

**STUDIES ON *PTEROMALUS* SWEDERUS (HYMENOPTERA:
CHALCIDOIDEA : PTEROMALIDAE) OF THE INDIAN
SUBCONTINENT WITH THE DESCRIPTION OF THREE NEW
SPECIES**

P. M. SURESHAN

Zoological Survey of India, Western Ghats Field Research Station, Calicut-673 002, Kerala

INTRODUCTION

Pteromalus Swederus is a cosmopolitan genus of Pteromalidae which includes over 100 species throughout the world (Boucek, 1988). They are mainly parasites in pupae of various Lepidoptera, Coleoptera, Hymenoptera, gall making Tephritidae (Diptera) etc., of which *P. puparum* (Linnaeus) is well known as a cosmopolitan parasite of Pieridae. Graham (1969) treated most of the European species of *Pteromalus* under *Habrocytus* Thomson but the latter was merged with *Pteromalus* by Boucek & Graham (1978) maintaining it as a subgenus.

So far only three species are known under *Pteromalus* from the Indian subcontinent viz., *P. puparum* (Linnaeus), *P. semotus* (Walker) and *P. sequester* Walker (Boucek *et. al.*, 1979). Here three new species are described under the genus from India. *P. semotus* (Walker) and *P. sequester* Walker are redescribed based on the study of the type material obtained from BMNH. A key to separate the species of *Pteromalus* of the Indian subcontinent is also provided.

Abbreviations used : F1-F6-Funicular segments 1 to 6; POL-Postocellar length; OOL-Ocellocular length; SMV-Submarginal vein; MV-Marginal vein; PMV-Postmarginal vein; STV-Stigmal vein; T1-Gastral tergite 1, BMNH-British Museum (Natural History), London, U.K.; ZSIC-Zoological Survey of India, Western Ghat Field Research Station, Calicut.

Key to the species of Pteromalus from the Indian subcontinent

1. Clypeus with anterior margin deeply incised medially, hence appearing almost bidentate (Fig. 1); propodeum (Fig. 24) with median area almost shiny with complete median carina
..... *sequester* Walker.
- Clypeus with anterior margin not as above, shallowly to moderately emarginate; propodeum with median area finely or moderately reticulate; median carina not complete, if complete, only vaguely indicated 2

2. Propodeum (Figs. 10, 23) with costula indicated, plicae not complete, not reaching hind margin of nucha 3
 — Propodeum (Figs. 21, 22, 25) with costula not indicated, plicae complete, reaching hind margin of nucha 4
3. Gaster (Fig. 15) elongate, 1.2x as long as head plus mesosoma combined, length 2.6x width in dorsal view; antennal scape reaching to upper margin of median ocellus; F1 (Fig. 4) longer than pedicel (6 : 5), clava as long as two preceding segments combined; body dark metallic blue *metallicus* sp. nov.
 — Gaster (Fig. 8, 12) short, a little shorter than head plus mesosoma combined, length 1.6x width in dorsal view; scape hardly reaching median ocellus; F1 a little shorter than pedicel (0.8 – 0.9x); clava a little shorter than two preceding segments combined; body black *keralensis* sp. nov.
4. Propodeum (Fig. 21) with nucha long, medially propodeum 0.7x as long as scutellum; POL as long as OOL; gaster (Fig. 16) shorter than head plus mesosoma combined; temple (Fig. 19) wide, length 0.6x eye length *puparum* (Linnaeus).
 — Propodeum with nucha short, medially propodeum 0.4 – 0.5 x as long as scutellum; POL 1.8 to 2x OOL; gaster longer than head plus mesosoma combined; temple narrow, length 0.3 – 0.4x eye length 5
5. Antennae (Fig. 5) with F1 longer than pedicel; propodeum (Fig. 22) medially 0.4x as long as scutellum; gaster (Fig. 17) 1.3x as long as head plus mesosoma combined and 2.5x as long as wide in dorsal view; MV (Fig. 7) 2x as long as STV; POL 2x OOL *nigrus* sp. nov.
 — F1 little shorter than pedicel; propodeum (Fig. 25) medially 0.5x as long as scutellum; gaster (Fig. 14) 1.1x as long as head plus mesosoma combined and 2.1x as long as wide; MV short, 1.1 – 1.6x as long as STV; POL 1.8x OOL *semotus* (Walker)

1. *Pteromalus sequester* Walker

(Figs. 1, 3, 13, 24)

1835. *Pteromalus sequester* Walker : *Ent. Mag.* 2 : 495.

