 1789), A: Dorsal view (Male with yellow scales); Aedeagus - B: Ventral view, C: Dorsal view, D: Left paramere with a spur, E: Right paramere

Aedeagus – Basal piece along with parameres ‘S’ shaped, about 1.3× as long as paramere, without median keel. Parameres asymmetrical, strongly curved dorsally, inner margin of parameres dorsally projected at midline, projection of left paramere more prominent than right one, left paramere with a spur, broad with rounded margin in basal half, strongly constricted and spine like in distal half.

Variability: BL: 22.32–24.71mm (x=23.5mm, n=3); vestiture of scales white (Fig. 4A-E). Shape of the spur on left paramere varied from subovate to subrectangular.

Cyphochilus septentrionalis Waterhouse, 1867, Figs. 5 A-E

Cyphochilus septentrionalis Waterhouse, 1867: 141.

Cyphochilus pygidialis Nonfried, 1893: 332. Synonymised by Sabatinelli, 2020

Cyphochilus pygidialis v. *angeri* Nonfried, 1893: 333. Synonymised by Sabatinelli, 2020

Material studied: INDIA: Manipur: 1♂, Ukhrul; 1647 m, 25°06’N; 94°21’E, 23.viii.2014, leg. H.M. Yeshwanth (UASB).

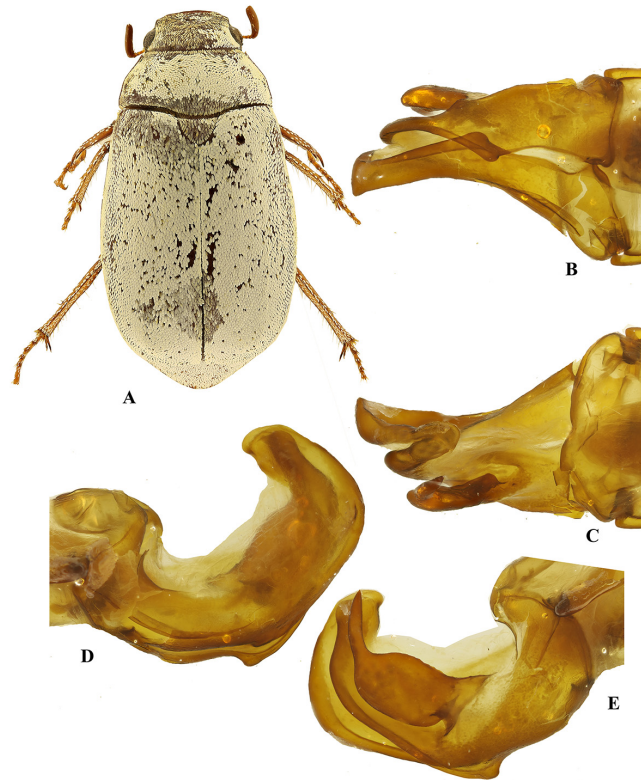


Fig. 4 *Cyphochilus candidus* (Olivier, 1789), A: Dorsal view (Male with white scales); Aedeagus - B: Ventral view, C: Dorsal view, D: Right paramere, E: Left paramere with a spur

