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Unocryptorhynchus, a new cryptorhynchine weevil genus infesting ginger from India (Insecta: Coleoptera: Curculionidae)

With 52 Figures

V. V. RAMAMURTHY & MICHAEL L. COX

Abstract. A new genus of cryptorhynchine weevil *Unocryptorhynchus* with a new species *U. zingiberae* infesting ginger (*Zingiber officinale* ROSCOE) rhizomes is described from India on the basis of adults and larvae. It has the following unique combination of characters: ventrite 2 longer than ventrites 3 and 4 together, pectoral canal present, mesosternal receptacle present, reduced postcoxal prosternal tubercles, sclerolepidia on the anapleural suture, uncinate and mucronate tibiae, elytrotergal stridulatory organs, rostrum dorsoventrally flattened with scrobes dorsal and endophallus of male genitalia devoid of "V"- or "Y"-shaped sclerite.

Introduction

Ginger is a valuable spice crop cultivated in China, India and Jamaica and the part used is the tuberous rhizome. It has been of medicinal value too as an aid to digestion and for relieving stomach upsets. Its value is due to the ethereal oils, pungent substance zingerone and a mixture of resins. Very few insects have been reported from ginger especially attacking the rhizomes (DAVID & KUMARASWAMI, 1975; KUMARESAN et al., 1988; NAIR, 1986). Such examples are the scales *Aspidiella hartii* (CKLL.), maggots of *Calobata* spec., *Mimegralla coeruleifrons* MAC. (Micropezidae), *Chalcidomyia atricornis* MALL. and *Formosina flavipes* MALL. (Chloropidae), *Celyphus* spec. (Celyphidae), *Eumerus pulcherrimum* BRU. (Syrphidae). The new genus described in this paper is of economic importance due to its infesting ginger rhizomes.

During the course of study on the cryptorhynchine weevils undertaken at the Natural History Museum, London, under the auspices of the Darwin Fellowship in biosystematics, we came across many undescribed species of potential economic importance. Among these were the adults and larvae of a new genus, submitted for identification to the International Institute of Entomology by the National Research Centre on Spices, Calicut, India. These were found infesting rhizomes of ginger, *Zingiber officinale* ROSCOE at Calicut in Kerala (CIE A19014 (1987) spec. 1; A19793 (1988), spec. 12–88). It was not represented in the BMNH collections and was identified as Cryptorhynchinae gen. et spec. indet. by M. COX.

Knowledge of the Indian Cryptorhynchinae is relatively poor with no keys to genera and specific keys to very few genera. Moreover, there is much controversy concerning the tribal classification and the

Addresses for correspondence:
V V Ramamurthy & M.L. Cox, International Institute of Entomology (an Institute of CAB International), 56 Queen's Gate, London SW7 5JR (UK)
Present address of V V. Ramamurthy: Division of Entomology, Indian Agricultural Research Institute, New Delhi-110012 (India)

placement of some genera in this subfamily is still in doubt. In addition, little is known concerning the immature stages, with a small percentage of the approximately 100 recognised species described in the larval stage. The genus *Unocryptorhynchus* has unusual adult and larval characters not shown by other Oriental cryptorhynchines and this work will be useful in the future understanding of the biosystematics of this important group of weevils.

This new genus differs from all other cryptorhynchines with ventrite 2 longer than or equal to ventrites 3 and 4 together, in possessing a mesosternal receptacle and rostrum flat with scrobes dorsal. This combination of characters places it nearer to the Psephalocini and *Rhynchodes* groups (LYAL, 1993), but differing in the absence of a "V"- or "Y"-shaped sclerite on the endophallus. In analysing this new genus, in addition to the usual taxonomic characters (MORIMOTO, 1978), the stridulatory organs, and sclerolepidia which are evidently of importance in the higher classification of weevils (LYAL, 1993; LYAL & KING, 1996) have also been taken into account and these have been also described.

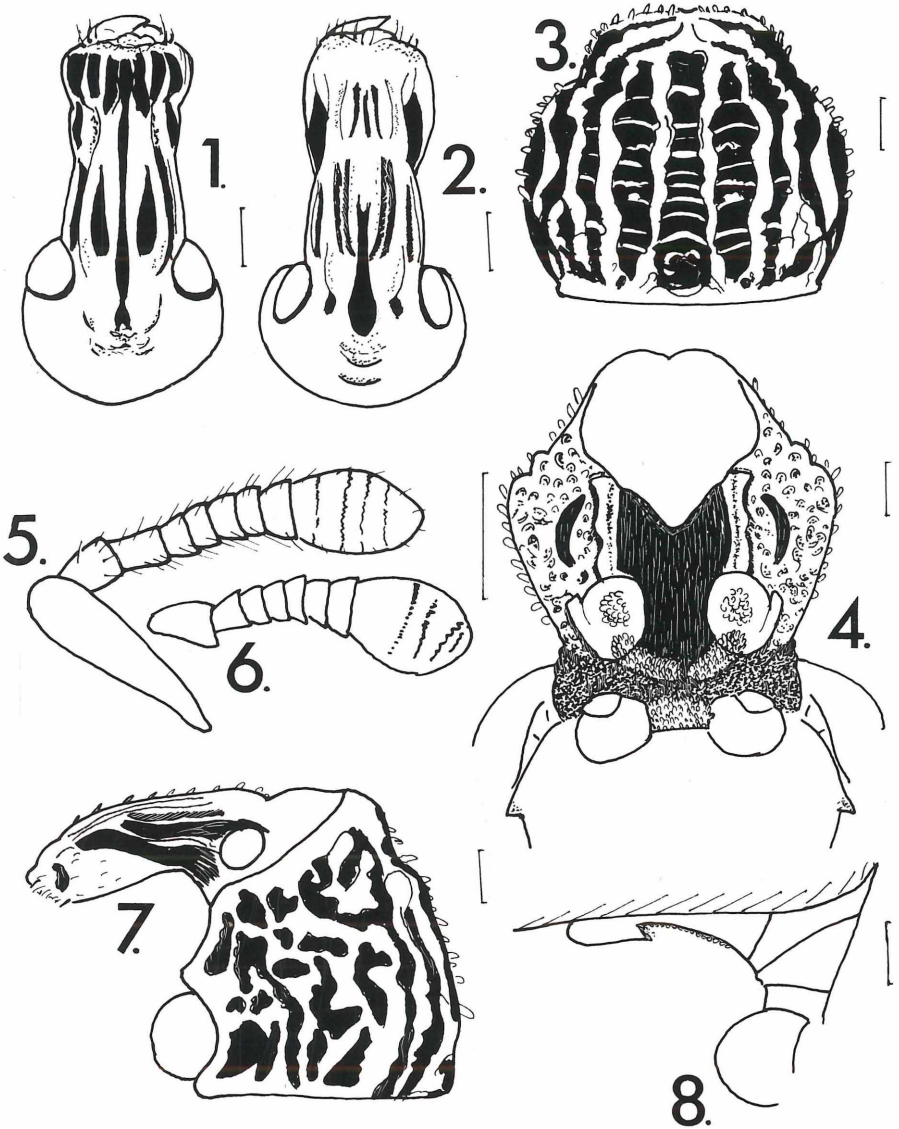
Unocryptorhynchus gen. nov.