1914. *Habrocytus medicaginis* Gahan : *Proc. U. S. natn. Mus.* 48. 163–164. (Synonymy by Bouček, 1988 : 432.)

For lectotype selection and various synonyms see Graham, 1969 : 554–555.

The species is redescribed here based on the study of the lectotype of *Pteromalus sequester* Walker selected by Graham, 1969 : 554.

Female : Length 3 mm. Head and mesosoma metallic bluish green; gaster mostly brown with metallic blue reflection on T1 and dorsolateral sides. Antennae with scape testaceous, remainder dark brown. Coxae concolorous with mesosoma; femora dark brown, remainder of legs testaceous with tips of tarsi brown. Tegulae dark brown; wings hyaline; veins brown.

Head : Closely and moderately reticulate, pubescence short and sparse; clypeus (Fig. 1) radiately striated, anterior margin deeply incised medially. In dorsal view head width 2x length; POL 1.4x OOL; temple round, length 0.6x eye length; eye height 1.7x width. Antennal scape nearly reaching level of vertex, pedicel plus flagellum length 0.9x head width; pedicel as long as F1; proximal funicular segments longer than wide, distal segments subquadrate or at most the sixth transverse; clava as long as two preceding segments combined.

Mesosoma : Moderately reticulate; pubescence short and sparse. Mesoscutum width 1.5x length. Scutellum medially 0.83x as long as mesoscutum, slightly longer than broad, frenal line indicated on sides. Propodeum (Fig. 24) shiny, median carina complete; propodeal nucha represented only by a narrow, transverse strip; spiracles elongate, oval, close to hind margin of metanotum. Forewing almost bare in the basal half, otherwise pubescence moderately dense; costal cell hairy towards the tip. Relative lengths : SMV 35, MV 18.5, PMV 15, STV 12.

Gaster : (Fig. 13) Dorsally collapsing, elongate, in dorsal view length 2x width and 1.3x as long as head plus mesosoma combined.

Material examined : Lectotype : Female : ENGLAND (BMNH type Hym. 5. 2754) Det. Graham, 1968.

2. *Pteromalus semotus* (Walker)

(Figs. 14, 18, 25)

1834. *Eutelus semotus* Walker : *Ent. Mag.* 2 : 367.

1906. *Etroxys marginicolis* Cameron, *J. Bombay. Nat. Hist. Soc.* 17 : 97. (Synonymy by Boucek *et. al.*, 1979 : 454).

1953. *Habroclytus milleri* Delucchi & Verbeke : *Bull. Inst. r. Sci. nat. Belg.* 29(3) : 1–14. (Synonymy by Graham, 1969 : 529).

For various synonyms see Graham, 1969 : 529–531.

The species is redescribed here based on the study of the lectotype of *Etroxys marginicolis* Cameron.

Female : Length 2.8mm. Body dark metallic green with golden reflection, prominent on dorsal part of gaster. Antennae testaceous. Coxae concolorous with mesosoma, femora brown, remainder of legs pale yellow. Tegulae brown; wings hyaline, veins yellow.

Head : (Fig. 18) Reticulation and pubescence as in *P. sequester*. In dorsal view head width 2x length; POL 1.8x OOL; temple length 0.4x eye length. In front view head width 1.3x height; eyes separated by 1.3x their height; malar space length 0.5x eye height; eye height 1.5x width; anterior margin of clypeus weakly emarginate; malar grooves weakly indicated. Antennae with scape reaching to upper margin of median ocellus, length 0.9x eye height; pedicel little longer than F1 (4.5 : 3.5).

