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FOUR NEW SPECIES OF CHALCIDOIDEA (HYMENOPTERA) FROM INDIA

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Three new species of Torymidae viz., *Palachia frontopuncta* Narendran sp. nov., *Palachia neorobusta* Narendran sp. nov., *Palmon kottiyooricus* Narendran sp. nov. and one new species of Eulophidae viz., *Kostjurixia laharaensis* Narendran sp. nov. are described from India and the differences from the closely resembling species are provided.

Keywords : *Palachia frontopuncta* Narendran sp. nov., *Palachia neorobusta* Narendran sp. nov., *Palmon kottiyooricus* Narendran sp. nov., *Kostjurixia laharaensis* Narendran sp. nov.

INTRODUCTION

The genus *Palachia* Bouček is represented by seven species from the Indian subcontinent. They are *Palachia mangalae* Narendran, *P. punctifronta* Narendran and Sureshan, *P. punctigastra* Narendran and Sureshan, *P. hayati* Narendran and Sureshan, *P. robusta* Bouček, *P. farooqii* Bouček, and *P. grisselli* Bouček (Bouček, 1976, 1998; Narendran; 1984, 1994; Narendran and Sureshan, 1988). Farooqi *et. al.*, (1990) described a new species of *Palachia* viz., *P. indica* which is synonymised with *P. hayati* by Bouček (1998). Grissell, (1995) gave a world catalogue of *Palachia* in his work on Toryminae. In the present paper two more new species viz., *Palachia frontopuncta* Narendran sp. nov., and *P. neorobusta* Narendran sp. nov. are described. The genus *Palmon* Dalmon is represented by *P. greeni* (Crawford), *P. orchesticus* (Masi), and *P. alfredi* Sureshan from the Indian subcontinent. Besides these two more species viz., *P. ashmeadi* (Crawford) and *P. megarhopalus* (Masi) are known from other regions of the Orient (Narendran, 1994; Grissell; 1995, Sureshan, 2003). A new species *P. kottiyooricus* is described here from India. A key to the Oriental species of *Palmon* is also provided. The genus *Kostjurixia* Narendran (Eulophidae : Tetrastichinae) is so far known only by its type species viz., *K. ootiyensis* Narendran (Narendran, 2007). Another new species from Himachal Pradesh is described in this paper.

MATERIALS AND METHODS

The holotypes of *Palachia frontopuncta*, *P. neorobusta* and *Kostjurixia laharaensis* are deposited in the NPCI and *Palmon kottiyooricus* is deposited in DZUC (eventually will be transferred to NZSI). The terms and measurements follow Boucek (1998) and Narendran (1994).

Abbreviations used : F1-F7 = Funicular segments; MS = Malar sulcus; OOL = Ocellocular distance; PMV = Postmarginal vein; POL = Postocellar distance; SMV = Submarginal vein; STV = Stigmal vein; SMG = Scutellar grooves; MV = Marginal vein; T1 = First tergite; CC = Costal cell.

Depositaries : DZUC = Department of Zoology, University of Calicut, India; NPCI = National Pusa Collection, Division of Entomology, Indian Agricultural Research Institute, New Delhi; NZSI = National Zoological Collections, Zoological Survey of India, Kolkata; ZDAMU = Zoology Department, Aligarh Muslim University.

Family TORYMIDAE

1. *Palachia frontopuncta* Narendran sp. nov.

(Figs. 1-4)

Holotype : *Female* : Length 2.27 mm. Ovipositor length 2 mm. Black with blue and violet refringence on head, green and blue refringence on mesoscutum, anterior part of propodeum, bronze refringence on pronotum (collum yellow), scutellum and a dark patch on hind coxa and on some parts of metasoma; antenna dark brown except pale yellow F4, F5, F6 and scape. Legs pale brownish yellow with a dark patch on dorsal side of hind coxa; pretarsi dark brown; gastral petiole pale yellow; gaster black with weak bronze refringence on some parts; ovipositor pale brownish yellow.

