



## Review of the leafhopper tribe Adelungiini (Hemiptera: Cicadellidae: Megophthalminae) from the Indian subcontinent

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**ABSTRACT:** Two known species of Adelungiini from India (Rajasthan) and Pakistan are redescribed and illustrated. These include one new combination, *Assiuta omani* (Kameswara Rao & Ramakrishnan) **comb. nov.** and the other species being *Platyproctus maculatus* (Pruthi). The leg chaetotaxy and female genitalia of these two species are described and illustrated for the first time. In addition, male genitalia of the two other species of *Assiuta* Linnavuori namely, *A. camena* Linnavuori and *A. salina* Lindberg are illustrated. A revised key is given to distinguish the two tribes recognised from the region (Agalliini and Adelungiini). © 2017 Association for Advancement of Entomology

**KEY WORDS:** *Assiuta*, *Platyproctus*, *Symphypyga*, morphology

### INTRODUCTION

Members of the tribe Adelungiini are highly specialised leafhoppers restricted to Old World deserts, breeding exclusively on xeric plants of the genera *Atraphaxis*, *Calligonum* (Polygonaceae), *Eremosparton*, *Smirnovia* (Fabaceae), *Halostachys*, *Haloxylon*, *Hammada*, *Iljinia*, *Kalidium*, *Salsola*, *Traganum* (Amaranthaceae) and *Zygophyllum* (Zygophyllaceae) (Emeljanov 1975). The tribe is small containing 12 genera and 62 species in the world today (Metcalf 1966, Linnavuori 1969, Emeljanov, 1975, Al-Neamy & Linnavuori, 1982), of which two are present in India (see key below). Pruthi (1930) described *Symphypyga maculatus*, the first species of Adelungiini from the subcontinent from Lyallpur, Pakistan and later, Kameswara Rao & Ramakrishnan (1983) described *Symphypyga omani* from Pilani, India. Emeljanov (1975) revised the tribe Adelungiini and transferred

*S. maculatus* (Pruthi) to the genus *Platyproctus* Lindberg. In this paper, both the species are redescribed and illustrated with details of the female genitalia and leg chaetotaxy given for the first time and in addition, *S. omani* is moved to the genus *Assiuta* Linnavuori **comb. nov.** Information on the host plants and biology of both the species of Adelungiini is not known. In view of the overlapping external morphological characters of the two recognised tribes from the region (Agalliini and Adelungiini), a revised key to distinguish these tribes based on male and female genitalia is also given (see Discussion).

The material studied in the present work came from the following depositories preceded by the abbreviations used in the text.

BMNH The Natural History Museum, London,  
United Kingdom

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IRSNB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium
NPC	National Pusa Collection, Indian Agricultural Research Institute, New Delhi, India
UASB	Department of Entomology, University of Agricultural Sciences, Bengaluru, India
ZSI	Zoological Survey of India, Kolkata, India

### Taxonomy

#### Key to genera of Indian Adelungiini

(Based on Linnavuori, 1969)

1. Face with lora swollen, raised above surface of genae (Fig. 11,12)..... *Assiuta* Linnavuori
- Face with lora neither swollen nor raised above surface of genae (Fig. 9,10) .....*Platyproctus* Lindberg

#### Genus *Assiuta* Linnavuori

*Assiuta* Linnavuori 1969: 212-213. Type species: *Melicharella salina* Lindberg, by original designation.

**Remarks:** In addition to the Indian species of this genus described below three other species are known. Males of two species, *A. camena* Linnavuori (1 male, W. Assiut, Egypt, 1.iv.1932, Dr H. Priesner, determined by R. Linnavuori in NMWC, Figs 50-51) and *A. salina* Lindberg (1 male, Spain, Canary Islands, Fuerteventura, Corralejus, 27.iii.1953, Lindberg, determined by R. Linnavuori in NMWC Figs 52-56) were examined. The third species, *A. hieroglyphica* (Bergevin) found in Algeria and Tunisia was not examined.

However, in both *Assiuta omani* (Kameswara Rao and Ramakrishnan), **comb. nov.** and *A. camena* Linnavuori, the author noted that the aedeagus is not compressed, but cylindrical. The chaetotaxy of the forefemora: anteroventral row of setae (AV) prominent and stouter than other setae, intercalary setae (IC) 9-10 in number, slender and almost in a

straight line; anterodorsal row (AD) with a row of 8 slender setae (Fig. 36). Metbasitarsus with one row of platellaelike setae, apical transverse row with two elongate setae intermediate between normal seta and platellae (Fig. 37). Davis (1975) and Al'Neamy & Linnavuori (1982) discussed the atypical sculpturing of the first pair of valvulae of the *A. hieroglyphica* (as *Platyproctus hieroglyphicus*) and *A. camena*, respectively. In Agalliini and Adelungiini, the first pair of valvulae have papillose or reticulate sculpturing, however, in the species of *Assiuta* examined, the sculpturing is strigate.