Type species: *Unocryptorhynchus zingiberae* spec. nov.

Diagnosis. There are few cryptorhynchines especially from the Oriental region, which are small, flightless, without elytral shoulders, and have ventrite 2 longer than or at least equal to ventrites 3 and 4 together. Among these only *Strattis* PASCOE (1883) and *Osseteris* PASCOE (1873) occur in the Indian subregion, *Syrotelus* PASCOE (1876), the third one falling under this group is not small. Of these, *Osseteris* lacks a mesosternal receptacle, whilst it is distinct in the other two. All of these are winged, have elytral shoulders, the female eighth sternite pouched and the male aedeagus characterised by a "V"- or "Y"-shaped sclerite on the endophallus. This new genus can be distinguished from these and other cryptorhynchines by possessing the following combination of characters: venter with ventrite 2 longer than ventrites 3 and 4 together, anapleural suture with sclerolepidia, mesosternal receptacle, pectoral canal, tibiae uncinate and mucronate, elytrotergal stridulatory organs, rostrum dorsoventrally flattened and straight with scrobes dorsal, prosternum with postcoxal tubercles, metasternum projecting laterally at its apex over metepisternum, intercoxal process of venter truncate and projecting anteriorly well ahead of the lateral articulations, endophallus devoid of "V"- or "Y"-shaped sclerites, female eighth sternite not pouched, tegmen of aedeagus with ring more elongate and apodeme short and transverse, and elytra without humeri.

Unocryptorhynchus zingiberae spec. nov.

Description. Genéral colour pale reddish brown (♀) to dark brown (♂), only punctations shiny, otherwise dull, vestiture of scales uniform, transparent, only moderately dense, but fully covering the integument, not imbricate except the under surface and some portions of elytra, almost wholly transparent, pale white to shining, silvery except elytra where they become sparingly black apically, intervals of elytra with a row of neatly arranged, erect, setiform scales, elytral scales well defined compared to those of other body parts. Pronotum in profile weakly defined anteriorly, smoothly convex, upper surface almost straight, except sides rounded and convex. Elytra convex, without humeri.
Head almost flat, very slightly convex dorsally. Eyes small, very flat, ante-ocular depressions very deep, between rostrum and head surface is strongly depressed, distinctly demarcating the rostrum, elevating it well over the surface of the head. Punctations small, shallow, sparse, confluent forming concentric circles around the frontal fovea, behind the eyes, less rugose punctate, no concentric circles of punctations as in ♀. Frons only slightly depressed, rostrum with lateral carinae inwardly curved and raised, projecting well above the surface at their union with frons (Figs. 1, 2, 7).
Rostrum flat, only 0.6× as long as pronotum (range 0.55 to 0.64), virtually straight in profile, except for the apical third which curves downwards ventrally, more strongly so in ♀, with the usual, two, oblique apical depressions containing the tufts of setae, dorsum covered with short, broad, recumbent



Figs 1–8. *Unocryptorhynchus zingiberae:* 1, 2: head, 1 ♀, 2 ♂; 3, 4: prothorax, 3 dorsal view, 4 ventral view; 5, 6: antennae, 5 ♂, 6 ♀ (funicle & club only); 7: head + prothorax, lateral view; 8: metasternum, lateral view. Scale bar = 0.05 mm, except for 5, 6, 8 = 0.025 mm.

scales and lateral furrows and genae with elongate, erect, setiform scales; median furrows with usual recumbent scales; apical half of broadened portion with only sparse scaling; not densely or finely punctured before insertions, otherwise punctations elongate, oval, deep, becoming confluent, disappearing especially apically. In ♂, sides almost parallel from base to beyond middle, then broadened abruptly and then again parallel, thus the widening at apex is for a longer distance than ♀; lateral pair of carinae less thick than that of ♀ (Fig. 2). In ♀ sides steadily narrowed from base to beyond middle and then gradually widened towards apex, scrobes more dorsal and wider (Fig. 1).

Antennae inserted slightly before middle of rostrum in ♀ and still nearer to apex in ♂, scape shorter than funicle, with dense white scaling on its outer apical surface, funicle with segment 1 longer than 2, 3–7 transverse and together only one third as long as funicle, segments progressively widening towards club, with fine, erect setae, without any scales, club ovate, in ♀ still wider and almost globular (Figs. 5, 6).