Head : 1.4x as broad as pronotum with large eyes; sculpture finely punctate without smooth part between ocelli and eyes (Fig. 1); vertex not elevated; POL = 17; OOL = 4; scrobe sculptured; MS indistinct, face not protuberant at toruli; scrobe moderately deep, ending vaguely about three ocellar diameters below from ocellus; scrobe reticulate; interantennal ridge narrow, reticulate, lower than slightly raised lateral sides of each torulus which continue downward as cross-striate areas separated by slight median depression; clypeus reticulate, lower margin mostly entire without a distinct median tooth; gena in lower half moderately convex; head length in front view equal to its width, upper face 1.57x as broad as high.

Relative measurements : head width = 11; length = 11; eye height 1.11x its width in side view, 4x length of MS; antennal flagellum plus pedicel 1.5x as long as width of head in front view; pedicel a little over 2.1x as long as broad; anellus subquadrate; funicular segments gradually widening, scape reaching front ocellus; clava as long as combined length of five preceding segments,

with micropilosity beneath, F2 at apex as broad as pedicel; F1 2x F7, 0.73x as long as broad; F4 barely longer than broad (Fig. 2).

Mesosoma : > 1.36 x as long as broad; weakly cross striate, remaining part strongly reticulate, pronotum 0.6x as long as its width; mesoscutum 0.67x as long as its width, longer than pronotum; scutellum wider than long, about as long as mesoscutum; mesoscutum and scutellum with strong raised reticulation; propodeum with strong reticulation, a little longer than scutellum, declining 70° to longitudinal axis of mesosoma, anteriorly a little depressed with a few short rugae at sides. Mesopleuron anterolaterally with distinct epicnemial edge, behind it almost flat and reticulate; mesepimeron smooth on upper anterior side, reticulate on lower side; mesopleuron with distinct crenulate groove along half length of metapleural margin. Legs rather strong, though tibiae and tarsi slender; hind coxa < 2.71x hind femur, 3.45x (teeth excluded) as long as broad, coxa with a longitudinal (Fig. 3) row of short white pilosity on dorsal margin in side view; femur with a teeth confined to distal half. Forewing about 3x as long as broad. Relative length of costal cell = 47, MV = 32; PMV = 13.7; STV = 5; stigma knobbed, with slight infumation near parastigma (Fig. 4).

Metasoma : Petiole a little longer than broad; gaster strong with faint traces of wide meshed reticulation; hypopygium reaching apex of gaster; ovipositor 2.5x as long as hind tibia; metasoma a little longer than mesosoma (19 : 17).

Male : Similar to female except mainly : (1) antenna not clavate, brown with scape paler on ventral part; (2) head metallic green; (3) hind coxa concolourous with dark mesosoma with apex pale; (4) hind tibia black with base and apex pale; (5) colour in general darker than that of female.

Biology : Unknown.

Material Examined : *Holotype* : Female, India : Himachal Pradesh, Hamirpur, Anu kalan, 1.vii.2006. Coll. S.M.A. Badruddin & F.R. Khan (Deposited in NPCI). *Paratypes* : 1 Female and 2 males of same data of Holotype (1 Female and 1 male in ZDAMU).

Discussion : This species comes near *Palachia punctifronta* Narendran and Sureshan in having vertex with dense reticulations but differs from it in having (1) no smooth area between hind ocelli and eyes; (2) PMV shorter than half length of MV; (3) crenulate groove of mesopleuron short and not running full margin of metanotum and in several other character. This new species comes to *Palachia hayati* Narendran & Sureshan in the key to species by Boucek (1998) and by Narendran and Sureshan (1989) but differs from *P. hayati* in having : (1) T1 black with yellowish brown tinge on sides anteriorly (in *P. hayati* T1 completely metallic green), (2) in female head black with blue and violet refringence (in *P. hayati* head metallic green); (3) colour of other parts darker (not so in *P. hayati*); (4) mesosoma > 1.36x as long as wide (in *P. hayati* mesosoma 1.88x as long as wide); (5) mesepimeron smooth and shiny on upper anterior part (completely reticulate in *P. hayati*); and (6) pronotal ledge, column and petiole pale yellow (not so in *P. hayati*). This new species

comes very close to *Palachia pulchra* Boucek in having column, lateral pronotal ledges as well as petiole and anterior part of T1 pale yellow or pale brownish yellow. However it differs from *P. pulchra* in very many characters and does not fit to the couplet of *pulchra* in the key to species by Boucek (1998).