#### *Assiuta omani* (Kameswara Rao & Ramakrishnan) **comb. nov.**

(Figs. 5-8, 11-12, 17-21, 36-49)

*Symphypyga omani* Kameswara Rao & Ramakrishnan 1983: 21-23, Figs. 1-9.

**Colour:** Grey with dark brown maculations on head, thorax and forewings as shown in figures 5 - 8. Transverse connected spots on vertex dorsad of ocelli and between eyes, and on anterior 3/4<sup>th</sup> of pronotum more prominent. Forewing venation prominent, dark brown.

**Male genitalia:** Male pygofer in lateral view longer than height, lobe produced posteriorly, with a dorsal submarginal pigmented thickening, dorsal margin almost straight, ventral margin strongly excavated about basal third, anterior margin with short dorsal apodeme. Subgenital plates fused basally, longer than wide, shorter than pygofer in length. Anal collar well sclerotized but not produced into a process. Style with outer fork shorter than inner fork, in dorsal view gradually narrowed to an acute point, in posterodorsal view strongly curved, with a tooth at midlength ventrally, and area proximad of it sculptured, distal half thin and long. Connective triangular with rather uneven lateral margins, anterior median process well developed. Aedeagus with well developed but short dorsal apodeme, shaft gradually curved anteriorly, ventral margin notched near base, and with series of lateral marginal short denticles arranged in one row, in posterodorsal view, apex with two prominent projections, gonopore apical.

*Female genitalia:* Ovipositor exceeding pygofer in ventral view. Seventh sternite in unprocessed abdomen, appears to have straight posterior margin with a median concave excavation and longer medially than preceding sternite. In processed abdomen, the seventh sternite medially broadly produced with lateral acute angles, medially with broad V-shaped excavation, surface covered with short setae. Eighth sternite also well developed, unpigmented and as broad as seventh but longer than seventh sternite, with a rectangular anterior projection extending into fifth visible abdominal segment. First and second pair of valvulae much broader compared to those of *P. maculatus* and straighter. First pair of valvulae with strigate sculpturing occupying distal 0.75 length but not attaining dorsal margin and the latter feebly serrate distally (Figs. 17-19). Second valvulae with toothed area crenulated, occupying distal 0.2 length (Figs. 20-21).

*Measurements:* Male 4.4 mm long, 1.65 mm wide across eyes and 1.4 mm wide across hind margins of pronotum. Female 4.7 mm long, 1.8 mm wide across eyes and 1.6 mm wide across hind margins of pronotum.

*Type material examined.* INDIA: Rajasthan: Holotype male, Pilani, Light, Oct.1965, Dr.Kundu (NPC). Paratype, 1 female, same data as holotype (NPC).

*Other material examined:* INDIA: 1 male, Rajasthan: Sri Kolayatji, 1.i.1975, S.L. Gupta (NPC).

**Remarks:** Kameswara Rao & Ramakrishnan (1983) described this species based on one male holotype and two male paratypes collected from Pilani, Rajasthan at light. The NPC collection has several specimens from Sri Kolayatji, Rajasthan, erroneously named as paratypes of this species as they have not been indicated in the original article. Among these only one male studied here belongs to this species whereas the others belong to *Platyproctus maculatus* (Pruthi). *A. omani* resembles *A. camena* Linnvuori closely, but can be

differentiated from the latter by the less strongly curved aedeagal shaft, more numerous lateral denticles on the aedeagal shaft and the subgenital plates are more elongate compared to those in *A. camena*.

### Genus *Platyproctus* Lindberg

*Platyproctus* Lindberg 1925: 112. Type species: *Platyproctus tessellatus* Lindberg by original designation.

**Remarks:** The fore femoral chaetotaxy is similar to that in *Assiuta*, but the intercalary row of setae are stouter. The first pair of valvulae have reticulate sculpturing compared to that in *Assiuta* where the sculpturing is strigate.

### *Platyproctus maculatus* (Pruthi)

(Figs. 1 - 4, 9 - 10, 13 - 16, 23 - 35)

*Symphypyga maculatus* Pruthi 1930:15-17, Text figs. 18-20, Plate II, figs. 3, 3a.

*Platyproctus maculatus* (Pruthi): Emeljanov 1975: 108.

*Colour:* Paler specimen dirty white with brown markings as shown in Figs. 1 - 4 and 9 - 10, and darker specimens grey with dark brown markings. A stripe across eyes above ocelli on vertex, pink to reddish, more prominent in females than in males.