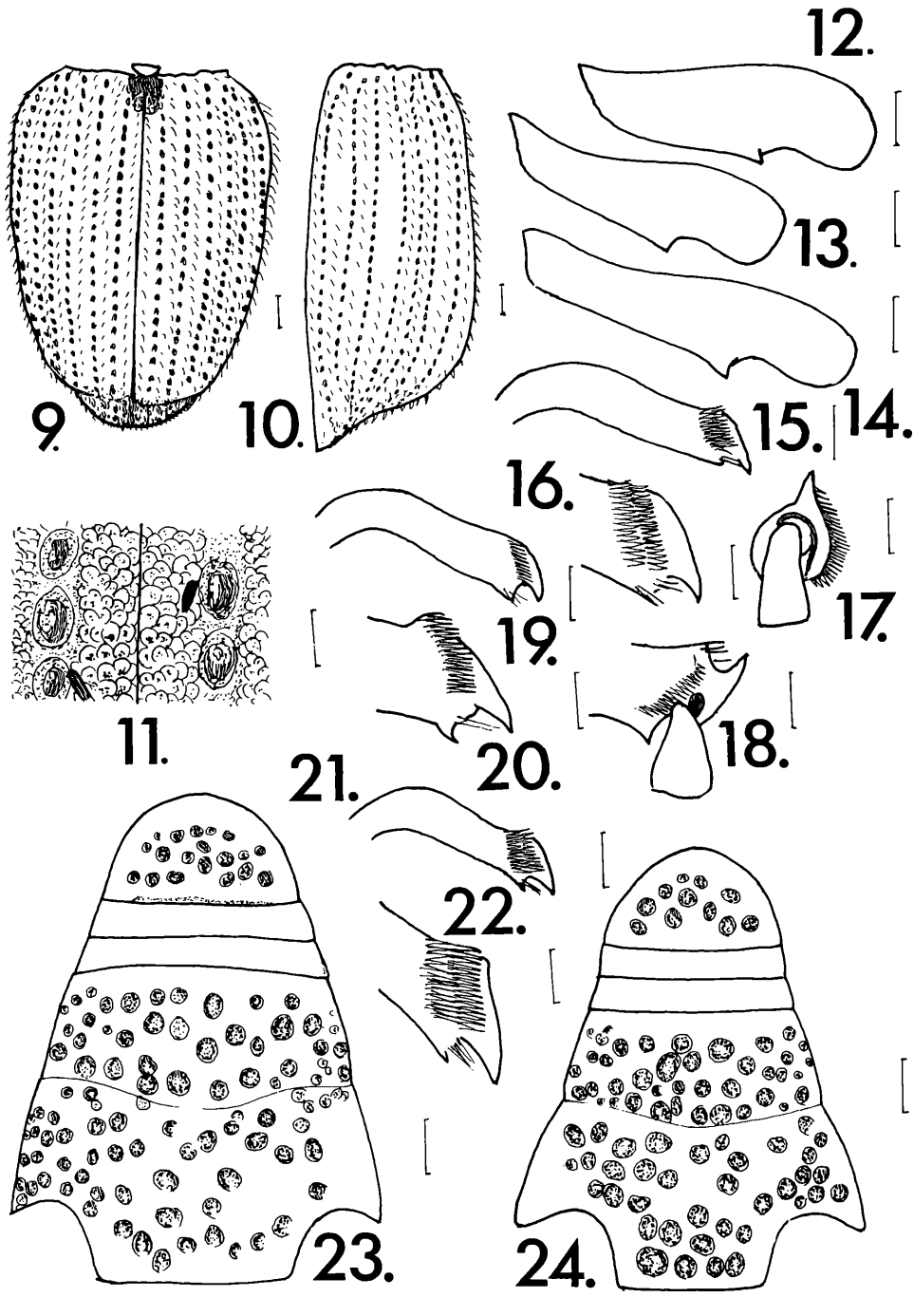
Pronotum length and breadth subequal, widest just before middle, sides rounded, convex, weakly so anterior to widest point, anterior margin strongly sinuate medially, posterior margin truncate, straight, weakly constricted before posterior margin, but strongly constricted in anterior third or fourth, postocular lobes very small covering only very little of eyes, vibrissae minute, dorsum very slightly convex longitudinally, transversely almost flat centrally, then strongly convex laterally, set with longitudinal, wide, deep furrows, intercepted by narrow, thin, transverse bridges, furrows becoming narrow laterally, punctations thus rugose, wider than interspaces, devoid of scales or setae, shining, smooth, with surface faveolate, pitted or with honeycomb markings, interspaces with flat scales smaller and less defined than elytra, pronotum ventrally also rugose-punctate as dorsum but furrows poorly defined, confluent, very shallow (Figs. 3, 4, 7). Scutellum small, transverse, surface convex, smooth, shining, glabrous, broadly triangular to semicircular, posterior margin elevated well above surrounding intervals.

Elytra subcylindrical, without humeri, broadest just below base, jointly almost straight except for a sinuation at base of intervals 3 and 7, at base only very slightly wider than base of pronotum; striae shallower than punctations on prothorax, only less than half as deep and as broad as those on prothorax, punctations subcircular, their peripheries very shallow, deepest point of punctations dark, without any scaling, intervals broader than striae, covered by dense scaling, scales depressed medially, interval 1 weakly raised and flat basally around scutellum, then convex, intervals 4, 5, 6, 7 strongly curved inwards at base, whereas 1–3 almost straight especially externally, intervals with scales circular, imbricate, depressed medially, with definitely arranged median row of erect, setiform scales. Basal margin strongly convex laterally, less so towards scutellum, only as wide as pronotum basally, sides smoothly convex, widest just about one tenth distance from base, then almost parallel to beyond middle, then strongly narrowed towards apex, strongly convex apically, prominences absent. Elytral strigil present, elytra not separately rounded apically, conjoint apices of elytra not mucronate (Figs. 9–11).