2. *Palachia neorobusta* Narendran sp. nov.

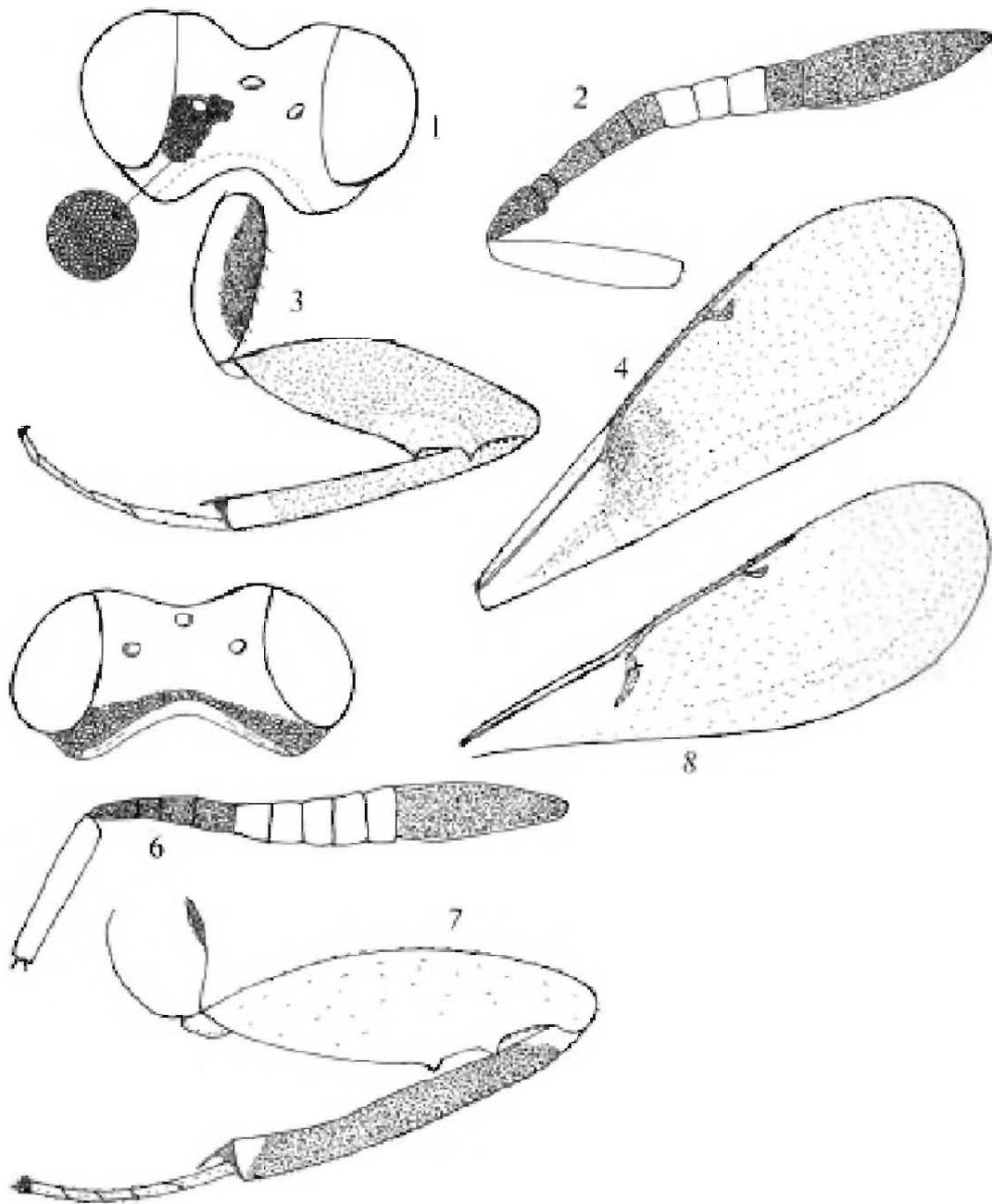
(Figs. 5-8)