*Male genitalia:* Male pygofer longer than height, with shorter pygofer lobe compared to that in *Assiuta*; lobe with dorsal submarginal pigmented thickening continued along the posterior margin; anterior margin of pygofer with well developed dorsal apodeme. Subgenital plate distally blunt and dorsally curved. Anterior margin of tenth segment sclerotized and collar-like, but not produced into a process. Style with outer fork shorter than inner one, inner fork with a tooth on ventral margin at midlength, fork beyond tooth narrowed, apex hooked. Connective rather triangular, with lateral margins slightly sinuate, posterior angle rimmed,

anterior margin deeply emarginate. Aedeagus with short but well developed dorsal apodeme, shaft almost straight and with lateral flanges in basal half, curved anteriorly and tubular in distal half, gonopore subapical.

*Female genitalia:* Ovipositor slightly exceeding pygofer in ventral view. Seventh sternite in unprocessed abdomen, rather transparent, with straight posterior margin with a median slightly convex lobe and longer medially than the preceding sternite. In processed abdomen, seventh sternite narrowed posteriorly with lateral obtusely rounded angles, with short median lobe with median V-shaped excavation, surface covered with short setae. Eighth sternite well developed, pigmented, semi-circular and much shorter than seventh sternite. The first pair of valvulae thinner, strongly dorsally curved, with reticulate sculpturing occupying distal 0.33 length and attaining dorsal margin; strongly crenulated along dorsal apical region (Figs 13-14). The second pair of valvulae also strongly dorsally curved, thin with apex rather obliquely truncate and two types of toothed area, proximal area with much broader teeth with secondary dentition and the apical region with crenulate teeth without secondary dentition (Figs. 15 - 16).

*Measurements:* Male 4.4 - 4.7 mm long, 1.5 - 1.6 mm wide across eyes and 1.2-1.3 mm wide across hind margin of pronotum. Female 4.8 - 4.9 mm long, 1.6 mm wide across eyes and 1.4 mm wide across hind margins of pronotum.

*Type material examined:* PAKISTAN: Syntype male, Punjab: Lyallpur, September, 1921, H.S. Pruthi, syntype female same data but collected on October, 1929, at light. A.R. Rahaman (ZSI).

*Other material examined.* INDIA: Rajasthan: 1 male, Pilani, A.S. Sohi (UASB); 3 males, Sri Kolayatji, 1.i.1975, in light dome, S.L. Gupta (NPC); 13 males, 36 females, Vasmat, viii.1955, P.S. Nathan (IRSNB); 1 male, Bikaner, 295m, 6.viii.2015, at light, Yeshwanth, H.M. (UASB).

**Remarks:** Pruthi (1930) described this species

based on two 'holotype No 528-529/H7' and unspecified number of other specimens from 'Lyallpur, Punjab; September, 1921 (H.S. Pruthi), at Light Trap; October, 1929 (A.R. Rahman), at Light Trap.' These are considered here as syntypes (see Viraktamath 1981:7).

## DISCUSSION

Oman *et al.* (1990) considered the group based on the genus *Adelungia* Melichar as a subfamily (Adelungiinae) with two tribes, Achrini and Peyerimhoffioliini. However, Dietrich (2005) treated this group as a tribe in the subfamily Megophthalminae, the other tribes included in the subfamily are Agalliini, Evansioliini and Megophthalmini. The tribes Adelungiini and Agalliini are very similar. They are usually separated by the presence or absence of reticulate venation of the forewings and complete or incomplete clypeal suture on the faces respectively (Dietrich, 2005). However, some agalliine genera namely, *Dryodurgades* Zachvatkin, *Durgula* Emeljanov and *Multinervis* Li and Li, have forewings with reticulate venation as in Adelungiini and *Agallia* Curtis, *Anaceratagallia* Zachvatkin, *Formallia* Viraktamath, *Hemagallia* Viraktamath and *Paulagallia* Viraktamath have complete clypeal suture that is either transverse or arcuate, as in Adelungiini. However, the two tribes differ in the shape of the connective in the male genitalia and sculpturing of the dorsoapical margin of the first pair of valvulae. Adelungiini have long, rather triangular connective in the male and the aedeagus is relatively small compared to the shorter, more or less broad connective and relatively large aedeagus in Agalliini. Only in the case of *Humpatagallia* Linnavuori and Viraktamath of the tribe Agalliini, is the connective long and the aedeagus relatively small but here the connective is rod shaped. The female first pair of valvulae in Adelungiini has the dorsoapical margin either serrate or crenulate whereas in Agalliini this margin is smooth (Al-Neamy and Linnavuori 1982). Thus these two tribes can be separated by the following key.