Mesosoma : Reticulation and pubescence as in *P. sequester*; anterior margin of pronotum sharp, not margined. Scutellum slightly longer than broad, medially 0.8x as long as mesoscutum, frenal line indicated on the sides. Propodeum (Fig. 25) with median area moderately reticulate, lateral area

finely reticulate, medially propodeum 0.5x as long as scutellum, nucha short. Metapleuron finely reticulate. Forewing with pubescence less dense, marginal fringe short. Relative lengths : SMV 31, MV 13, PMV 15.5, STV 11.5.

Gaster : (Fig. 14) Little longer than head plus mesosoma combined (62 : 55) and 2.1x as long as broad in dorsal view.

Material examined : Lectotype : Female : PAKISTAN : Quetta, 7.03. Nurse coll. 1915–34. (BMNH type Hym. 6.704), Det. Boucek, 1978.

Other material examined : 1 Female, INDIA : Kerala; Trichur district, Vazhani, 7.ii.1989; 1 Female, Waynad district, Thariyod, 22.ii.1988; 2 Female, Ernakulam, 9.ii.1989; 1 Female, Kannur district, Kannavam forest, 1.ii.1995; Coll. P. M. Sureshan; 25 Female, Malappuram district, Calicut University campus, 1987–1989, Coll. T. C. Narendran & party; 15 Female, Idukki district, Eravikulam National Park, 1993–1995, Coll. P. M. Sureshan (in ZSI. Calicut).

3. *Pteromalus puparum* (Linnaeus)

(Figs. 2, 6, 16, 21)

1758. *Ichneumon puparum* Linnaeus : *Syst. Nat.* 1 : 567

For lectotype designation and various synonyms see Graham, 1969 : 489–490.

Description of the species is provided below based on the study of Indian specimens.

Female : Length 2.4–3 mm. Body dark metallic blue. Antennae with scape testaceous, remainder brown. Coxae concolrous with mesosoma, femora dark brown except tips and remainder of legs testaceous with tips of tarsi brown. Tegulae dark brown, wings hyaline, veins pale brown.

Head : Moderately and closely reticulate, pubescence short and sparse. In dorsal view head width 2.1x length and in front view width 1.5x height; temple length 0.6x eye length; POL as long as OOL; eyes separated by 1.7x their height; eye height 1.7x width; malar space length 0.7x eye height; malar grooves weakly indicated; anterior margin of clypeus shallowly emarginate. Antennae (Fig. 2) with scape reaching level of vertex, little shorter than eye height (0.9x), combined length of pedicel plus flagellum equal to head width; F1 longer than pedicel; funicular segments longer than wide; clava almost equal to two preceding segments combined.

Mesosoma : Reticulate punctate; pronotal collar distinctly narrower than head, width 7.7x length. Mesoscutum width 2x length. Scutellum medially little longer than mesoscutum (20.5 : 19), frenal line vaguely indicated. Propodeum (Fig. 21) medially 0.7x as long as scutellum, median area moderately reticulate, lateral area finely reticulate, median carina vaguely indicated; plicae complete, nucha long, about one third as long as propodeum. Forewing (Fig. 6) with basal part almost bare, costal cell hairy on the upper part, basal hairline indicated. Relative lengths : SMV 42, MV 20, PMV 21, STV 13.

Gaster : (Fig. 16) Ovate, shorter than head plus mesosoma combined and 1.6x as long as broad in dorsal view.

Material examined : 1 Female : INDIA : Kerala : Palghat district, Anakkatty, 12.xii.1987; 1 Female, Palghat district, Mukali, 10.xii.1987, Coll. P. M. Sureshan; 1 Female, Wynad district, Sultan's Battery, 19.ix.1985, Coll. T. C. Narendran (in ZSI, Calicut).