Holotype : Female : Length 1.933 mm plus ovipositor 2.48 mm. Lower frons, face, gena bright metallic green; pronotum with lateral perpendicular panel and collum pale yellow, anterior half of remaining part dark metallic green, posterior half dark with slight bronze refringence; mid lobe of mesoscutum dark violet blue; most of scapulae and scutellum dark with bronze refringence; propodeum bright metallic greenish blue with bright bronze area in middle; antenna with scape, F3 to F7 pale yellow; pedicel, anellus, F1 and F2 brown; clava black; fore and mid legs pale yellowish white; hind coxa pale yellowish white with a small brownish patch on dorsal side, dorsal inner half of femur pale brown with ventral half pale yellowish white; hind tibia brown with base and apex pale; tarsi pale yellowish white; hind tibia brown with base and apex pale; tegula pale yellowish white; petiole pale yellowish white; gaster pale brown with median dorsal part slightly darker brown; ovipositor sheath dark brown; ovipositor brown with apex pale brown. Wings hyaline with very slight infumation attached to parastigma.

Head : 1.53x as broad as mesosoma; vertex smooth with reticulate area behind on the sloping posterior part above occipital carina (Fig. 5); hind ocellus distinctly nearer to front ocellus than to occipital carina; mid and lower frons with distinct (not very shallow as in *P. robusta*) reticulations which merges with dense reticulation in scrobe; latter reaching from ocellus but its sides vague; in side view face slightly protuberant at toruli; temple in dorsal view short; eye broadest in lower third; clypeus small, middle of its lower margin hardly produced; no paraclypeal tooth.

Relative measurements : Head width (anteriorly) 11 = 13; length = 12; POL = 19; OOL = 4; eye length : width in lateral view = 8.5 : 6; MS = 2.4; scape = 6; flagellum plus pedicel = 19; antenna as in figure 6.

Mesosoma : > 1.64x as long as broad; pronotum convex, anteriorly rounded, column weakly cross reticulate, remaining part with strong raised reticulations; pronotum 0.45x as long as long as its width; mesoscutum 0.46x as long as its width, 1.4x as long as pronotum; scutellum a little wider than long, subequal in length to mesoscutum; reticulation on mesoscutum and scutellum strong as that of pronotum; propodeum as long as scutellum, with strong raised reticulation, declining 60° to longitudinal axis of mesosoma, anteriorly a little depressed with short rugae on anterior margin. Mesopleuron anterolaterally with distinct epicnemial edge, behind it almost flat and reticulate; mesepimeron almost completely reticulate; mesopleuron with distinct crenulate groove



Figs. 1-4. *Palachia frontopuncta* Narendran sp. nov. Female. 1. Head—Dorsal view; 2. Antenna; 3. Hind leg; 4. Forewing.

Figs. 5-8. *Palachia neorobusta* Narendran sp. nov. Female. 5. Head—dorsal view; 6. Antenna; 7. Hind leg; 8. Forewing.

along metapleural margin. Legs not very strong; hind coxa 1.8x hind femur, 3.25x (teeth excluded) as long as broad, coxa dorsally with 2 longitudinal irregular row and a ventral irregular row of short white pilosity in side view; femur (Fig. 7) with teeth confined to distal half, with 6 minute teeth between distal large tooth and apex of femur. Forewing 3.2x as long as broad.

Relative length : costal cell = 47, MV = 26; PMV = 13; STV = 5; stigma hardly knobbed, with a strip of slight infumation near parastigma (Fig. 8).