1. Female first pair of valvulae with dorsoapical margin serrate or crenulated (Figs. 14,18);

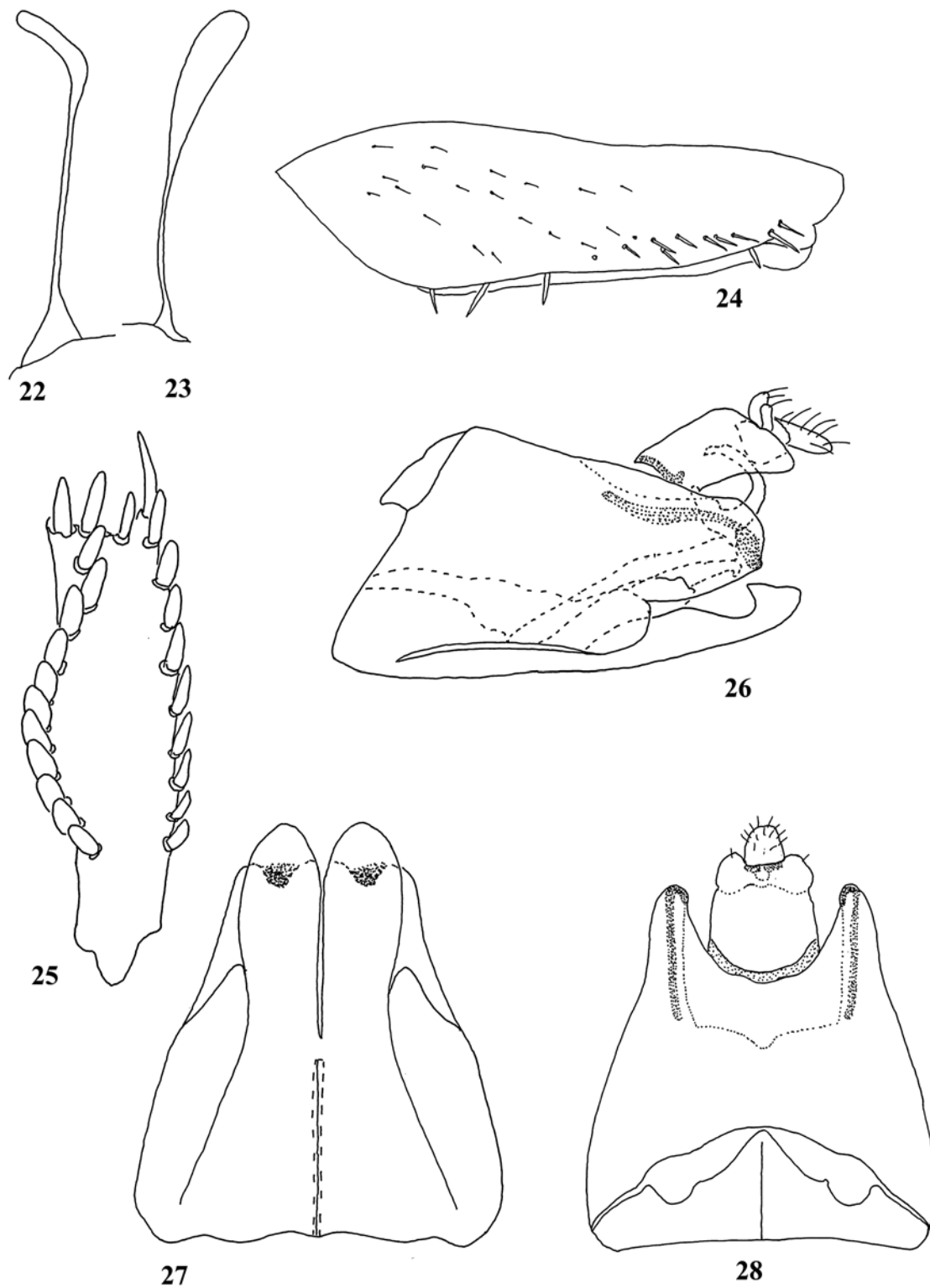




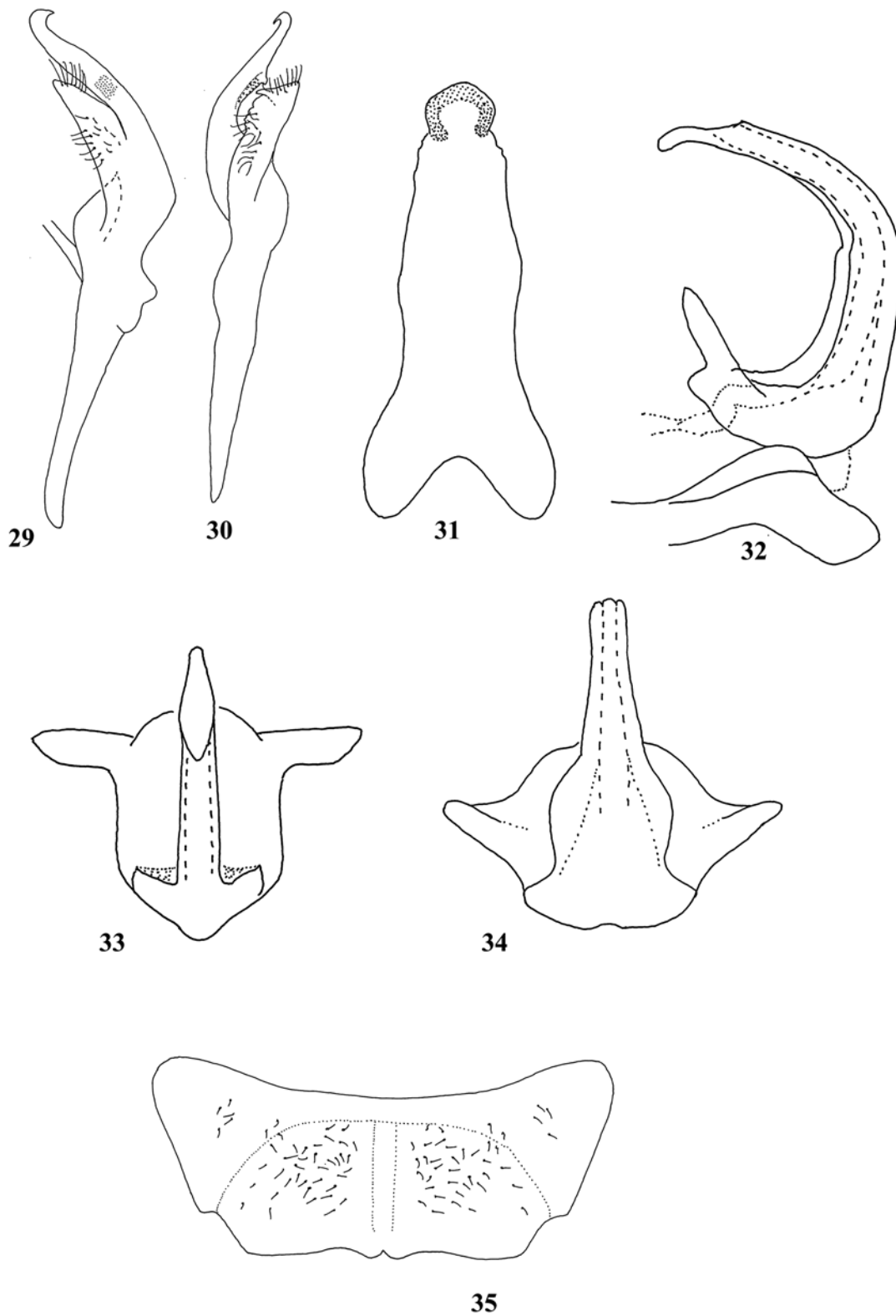
Figs. 1-12. Species of Adelungiini, 1-4. *Platyproctus maculatus* (Pruthi), male and female dorsal and lateral habitus, respectively; 5-8. *Assiuta omani* (Kameswara Rao & Ramakrishnan) comb. nov., male and female dorsal and lateral habitus, respectively. 9-10. *P. maculatus* (Pruthi), male and female face, respectively;



Figs. 13-21. Female valvulae of Adelungiini. 13-16. *Platyproctus maculatus* (Pruthi): 13 - First pair of valvula, lateral view; 14 - Apex of first pair of valvulae, magnified; 15 - Second pair of valvulae, lateral view; 16 - Apex of second pair of valvula magnified. 17-21. *Assiuta omani* (Kameswara Rao & Ramakrishnan) 17 - First pair of valvula, lateral view; 18-19. Apices of first pair of valvulae, magnified; 20 - Second pair of valvulae, lateral view; 21 - Apex of second pair of valvulae magnified.



Figs. 22-28. Species of Adelungiini. 22-23. Anterior tentorial arms of *Platyproctus maculatus* and *Assiuta omani*, respectively. 24-28. *P. maculatus*: 24 - Chaetotaxy of fore femur, mesal view; 25 - Chaetotaxy of metabasitarsus, ventral view; 26 - Male genital capsule, lateral view; 27 - Male genital capsule, ventral view; 28 - Male genital capsule, dorsal view.



Figs. 29-35. *Platyproctus maculatus*: 29, 30. Male style, dorsal and lateral view, respectively; 31 - Connective, dorsal view; 32 - Aedeagus and part of connective, lateral view; 33 - Aedeagus, dorsal view; 34 - Aedeagus, posterodorsal view; 35 - Female seventh sternite, ventral view.