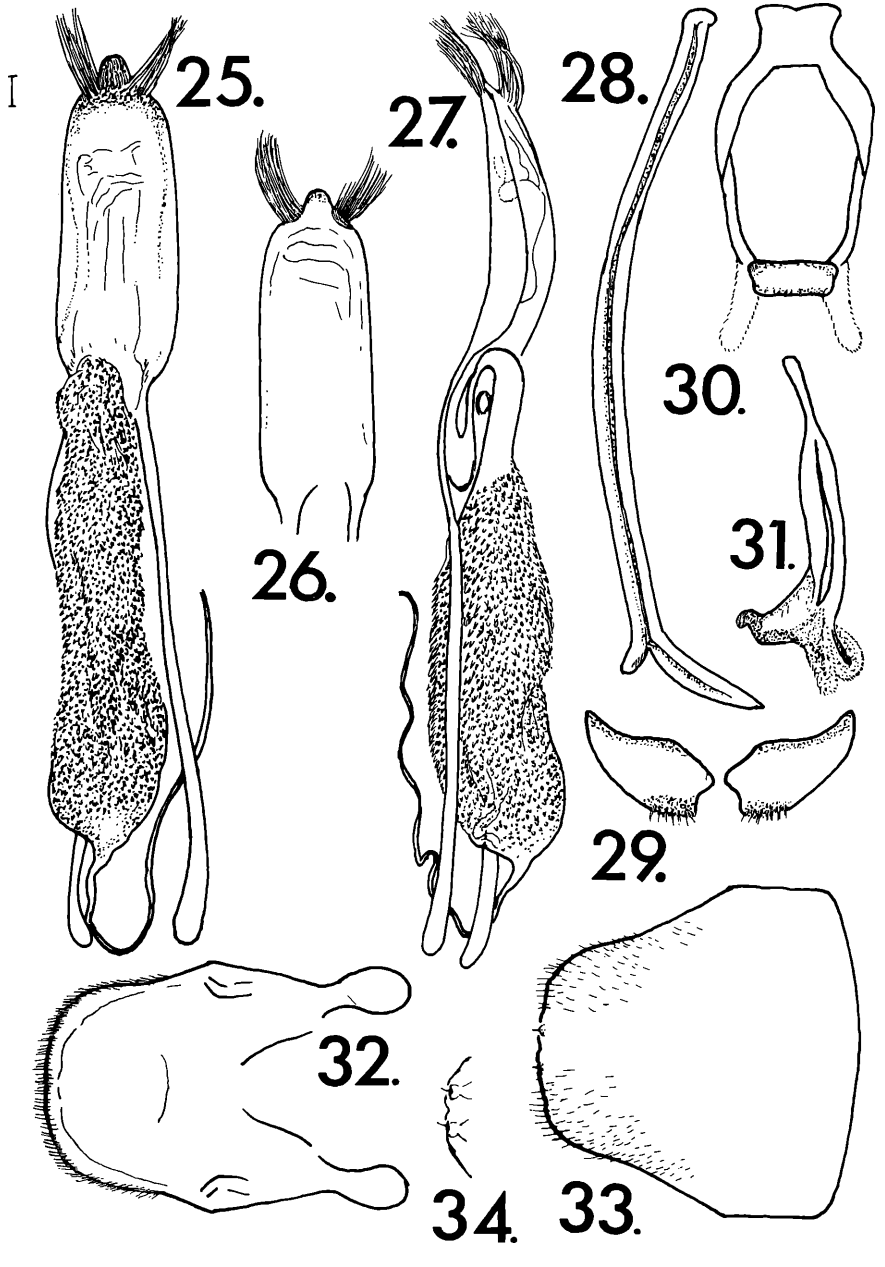
Ventrally, postocular lobes very small, rounded, continuous with marginal carina of pectoral canal; pectoral canal very wide, with transparent sparse, flat scales until forecoxal level, thereafter glabrous. Mesosternal receptacle small, transverse, less cavernous, extending to only middle line between the middle coxae, margins projecting less, almost straight. Metasternum with broad, deep depression, truncate posteriorly, anapleural suture with sclerolepidia, laterally rugose-punctate, lateral margin projecting posteriorly over metepisternum tucking the anapleural suture ventrally, ventrally projecting between middle and hind coxae just external to narrowest part broadly separating them by more than length of hind coxa. Metepisternum very narrow, especially posteriorly, extending well beyond hind coxal-ventral articulation, with a row of silvery white, elongate, erect, setiform scales (Figs. 4, 8).

Legs squamose, with dense, imbricate scaling, plus rows of regular, erect, setiform scales. Fore legs not longer than others in males. Fore coxae with lateral projection, fore and middle coxae with patches of dense scaling, separated medially by smooth, bare area. Femora neither compressed nor flat, with ventral tooth, larger in middle and hind legs, lacking ventral groove or sulcus; hind femora longer, less broad, not reaching apex of elytra. Tibiae with obtuse angulations at basal third, bent sharply at outer angle, just before middle. Fore tibiae never straight, neither serrate internally nor arched dorsally. All tibiae with shallow ventral groove, uncus, mucro, premucro; fore tibiae with pre mucro very sharp. All hind tibiae with supraucal projection well developed; fore tibial apex with single row of setae, middle and hind tibiae with two rows (Figs. 12–22).