Metasoma : Petiole a little longer than wide in side view; gaster smooth and shiny without distinct reticulations; hypopygium reaching apex of gaster, gaster subequal in length to mesosoma; ovipositor 3.5x as long as hind tibia.

Male : Similar to female except in having antenna without distinct clava, and gaster a little shorter than mesosoma (7 : 8).

Biology : Unknown.

Material Examined : *Holotype* : Female, India : Uttar Pradesh (U.P.), Lakhimpur, Imami Purva, 27.xi.2006. Coll. S.M.A. Badruddin & F.R. Khan (NPCI).

Paratypes : 2 males, U.P., Bahraich, Tikona Mod, 1.x.2006. Coll. F.R. Khan (ZDAMU).

Discussion : This species comes to *Palachia mangalae* Narendran in the key to species by Boucek (1998) but differs from it in having : (1) pronotum, mesoscutum and scutellum not dark cupreous (dark cupreous in *P. mangalae*), (2) F3 and F4 pale yellow (F3 and F4 black or dark brown in *P. mangalae*); (3) Gaster pale brown with median dorsal part without any metallic refringence (in *P. mangalae* gaster blackish brown with slight metallic refringence); (4) ovipositor sheath dark brown (in *P. mangalae* ovipositor sheath white with tip shortly blackish); (5) antennal flagellum plus pedicel as long as 1.67x width of head (in *P. mangalae* 1.56x width of head); (6) lateral ledge of pronotum pale yellow (lateral ledge of pronotum not so in *P. mangalae*); and (7) eye height in profile 3.3x as long as MS (in *P. mangalae* eye height in profile 5.4x as long as MS).

This new species resembles *Palachia robusta* Boucek in the colour of antenna, pronotal ledge and legs but differs from *P. robusta* in having : (1) ovipositor sheath dark brown (whitish in *P. robusta*); (2) hind ocellus distinctly nearer to front ocellus than to occipital margin (hind ocellus equidistant to front ocellus and occipital margin in *P. robusta*); (3) Scrobe reaching front ocellus (in *P. robusta* scrobe not reaching front ocellus); (4) hind femur with 6 minute black teeth between distal large tooth and apex of femur (in *P. robusta* hind femur with one relatively large tooth followed by irregular serration between large tooth and apex of femur as in Figure 31, Boucek 1998); (5) mesopleuron with complete crenulate groove at metapleural margin (in *P. robusta* crenulate groove short and weak); and (6) mid lobe of mesoscutum with raised reticulation (with weak wide meshed reticulation and shiny on the mid lobe of mesoscutum in *P. robusta*).

3. *Palmon kottiyooricus* Narendran sp. nov.

(Figs. 9-11)

Holotype : Female : Length 2.18 mm. Ovipositor length 2.42 mm. Head and mesosoma dark metallic green; eyes reddish brown; ocelli dark brown; scape and pedicel pale yellow; anellus and funicle pale brownish yellow with anterior margin slightly darker, mandible brown; fore and mid legs pale yellow; hind coxa pale yellow with a small dark patch dorsobasally; hind femur pale yellow with apical one-fourth brown, teeth black; hind tibia pale brownish yellow; hind tarsus pale yellow. Wings hyaline with veins pale brown; metasoma pale brown with dark circular parts basally and subapically as in figure 9, basal dark part with slight metallic green refringence; ovipositor sheath dark brown.

Head : 1.35x as broad as pronotum with large eyes; vertex and frons moderately reticulate; head width in dorsal view 2.25x its length; width in anterior view 1.08x its length; POL 3.33x OOL; distance between hind ocellus and front ocellus half of POL; occiput with a fine carina; scrobe reticulate reaching front ocellus; margin ecarinate; MS about 0.2x diameter of eye in profile; gena with fine posterior carina; eye separated from each other by 1.1x length of eye; antennal flagellum plus pedicel 1.57x as long as width of head in front view; scape almost reaching front ocellus; clava a little longer than flagellum (52 : 49); antennal segments as in figure 10.