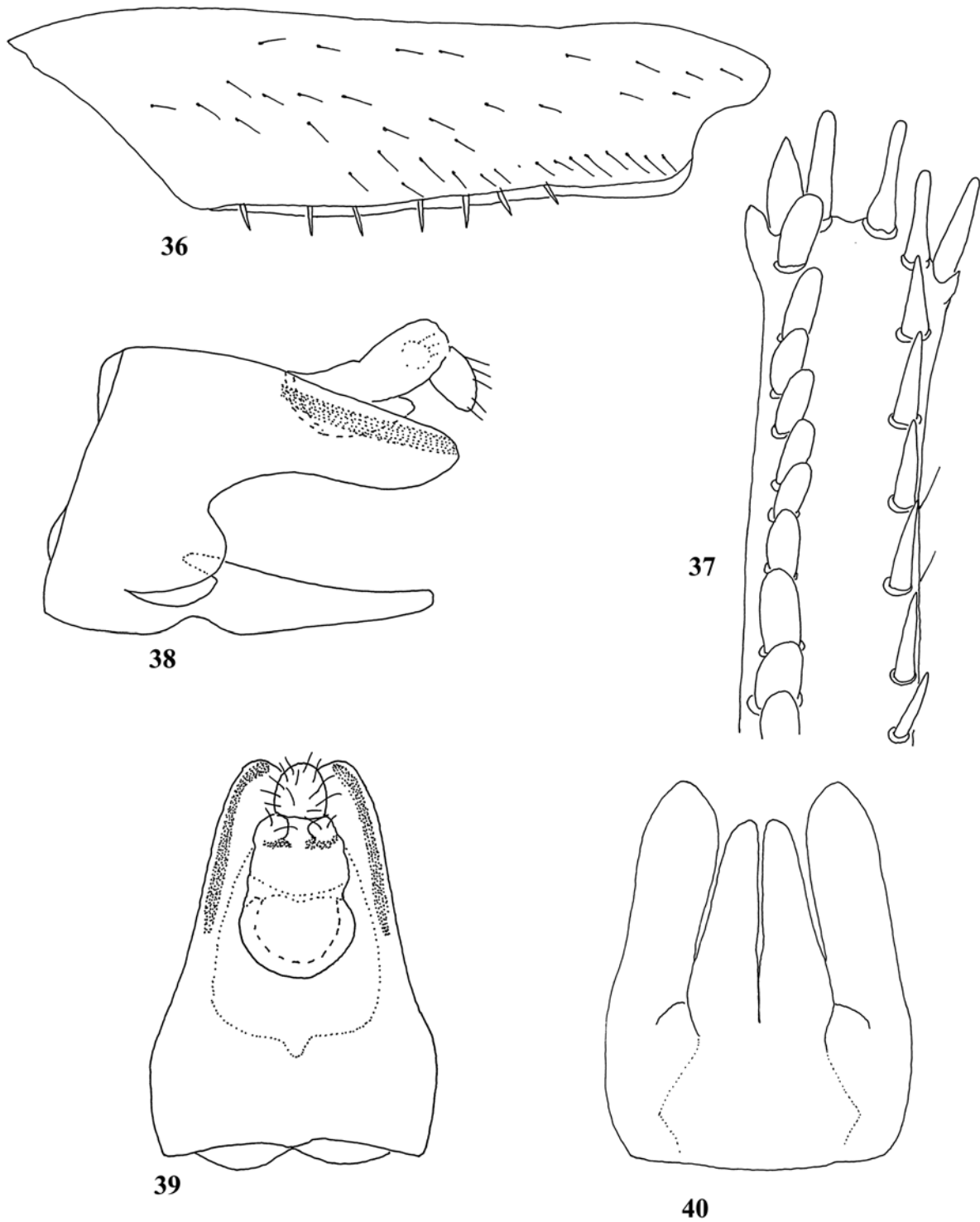
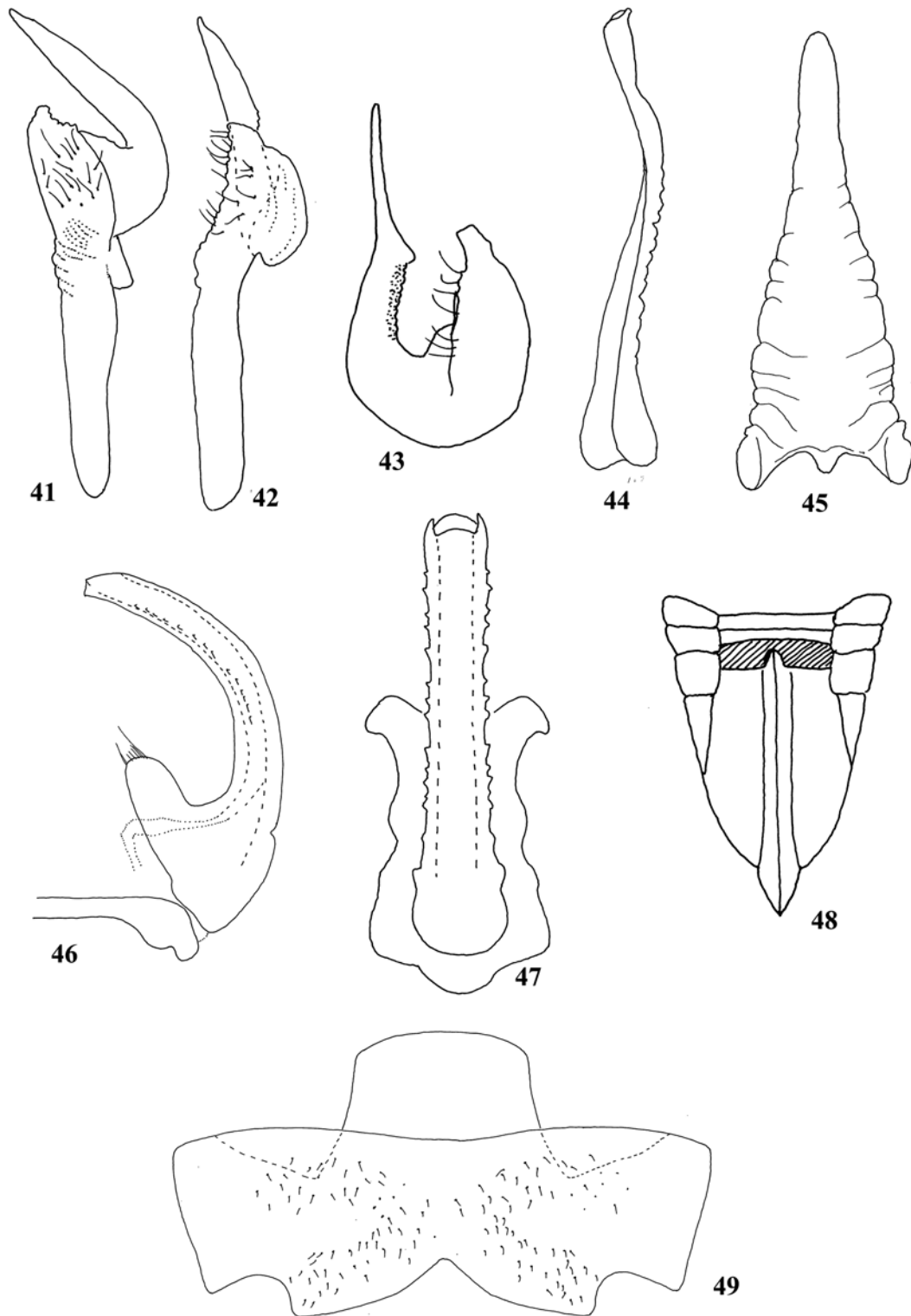