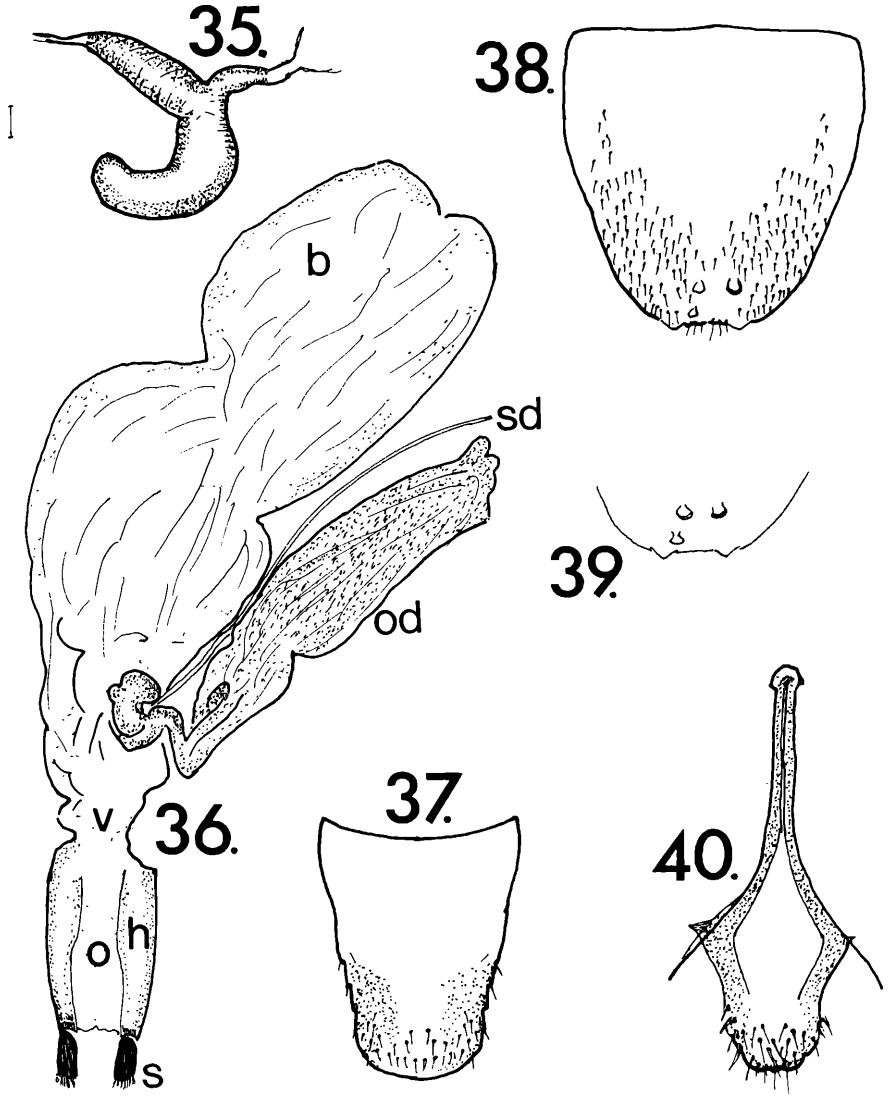
Abdominal ventrite 1 almost flat, intercoxal process longer than wide, extending well before the level of lateral articulations with thorax, anterior margin straight, truncate, ventrite 2 shorter than 1, only 0.75× as long as 1, division between ventrites 1 and 2 sinuate medially, suture between them very fine throughout, ventrite 1 behind coxae as long as 2, ventrites 1 and 2 laterally at their articulation sinuate in ♀, not so in ♂, ventrite 1 sloping down to 2 abruptly in ♀, not so in ♂, sides of venter narrowing abruptly/sharply towards apex in ♀ but smoothly in ♂, ventrite 2 distinctly longer than 3 and 4 together, only ventrites 1, 2 and 5 rugose-punctate, punctations round, small, deep, each with an erect setiform



Figs 9–24. *Unocryptorhynchus zingiberae*: 9–11: elytra, 9 dorsal view, 10 lateral view, 11 vestiture; 12–14: femora, 12 fore-, 13 middle, 14 hind femur; 15, 19, 21: tibiae, 19 fore-, 21 middle, 15 hind tibia; 16–18, 20, 22: tibial apex, 20 fore-, 22 middle, 16–18 hind tibial apex, 16 outer view, 17 apical view, 18 inner view; 23, 24: venter, 23 ♂, 24 ♀. Scale bar = 0.05, except for 11, 16–18, 20, 22 = 0.01 mm.



Figs 25–34. *Unocryptorhynchus zingiberae*: ♂ genitalia: 25–27: aedeagus, 25 ventral view, 26 dorsal view (apex only), 27 lateral view; 28: spiculum gastrale; 29: sternite 8; 30, 31: tegmen, 30 ventral view, 31 lateral view; 32: tergite 8; 33, 34: tergite 7 (34 apex only enlarged 2×). Scale bar = 0.005 mm, except for 34 = 0.0025 mm.



Figs 35–40. *Unocryptorhynchus zingiberae*: ♀ genitalia: 35: spermatheca, 36: genitalia complete; 37: tergite 8; 38, 39: tergite 7 (39 apex only enlarged 2×); 40: sternite 8. Abbreviations: b, bursa; h, hemisternite; o, ovipositor; od, oviduct; s, styli; sd, spermathecal duct; v, vagina. Scale bar = 0.005 mm, except for 35, 39 = 0.0025 mm.

scale, 1 and 2 with dense scaling, scales larger than those of elytra, ventrites 3 and 4 with long, transverse row of erect, setiform scales – these scales longer than those of elytra, ventrite 5 punctate, not squamose as in 1 and 2, each punctation with a long erect setiform scale (Figs. 23, 24).