Mesosoma : 1.8x as long as broad; uniformly provided with setigerous pits; pronotum 0.33x as long as its width; mesoscutum 0.59x as long as its width, 2x as long as pronotum; scutellum length subequal to its width, subequal in length to mesoscutum; propodeum a little shorter than scutellum, with strong raised pits and a strong cross carina slightly behind its middle, declining 50° to longitudinal axis of mesosoma; episternum weakly cross reticulate; epimeron with a deep pit between upper and lower halves; front margin of metapleuron straight; hind coxa with a moderately spaced somewhat long setae on dorsal margin in side view, hind femur length 2.27x its width (including teeth), ventral margin with 9 teeth (1 + a + b + c + 2 + d + 3 + 4 + 5 where 1-5 represent primaries and a-d represents secondaries) as in figure 11. Forewing 3.52x as long as broad; relative length of costal cell = 24, MV = 19; PMV = 7; STV = 3 (Fig. 9).

Metasoma : Excluding ovipositor longer than mesosoma (41 : 35), subequal in length to combined length of head plus mesosoma; hypopygium reaching apex of gaster; ovipositor sheath longer than head plus mesosoma plus metasoma (excluding ovipositor sheath) (83 : 91), 2.2x as long as gaster, 3.4x as long as hind tibia.

Male : Unknown.

Biology : Unknown.

Material Examined : *Holotype* : Female, India : Kerala, Kannur district, Kottiyoor, 18.xi.2004. Coll. Sabu. K.T. (Deposited in DZUC pending transfer to NZSI).

Discussion : This new species can be separated from all other Oriental species of *Palmon* by the following key :

KEY TO ORIENTAL SPECIES OF *PALMON* DALMAN

1. Ovipositor much shorter than 2x (less than 1.6x) length of rest of body 2
- = Ovipositor 2x as long as rest of body 5
2. Propodeum with a strong cross carina a little behind middle 3
- = Propodeum without a strong cross carina [ovipositor 2.92x as long as gaster and 1.4x as long as rest of body, length of antennal clava 1.3x preceding funicular segments and anellus together].....*P. alfredi* Sureshan
3. Ovipositor 1.45x as long as rest of body; head and mesosoma dull green; metasoma yellowish with base metallic and apical half brown; antennae yellowish with clava dark; hind coxa at base metallic, rest yellowish; hind femur and tibia more or less obscured with dusky colour *P. ashmeadi* (Crawford)
- = Ovipositor shorter than 1.2x rest of body; other characters may or may not be agreeable 4
4. Clava with apex broad and oblique (Fig. 17a, Masi 1926), as long as combined length of funicle segments and anellus; pedicel 0.45x length of scape; ovipositor 1.15x length of rest of body; PMV 3x as long as STV *P. megarhopalus* (Masi)
- = Clava (Fig. 10) with apex pointed, longer than combined length of funicle segments and anellus; pedicel 0.52x length of scape; ovipositor 1.11x length of rest of body; PMV shorter than 3x STV *P. kottiyooricus* sp. nov.
5. Hind coxa greenish black or bluish black with apex pale; forewing with an infuscated area attached to STV; gaster with T1 joining petiole at condyle away from its insertion at foramen *P. greeni* (Crawford)
- = Hind coxa yellow with a blackish patch on dorsal side of basal half; forewing without an infuscation attached to STV; gaster with T1 joining petiole at condyle near its insertion at foramen *P. orchesticus* (Masi)

Family EULOPHIDAE

4. *Kostjurixia laharaensis* Narendran sp. nov.

(Figs. 12-15)

Holotype : Female : Length 0.9 mm black; eye brown; ocelli dark brown; antenna brown with scape pale brown; tips of femora, tibiae and tarsi pale yellow; pretarsi brown; coxae concolourous with mesosoma. Wings hyaline, veins pale yellow; pilosity brown; tegula brown. Pubescence dirty white.