4. *Pteromalus metallicus* sp. nov.

(Figs. 4, 15, 23)

Female : Length 2.6–3.6 mm (Holotype 3.6 mm). Head and mesosoma dark metallic blue with bronzy reflection; gaster blackish blue, T1 dorsally with strong metallic blue reflection. Antennae testaceous with scape and pedicel pale. Coxae concolrous with mesosoma, femora dark brown except tips and remainder of legs yellow with tips of tarsi brown. Tegulae pale brown, wings hyaline, veins yellow.

Head : Moderately reticulate, reticulation finer on lower face and gena, pubescence small and sparse; clypeus radiately striated, anterior margin moderately emarginate; in dorsal view head width 2.3x length and in front view width 1.2x height; temple length 0.6x eye length; POL 1.5x OOL; eyes separated by 1.4 their height; eye height 1.6x width; malar space length 0.5x eye height; scape length 0.9x eye height; pedicel plus flagellum (Fig. 4) length 0.9x head width, pedicel little shorter than F1; clava as long as two preceding segments combined.

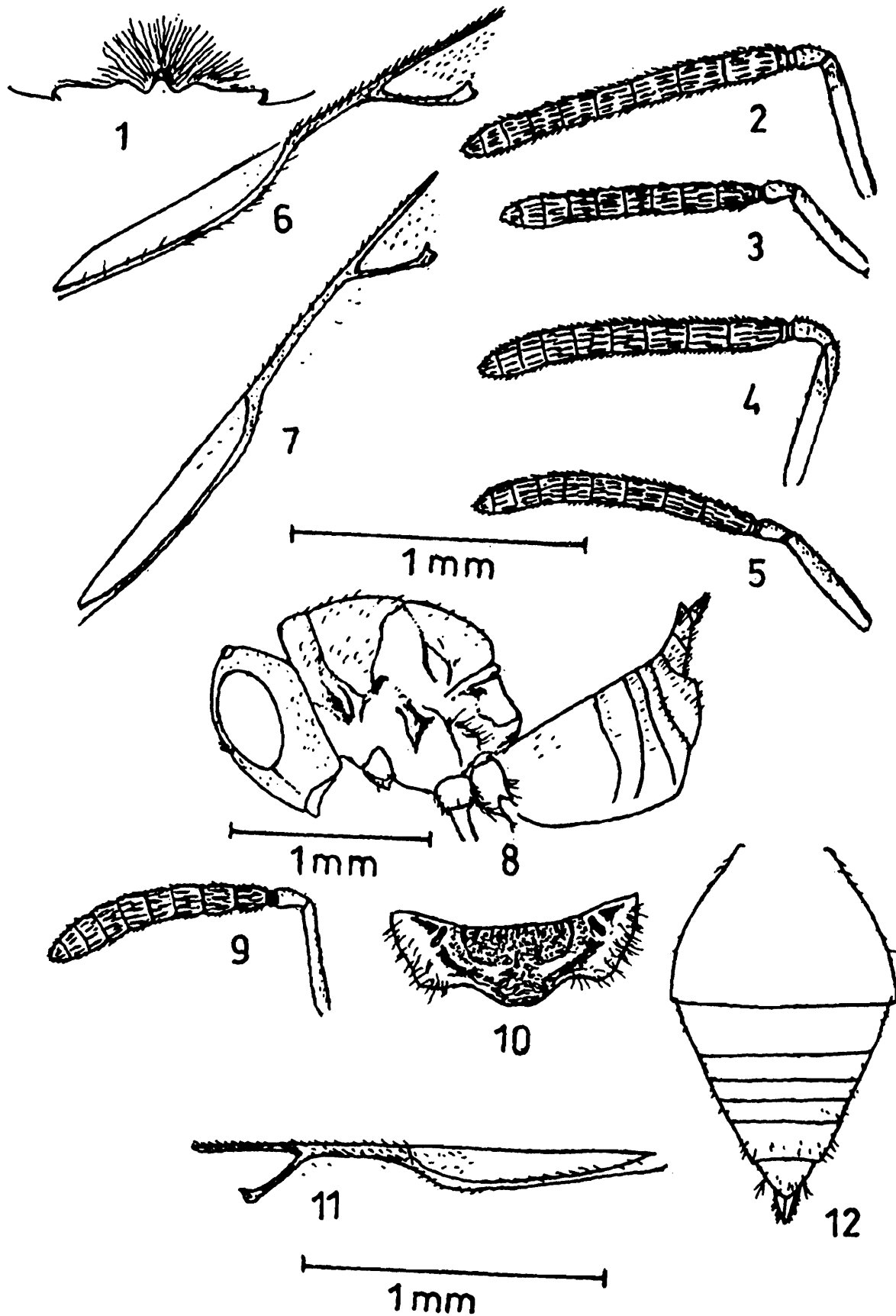
Mesosoma : Distinctly reticulate punctate. Pronotal collar anteriorly sharp. Mesoscutum width 2.1x length. Scutellum medially little longer than mesoscutum (21 : 20). Propodeum (Fig. 23) medially 0.6x as long as scutellum, median area moderately reticulate, other areas and nucha finely reticulate, median carina indicated only anteriorly, plicae not indicated beyond weak costula, the area in front of costula slightly depressed, spiracles oval, elongate, very close to metanotum. Forewing with costal cell hairy towards the tip, basal hairline indicated by 3 or 4 hairs. Relative lengths : SMV 40, MV 19, PMV 18, STV 12.