Female genitalia: Tergite 7 with length and breadth subequal, microsetae asymmetrical, with one microseta on a transverse tubercle near the apex followed by a pair on transverse tubercles, area around these tubercles glabrous; anterior margin almost straight, posterior margin convex laterally, sinuate in middle (Figs. 38, 39). Tergite 8 elongate (3 : 2.5), anterior margin concave, posterior convex, sides

crenulate on posterior half only (Fig. 37). Sternite 8 with apical plate longer than wide, shorter than apodeme, anterior end of apodeme slightly expanded, rounded (Fig. 40). Hemisternites of ovipositor longer than broad, only one third as long as apical plate of sternite 8, styli terminal. Spermathecal duct arising at junction of bursa and oviduct, vagina and bursa devoid of sclerotisation except for base of latter which is only weakly sclerotised (Fig. 36). Spermatheca with proximal and distal arms subequal, attachment of spermathecal gland distant from spermathecal duct (Fig. 35).

Male genitalia: Tergite 7 with length and breadth subequal, with pair of microsetae on apical transverse projections; areas around these projections glabrous; sides parallel in anterior third but then gradually narrowed to almost truncate apex (Figs. 33, 34). Tergite 8 as in Fig. 32. Sternite 8 divided into two distinct plates, adhering to spiculum gastrale, strongly sclerotised (Fig. 29). Spiculum gastrale with basal prong unequal, narrowly divergent, longer than aedeagal apodemes (Fig. 28). Tegmen as long as body of aedeagus; unique with parameres very small, almost on same side as that of apodeme, beyond tegminal ring apodeme very short, transverse, apex truncate, tegminal ring unusually elongate, at least twice long as broad (Figs. 30, 31). Aedeagus with body only half as long as apodeme, 3× as long as broad, moderately curved, sides strongly rounded anteriorly, apex acuminate with two tufts of long, curved, dense pubescence, endophallus only weakly sclerotised, with dense, sclerotised, minute papillae, osteolar sclerites replaced by membranous, weakly sclerotised plates, flagellum apical (Figs. 25–27).

Measurements (in mm; n = 4)

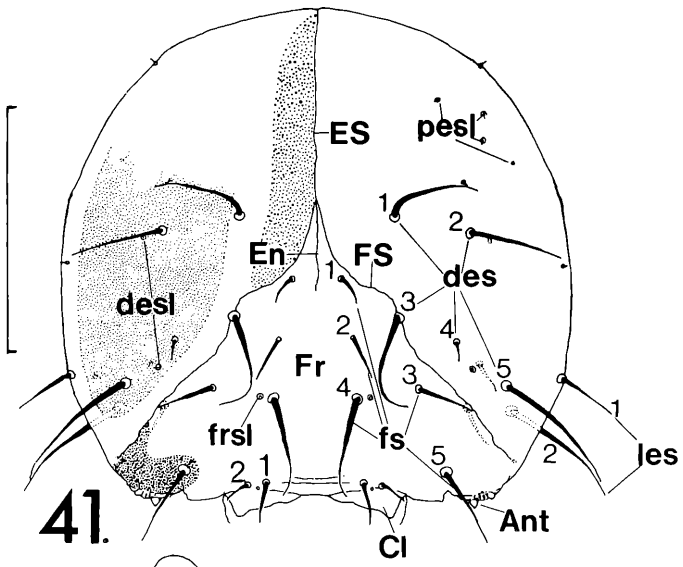
	Rostrum Length	Rostrum Width	Prothorax Length	Prothorax Width	Elytra Length	Elytra Width
♀						
Mean	0.90	0.48	1.47	1.56	2.79	2.00
Range	0.82–0.93	0.47–0.49	1.43–1.52	1.42–1.63	2.52–2.92	1.91–2.06
♂						
Mean	0.86	0.43	1.41	1.45	2.67	1.90
Range	0.83–0.89	0.39–0.49	1.27–1.55	1.33–1.58	2.52–2.79	1.74–2.10

Larva

GARDNER (1934, 1938) described and figured the larvae of several cryptorhynchine genera belonging to four different tribes. In the earlier work a key to weevil subfamilies and genera including the Cryptorhynchinae was provided, whilst in 1938 a key to eight genera then assigned to this subfamily was given. RAHMAN & AHMAD (1972) described and figured the larva of *Sternochetus frigidus* (FABRICIUS), whilst MAY (1994) described and figured that of *S. mangiferae* (F.). LEE & MORIMOTO (1996) described and figured the larvae of 11 Japanese cryptorhynchine genera. The terminology of larval characters follows that of ANDERSON (1947), which was also employed by BLAIR et al. (1980)

►

Figs 41–47. *Unocryptorhynchus zingiberae:* final instar larva head and mouthparts ; 41: head frontal view with mouthparts removed (only left half shaded to show patterning); 42: right antenna, dorsal view; 43: labrum, dorsal view; 44: epipharynx; 45: maxillae and labium; 46, 47: left mandible, ventral and dorsal views, respectively. Abbreviations: Ant, antenna; Cd, cardo; Cl, clypeus; des, dorsal epicranial suture; desl, dorsal epicranial sensilla; ES, epicranial suture; Fr, frons; frsl, frontal sensilla; FS, frontal suture; fs, frontal setae; Gls, glossal setae; Lbp, labial palpus; les, lateral epicranial setae; Lr, labral rod; MA, mala; mds, mandibular setae; mdsl, mandibular sensilla; mxp, maxillary palpus; pesl, posterior epicranial sensilla; PM, postmentum; pms, premental sclerite; Prms, premental setae; st, stipes. Scale line = 0.5 mm (41, 45); 0.2 mm (43, 44, 46, 47); 0.1 mm (42).