Head : Anteroposteriorly compressed; width in anterior view subequal to its anterior length; POL 1.33x OOL; occiput subvertical; frontofacial sutures as in figure 12, separated from each other and running to sides of front ocellus; lower margin of clypeus entire but with two minute lobes; mandibles bidentate; eyes sparsely pilose, 2x as long as MS, a little over 2x as long as wide in anterior view; MS straight, without a basal fovea; antennal formula 11233 (Fig. 13); scape not reaching front ocellus, a little shorter than eye height in profile, 2.63x as long as wide; pedicellus 1.4x as long as wide, longer than F1 (11 : 8); F1 a little wider than long (10 : 8); F2 a little longer than F1 (9 : 8), as long as its width; F3 subequal in length to F2, subequal in length to its width; clava 2.33x as long as wide (21 : 9), subequal in length to scape.

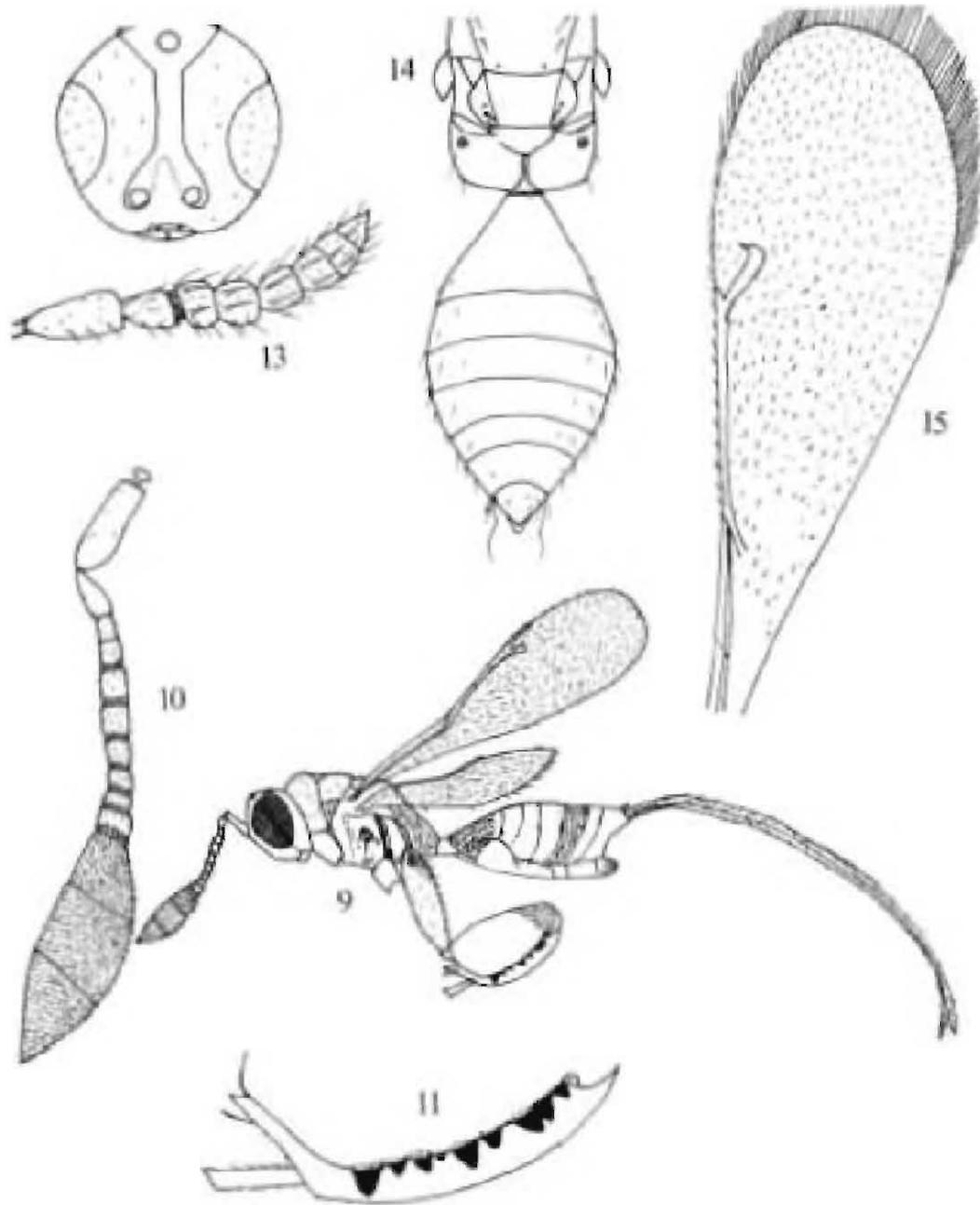
Mesosoma (Fig. 14) : Flat, with 3 depressed setae (posterior most pair worn but setal pits can be seen on careful observation under proper illumination) on either side; pronotum a little shorter than (15 : 17) mesoscutum, weakly reticulate; mesoscutum 1.53x as broad as long (22 : 17); scutellum 0.65x (11 : 17) as long as mesoscutum, 1.45x as broad as long, surface weakly reticulate; SMG distinct but weak, two pairs of setae present on posterior half; dorsellum lying over metanotum medially, touching propodeum; propodeum with a median carina and surface as in *Aceratoneuromyia*, as long as scutellum; propodeal spiracle separated from metanotum by about its own diameter; hind coxa mostly smooth with weak reticulation; hind femur 2.4x as long as wide; spur of mid tibia about as long as mid metatarsus; forewing (excluding marginal fringe) 3x as long as broad; CC a little shorter than MV; MV 3.46x as long as STV, marginal fringe 0.77x length of STV; speculum very small, closed behind by setae, not extending forward below MV (Fig. 15).