Gaster : (Fig. 15) 1.2x as long as head plus mesosoma combined, in dorsal view length 2.6x width, lanceolate.

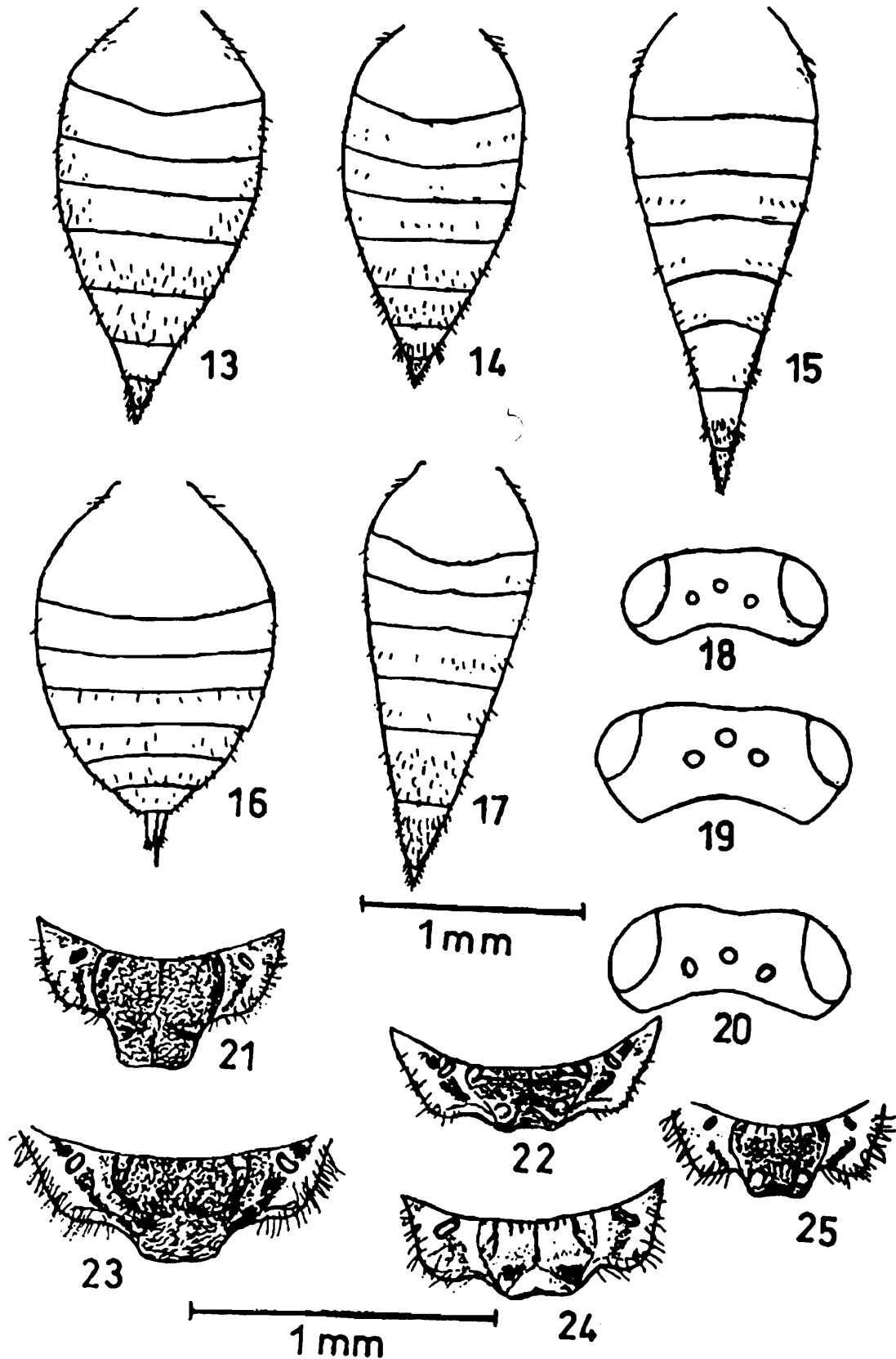
Male : Length 2.2 mm. Resembles female but differs in having gaster short and compressed, with a yellow spot dorsally on basal half, antennae with dense pubescence.