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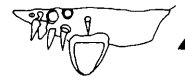

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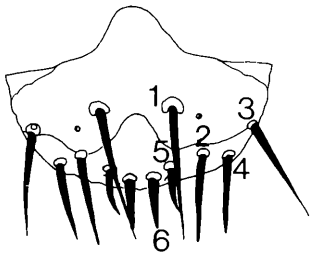

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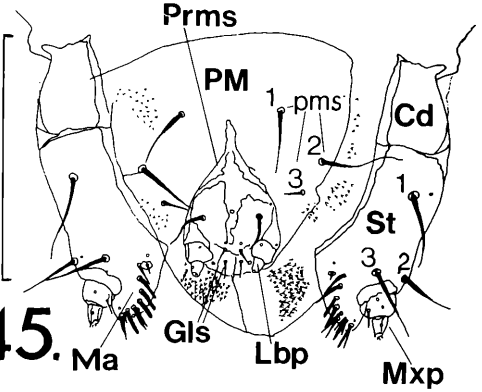

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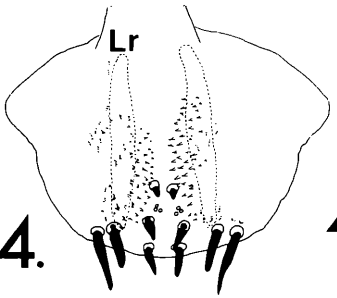

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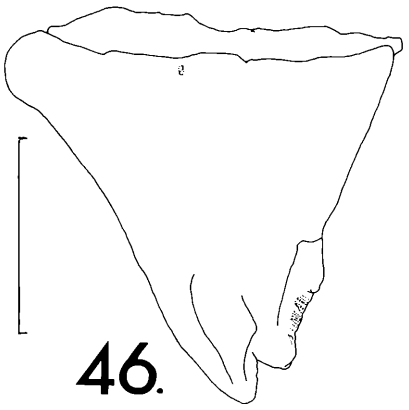

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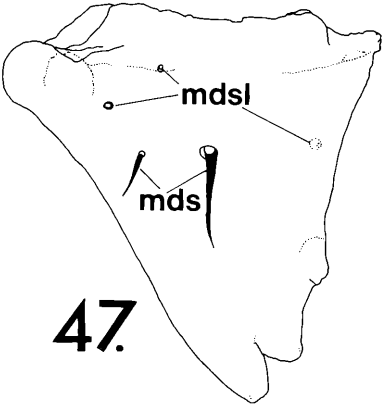

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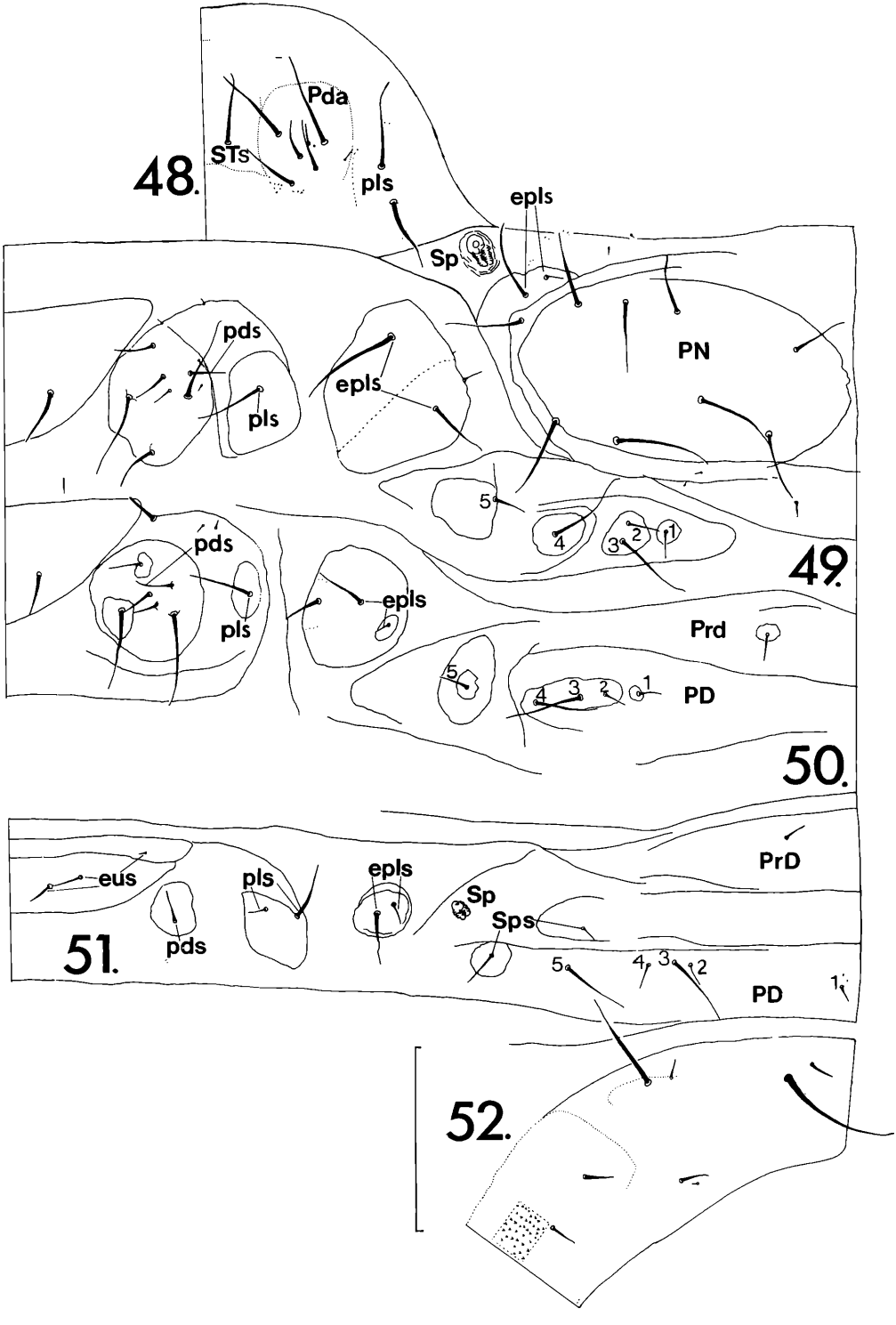
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when describing the larva of the cryptorhynchine, *Conotrachelus retensus* (SAY) and also by RAHMAN & AHMAD (1972).