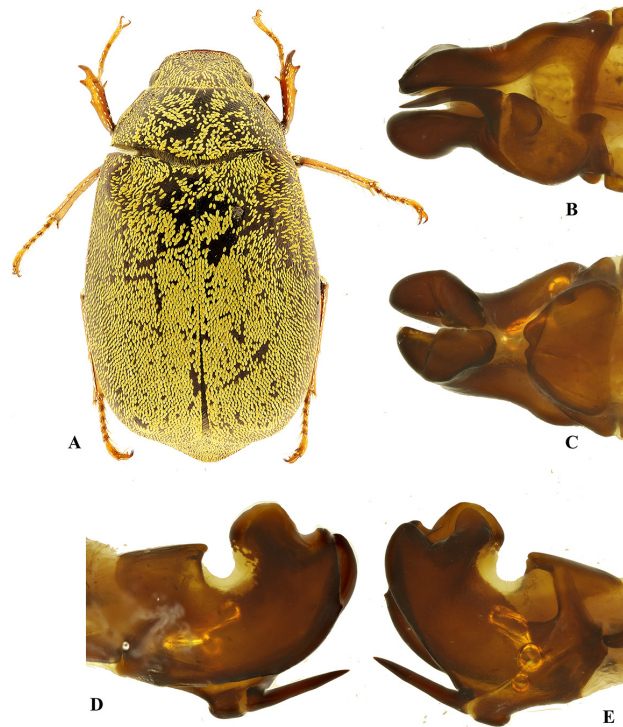


Fig. 5 *Cyphochilus septentrionalis* Waterhouse, 1867, A: Dorsal view (Male); Aedeagus - B: Ventral view, C: Dorsal view, D: Right paramere, E: Left paramere with a spine

Description: *Size* – BL: 23.44mm, BW: 10mm, BWX: 11.87mm at mid-point of elytra. *Colour* – Integument dark reddish brown including antennal club and legs; dorsal surface with uniformly yellow lanceolate scales, each scale originating from a small puncture, scales on clypeus, frons, pronotal and elytral disc comparatively larger; sides of pronotum, lateral and apical margin of elytra with smaller scales. *Head* – CW/L: 2.85; anterior margin of clypeus straight, slightly reflexed; clypeo-frontal suture feeble; eyes not prominent (F/O: 7.9); a subtriangular depression on frons just behind clypeo-frontal suture distinct; antennal club slightly shorter than antennomeres 2-7 combined (A2-7/CL: 1.12). *Pronotum* – Transverse (PnW/L: 2), strongly convex, anterior margin concave, posterior margin arched at middle, anterior angles almost right angled, posterior angles conically rounded and obtuse angled. *Scutellum* – Semi-circular, sparsely covered with scales. *Elytra* – Without visible stria or costa. *Pygidium* – Convex, apex rounded and apical margin reflexed, dorsal surface with scales. *Thoracic sterna* – With long yellowish brown pubescence and spiniform scales; prosternal process tubercular; mesosternal process well developed (MstL: 2.6 mm), acute, ventrally glabrous. *Abdomen* – Sternites with sparse scales, medioapical part of 8th sternite glabrous. *Legs* – Protibia tridentate, apical tooth acute; subapical tooth triangular and positioned at same level as inner apex of protibia. *Aedeagus* – Basal piece 1.33× longer than parameres and without median keel. Parameres asymmetrical, fused at base and dorsally curved, a posteriorly directed pointed spine on ventral inner margin at midlength of left paramere and a short tooth-like projection on ventral inner margin of right paramere subapically, right paramere concavely excavated along the inner margin subapically, left paramere slightly sinuate along inner margin subapically.

Remarks: This species resembles *C. candidus* (Olivier, 1789) externally but can be differentiated by the aedeagus. *C. candidus* has a subovate to subrectangular spur with distal attenuated process on the outer surface of left paramere, whereas *C. septentrionalis* has a posteriorly directed pointed spur on the ventral inner margin.

Updated checklist of species of *Cyphochilus* Waterhouse, 1867 known from India

C. candidus (Olivier, 1789) –India: Sikkim, West Bengal, Assam, Meghalaya, Manipur

C. gandhii Sabatinelli, 2020– India: West Bengal, Sikkim, Assam, Arunachal Pradesh

C. manipurensis Nonfried, 1893 – India: Manipur

C. niveosquamosus (Blanchard, 1851) – India: Karnataka, Tamil Nadu

C. oberthueri Brenske, 1903 – India: Tamil Nadu

C. satyarthii Sabatinelli, 2020– India: Sikkim, West Bengal

C. septentrionalis Waterhouse, 1867 – India: Uttar Pradesh, Sikkim, Assam; Meghalaya, West Bengal and Nagaland

C. waterhousei Brenske, 1903 – south India

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