Holotype : Female : INDIA : Kerala, Kannur district, Tellicherry, 4.ii.1995, Coll. P. M. Sureshan; *Paratypes* : 4 Female, 1 Male, same data as that of holotype; 1 Female, Kerala, Kannur district, Kottiyoor Forest, 2.ii.1995, 1 Female, Kannavam forest, 1.ii.1995, 1 Female, Malappuram district, Calicut University campus, ix.1985; 1 Female, Alappuzha district, Kayamkulam, 19.ii.1989; 1 Female, Karnataka, Coorg district, Nemanakolly, 7.ii.1994, Coll. P. M. Sureshan (in ZSI, Calicut).

Remarks : This species resembles *P. integer* (Walker) in having propodeum with posterior part of plicae strongly converging, median area with a costula, in body colour and large size but differs in having proximal segments of antennal funicle longer than wide and F1 longer than pedicel (in *integer* proximal segments of antennal funicle subquadrate and F1 hardly as long as pedicel).



Figs. 1-12. *Pteromalus* spp. 1, *P. sequester* Walker, female, clypeus; 2, *P. puparum* (Linnaeus) female, antenna; 3, *P. sequester* Walker, female antenna; 4, *P. metallicus* sp. nov. female, antenna; 5, *P. nigrus* sp. nov. female antenna; 6, *P. puparum* (Linnaeus), female, forewing venation; 7, *P. nigrus* sp. nov. forewing venation; 8-12. *P. keralensis* sp. nov. female, 8, body in profile; 9, antenna; 10, propodeum in dorsal view; 11, forewing venation; 12, gaster in dorsal view.



Figs. 13–25. *Pteromalus* spp. gaster in dorsal view. 13, *P. sequester* Walker, 14, *P. semotus* (Walker); 15, *P. metallicus* sp. nov.; 16, *P. puparum* (Linnaeus); 17, *P. nigrus* sp. nov.; 18–20. *Pteromalus* spp. head in dorsal view. 18, *P. semotus* (Walker); 19, *P. puparum* (Linnaeus); 20, *P. nigrus* sp. nov.; 21–25. *Pteromalus* spp. propodeum in dorsal view. 21, *P. puparum* (Linnaeus), 22, *P. nigrus* sp. nov.; 23, *P. metallicus* sp. nov.; 24, *P. sequester* Walker; 25, *P. semotus* (Walker).