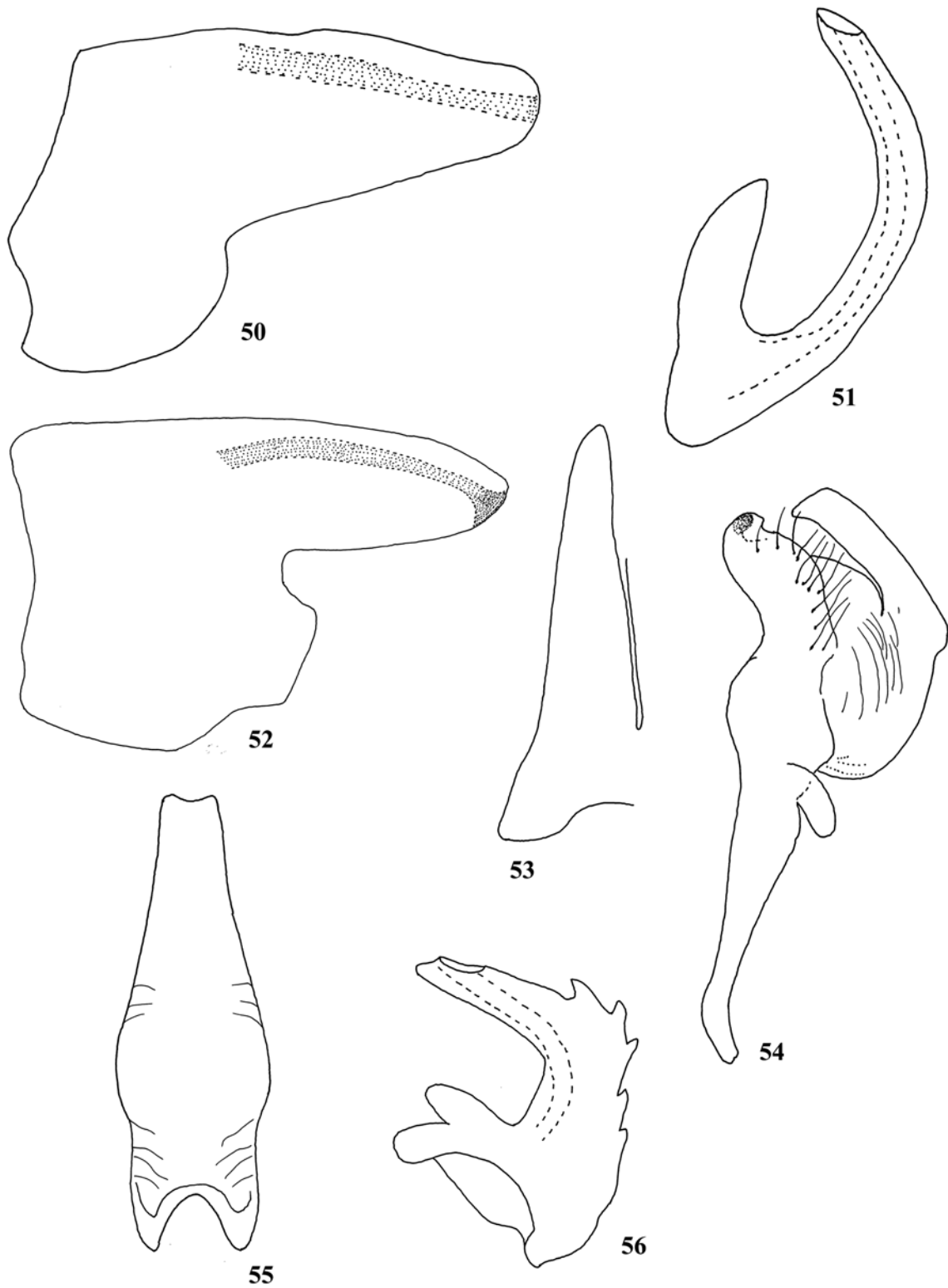