Metasoma : Longer than mesosoma, subequal to combined length of head plus mesosoma; hypopygium exceeding a little beyond middle of gaster.

Male : Similar to female except the funicular segments more transverse.

Biology : Unknown.

Material Examined : *Holotype* : Female, India : Himachal Pradesh, Mandi, Lahara, 23.vi.2006. Coll. S.M.A. Badruddin & F.R. Khan (NPIB/ZDAMU—HP2006.1) (Deposited in NPCI).



Figs. 9-11. *Palmon kottiyooricus* Narendra sp. nov. Female. 9. Body profile; 10. Antenna; 11. Teeth of hind femur.

Figs. 12-15. *Kostjurixia laharaensis* Narendran sp. nov. Female. 12. Head—front view; 13. Antenna; 14. Mesosoma and metasoma dorsal view; 15. Forewing.

Paratypes : 1 Female and 2 males of same data of Holotype (ZDAMU).

Discussion : This new species differs from *K. ootiyensis* Narendra in having : (1) MS straight (in *K. ootiyensis* MS curved), (2) pedicel 1.4x as long as wide (in *K. ootiyensis* pedicel length subequal to its width); (3) F2 a little longer than F1 (F2 shorter than F1 in *K. ootiyensis*); (4) F3 width subequal to its length (in *K. ootiyensis* F3 wider than long); (5) clava 2.33x as long as wide (clava 1.7x as long as wide in *K. ootiyensis*); (6) claval length subequal to length of scape (not so in *K. ootiyensis*); (7) mesoscutum 1.53x as broad as long (in *K. ootiyensis* mesoscutum 2.1x as broad as long); (8) mesosoma black (in *K. ootiyensis* mesosoma pale brown); (9) gaster black (gaster dark brown in *K. ootiyensis*); (10) hind femur 2.4x as long as wide (in *K. ootiyensis* hind femur about 3x as long as wide); (11) forewing 3x as long as broad (forewing shorter than 3x its width in *K. ootiyensis*); (12) pronotum a little shorter than mesoscutum (pronotum as long as mesoscutum in *K. ootiyensis*); and (13) General body colour black (in *K. ootiyensis* head and mesosoma light brown and gaster dark brown).

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