5. *Pteromalus nigrus* sp. nov.

(Figs. 5, 7, 17, 20, 22)

Female : Length 1.8–3.8 mm (Holotype 3.2 mm) Head and mesosoma bluish black; gaster brownish black with blue reflection mainly on dorsal and lateral areas. Antennae with scape and pedicel testaceous, remainder dark brown. Coxae concolrous with mesosoma, femora brown, remainder of legs pale testaceous with tips of tarsi brown. Tegulae brown, wings hyaline, veins pale brown.

Head : (Fig. 20) Uniformly and finely reticulate, 1.1x as broad as mesosoma, in dorsal view width 2.2x length and in front view width 1.3x height; vertex narrow, abruptly sloping; temple narrow, length 0.3x eye length; POL 2x OOL; anterior margin of clypeus emarginate; malar space length 0.34x eye height; eye height 1.5x width; eyes separated by 1.3x their height. Antennae (Fig. 5) inserted below centre of face, scape length 0.7x eye height, combined length of pedicel plus flagellum 0.9x head width; F1 1.5x as long as pedicel, all funicular segments longer than wide; clava as long as two preceding segments combined.

Mesosoma : Moderately reticulate. Mesoscutum width 1.8x length. Scutellum with frenal line vaguely indicated, medially 0.84x as long as mesoscutum. Propodeum (Fig. 22) with median area finely reticulate, medially 0.4x as long as scutellum; median area with two transverse depressions connecting basal and apical foveae of both sides; plicae less sharp, spiracles large and oval, median carina vaguely indicated at the base. Forewing (Fig. 7) length 2.2x width; pubescence less dense, basal hair line not indicated. Relative lengths : SMV 34, MV 20.5, PMV 16.5, STV 10.5.

Gaster : (Fig. 17) Elongate, 1.3x as long as head plus mesosoma combined and 2.5x as long as wide in dorsal view; hind margin of T1 produced.

Holotype : Female : INDIA : Kerala : Palghat district, Malampuzha, i.1986, Coll. P. M. Sureshan;
Paratypes : 1 Female, same data as that of holotype; 1 Female, Malampuzha, 13.i.1986; 1 Female, Palghat district, Kalkandi, 13.xii.1987; 3 Female, Malampuzha, 21.v.1985, 15.i.1986, 21.ii.1997, Coll. P. M. Sureshan (in ZSI, Calicut).

Remarks : This species resembles *P. fasciatus* Thomson in the nature of propodeum, pronotum and having longer MV but differs in having scape not reaching level of vertex and upper surface of mesoscutum not distinctly curved (in *fasciatus* scape raching level of vertex or even slightly above it and upper surface of mesoscutum distinctly curved).

6. *Pteromalus keralensis* sp. nov.

(Figs. 8–12)

Female : Length 1.4–2.4 mm (Holotype 2.2 mm). Body black with metallic blue reflection on dorsal part of gaster. Antennae with scape and pedicel testaceous, remainder pale brown. Coxae concolrous with mesosoma, femora dark brown except at tips and remaining parts testaceous with tips of tarsi brown. Tegulae dark brown; wings hyaline, veins pale brown.

Head : (Fig. 8) Moderately and closely reticulate; pubescence sparse and small. In dorsal view head width 2.4x length and in front view width 1.3x height; temple length 0.5x eye length; POL 1.8x OOL; malar grooves indistinct; malar space length 0.5x eye height; eye height 1.7x width; eyes separated by 1.5x their height; clypeus anteriorly emarginate. Antennae (Fig. 9) with scape hardly reaching median ocellus, length 0.8x eye height; pedicel plus flagellum length 0.8x head width; F1 almost equal to pedicel; F1–F3 longer than wide; F4 sub quadrate; F5 and F6 quadrate; clava 1.2x as long as two preceding segments combined.