Description. Full grown larva approximately 6.4–6.5 mm (n = 2) in length when extended; curved; white, except for lightly pigmented, pale yellow pronotal plate; densely covered with microscopic asperities (as inset Fig. 52); head exserted, including labrum, maxillae and labium pale brown, mandibles dark brown.

Head broad oval, slightly longer than wide, pale brown, except paler longitudinal stripe parallel to epicranial suture and laterally, and clypeus; area posterior to antennae and maxillary palpi slightly darker brown (Fig. 41). Width of head approximately 1.04 mm (n = 2); length to apex of mandibles 1.21 mm (n = 2). Antennae short, 1-segmented, flat, bearing accessory conical anteriorly directed process, 5 large tactile sensilla, 2 campaniform sensilla (Fig. 42). Anterior and posterior ocelli missing. Frontal sutures distinguishable throughout their length; epicranial suture less than $^1/_2$ as long as head; endocranial suture less than $^1/_3$ as long as frons. Frons with 5 pairs of setae; seta 2 present, subequal in length to seta 3; seta 3 over $^1/_2$ as long as seta 4; setae 4 and 5 long; 1 pair of frontal sensilla present, between frontal setae 3 and 4. Dorsal epicranium bearing 5 pairs of setae, setae 1, 2, and 3 subequal in length, moderately long; seta 4 greatly reduced, approximately $^1/_5$ length of setae 1–3; seta 5 long, about $^1/_3$ again longer than setae 1–3. Posterior epicranial setae greatly reduced, 4 in approximate longitudinal line, plus 2 sensilla. Ventral epicranium bearing 2 pairs of setae, seta 2 slightly longer than seta 1. Fronto-clypeal suture indistinct. Clypeus wider than long, bearing 2 pairs of short setae and 1 pair of sensilla, seta 1 about 2x length of seta 2. Anterior margin of labrum slightly sinuous, moderately evenly rounded; labrum bearing 6 pairs of long setae, anterior setae 5 and 6 the shortest, 1 pair of sensilla placed lateral of seta 1 (Fig. 43). Epipharynx with 5 pairs of setae, 2 pairs of antero-lateral setae, 1 pair antero-median setae, 2 pairs median, spine-like setae, 2 groups of 3 sensilla between these median setae on each side, patches of minute unidentate, bidentate or multidentate spicules on each side; labral rods elongate, slender, subparallel (Fig. 44). Mandibles short, subtriangular, with 2 apical teeth and shorter, more obtuse tooth on inner margin; 2 dorsal setae, markedly different in length; 3 sensilla present (Figs. 46, 47). Labial palpi 2-segmented, these each with 1 sensillum, segment 2 with few minute papillae apically. Premental sclerite complete, with anterior and posterior extensions. 1 pair moderately long, premental setae and several pairs of sensilla present. Ligula (glossa) bearing 2 pairs of short, stout setae. Postmentum with 3 pairs of setae; seta 2 long, only slightly longer than seta 1; seta 3 the shortest (Fig. 45).

Thorax subequal in width to abdomen. Pronotum bearing 9 setae (Fig. 48). Prothoracic spiracle large, bicameral. Prodorsum of meso- and metathorax with 1 short seta; postdorsum of meso- and metathorax bearing 5 setae, postdorsal setae 1, 2, and 5 short, setae 3 and 4 long, subequal in length, about three times longer than others. Epipleural lobe of meso- and metathorax bearing 2 long and 1 shorter seta (Figs 49, 50). Prothorax with 2 pleural setae, the anterior seta only slightly longer than posterior seta. Meso- and metathorax each bearing 1 long pleural seta. Pedal area of each thoracic segment with 6 setae, 2 much longer than others; one sternal seta.

Abdomen with eight pairs of lateral bicameral spiracles. Abdominal segments I–VIII each with 3 dorsal folds, and each segment bearing 1 prodorsal and 5 postdorsal setae (Fig. 11); postdorsal setae 3 and 5 long, about 3 times longer than seta 4. Spiracular area with 2 short setae, the anterior one shortest, about equal in length to seta 1; the posterior one, closest to spiracle and about half length of seta 5. Epipleurum bearing 1 long and 1 short seta; pleural lobe with 1 long and 1 short seta; pedal lobe with 1 moderately long seta; 2 moderately long and 1 very short dorso-anterior eusternal setae also present

◀

Figs 48–52. *Unocryptorhynchus zingiberae:* final instar larva, chaetotaxy of left side of body; 48: prothorax; 49: mesothorax; 50: metathorax; 51: first abdominal segment; 52: ninth abdominal segment. Abbreviations: epls, epipleural setae; eus, eusternal setae; mdl, mid-dorsal line; mvl, mid-ventral line; PD, postdorsum; pds, pedal setae; pls, pleural setae; Prd, prodorsum; PN, pronotum; sp, spiracle; sps, spiracular setae. Scale line = 0.5 mm.

(Fig. 51). Abdominal segment IX dorsally bearing 2 long and two shorter setae; laterally bearing 1 moderately long and two very short setae; ventrally bearing 2 moderately long and 1 very short seta (Fig. 52).

Holotype ♂, India, Calicut, Kerala, 1988, in rhizomes of ginger, Coll. K.M.A. Koya, sp. 12–88, CIE A19793, presented by CIE BM 1988-1, Cryptorhynchinae ?Ithyporini, gen. et sp. indet., det. M.L. Cox 1988; same data as holotype except date 1987, Coll. S. Devasahayam, Sp. I CIE A19014, presented by CIE BM 1987-1; paratypes 3 ♂♂ (BMNH-1; NPC-1; SMTD-1), 1 ♀ (NPC); same data as holotype, 2 paratypes ♀♀ (BMNH).

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