Fig.s 36-40. *Assiuta omani*: 36 - Chaetotaxy of fore femur, mesal view; 37 - Chaetotaxy of metabasitarsus, ventral view; 38 - Male genital capsule, lateral view; 39 - Male genital capsule, dorsal view; 40 - Male genital capsule, ventral view



Figs. 41-49. *Assiutao mani*: 41 - 42. Male style, dorsal and lateral view, respectively; 43 - Apophysis of style, posterodorsal view; 44 - 45. Connective, lateral and dorsal views; 46. Aedeagus and part of connective, lateral view; 47 - Aedeagus posterodorsal view; 48 - Posterior part of female abdomen, ventral view; 49 - Female seventh and eighth sternites, ventral view.



Figs 50-56. Species of *Assiuta*. 50-51. *Assiutacamena* Linnavuori: 50. Male pygofer, lateral view; 51. Aedeagus, lateral view. 52-56. *Assiutasalina* (Lindberg): 52. Male pygofer, lateral view; 53. Subgenital plate, ventral view; 54. Male style, dorsal view; 55. Connective, dorsal view; 56. Aedeagus, lateral view.

male with connective triangular and longer than aedeagus (Figs. 31, 45, 55)...Adelungiini

- Female first pair of valvulae with dorsoapical margin smooth; male with connective broad and much shorter than aedeagus, if longer than aedeagus (as in *Humpatagallia*), connective rod shaped ..... Agalliini

Emeljanov (1975) grouped the adelungiine genera into two groups, distinguishing the first group of genera (*Assiuta* and *Homogramma* Emeljanov) from the second group of genera (*Melicharella*, *Platyproctus* and *Pleopardus* Linnavuori) by the nature of the teeth on the second pair of valvulae and shape of the aedeagus. In *Assiuta* and *Homogramma* the second valvulae of the ovipositor has teeth in one uniform series (“uniform saw above”), on the other hand in the second group of genera (that includes *Platyproctus*), the second valvulae of the ovipositor have teeth in two series set at apposing angles with different denticles (“two parts set at an angle to one another and with different denticles”). The aedeagal shaft was stated as flattened laterally in *Assiuta* and *Homogramma* but tubular in the second group but *A. omani* and *A. camena* have a flattened aedeagal shaft.

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