Mesosoma : (Fig. 8) Moderately reticulate, pubescence less distinct; anterior margin of pronotal collar rounded. Mesoscutum width 2.1x length. Scutellum medially as long as mesoscutum. Propodeum (Fig. 10) medially half as long as scutellum, median area closely and moderately reticulate, otherwise finely reticulate, almost shiny; median carina vaguely indicated; plicae distinct; costula indicated, nucha moderate; spiracles large and oval, almost touching metanotum. Forewing (Fig. 11) length 2.4x width, almost bare on the basal part, costal cell hairy towards the tip. Relative lengths : SMV 30, MV 15.5, PMV 13, STV 9.

Gaster : (Figs. 8, 12) Short, ovate, length 1.6x width, little shorter than head plus mesosoma combined (0.9x), length 1.6x width in dorsal view.

Male : Length 1.9 mm. Resembles female but differs in having gaster compressed with an yellow spot at base and flagellum with pubescence dense.

Holotype : Female : INDIA : Kerala, Alappuzha district, Kayamkulam, 19.ii.1989, Coll. P. M. Sureshan; **Paratypes :** 1 Male, 1 Female, Kerala : Palghat district, Anakkatty, 7.i.1989; 19 Female, Ernakulam, 9.ii.1989, 6 Female, data same as that of holotype; 2 Female, Kerala, Eravikulam National Park, 28.ii.1995, 1 Female, Kerala : Parambikulam wild life sanctuary, Anappady, 6.v.1989; 1 Female, Karnataka : Coorg district, Sollekolly, 6.iii.1994; 1 Female, Kerala : Kannur district, Aralam farm, 25.ii.1988, Coll. P. M. Sureshan; 1 Female, Kerala : Palghat district, Silent valley, 30.xii.1988; 13 Female, Kerala : Malampuzha, i.1986, Coll. Narendran & party (in ZSI, Calicut).

Remarks : In the nature of propodeum, gaster and forewing venation this species resembles *P (H) scandiae* Graham but differs in having antennal flagellum proximally stouter than pedicel, pedicel as long as F1, mesoscutum 2.1x as broad as long (in *scandiae* antennal flagellum proximally not stouter than pedicel, pedicel distinctly longer than F1, and mesoscutum about 1.6x as broad as long).

SUMMARY

Three new species of *Pteromalus* Swederus viz. *P. metallicus*, *P. nigrus* and *P. keralensis* are described from India. *P. sequester* Walker and *P. semotus* (Walker) are redescribed from the lectotype.

ACKNOWLEDGEMENTS

I am grateful to the Director, Zoological Survey of India, Calcutta and the Officer-in-charge, Zoological Survey of India, Western Ghats Field Research Station, Calicut for providing facilities

and encouragement. I am also grateful to Dr. John. S. Noyes and Miss. Suzanne Lewis, BMNH, London for providing the type material on loan and to Dr. T. C. Narendran, University of Calicut for encouragement and useful suggestions.

REFERENCES

- Boucek, Z., 1988. Australasian Chalcidoidea (Hymenoptera) CAB. International, Wallingford, U. K. pp. 832.
- Boucek, Z. & Graham, M. W. R. de V., 1978. British check-list of Chalcidoidea (Hymenoptera) : taxonomic notes and additions – *Entomologist's Gaz.* **29** : 225–235.
- Boucek, Z., Subba Rao, B. R. & Farooqi, S. I., 1979. A preliminary review of Pteromalidae (Hymenoptera) of India and the adjacent countries. *Oriental Ins.* **12** : 433–467.
- Graham, M. W. R. de V. 1969. The Pteromalidae of North-Western Europe (Hymenoptera : Chalcidoidea). *Bull. Br. Mus. nat. Hist. Ent. Suppl.* **16** : 1–908.