

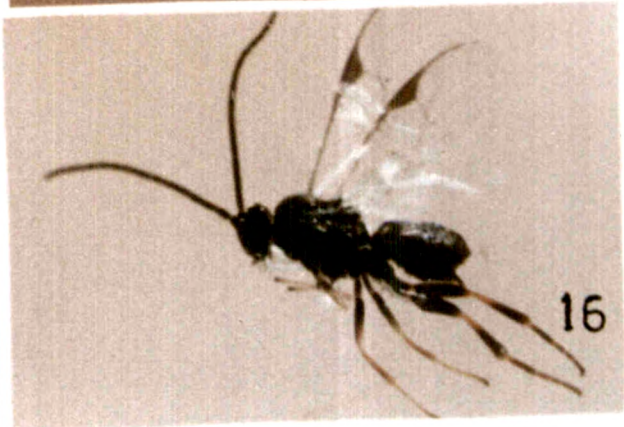
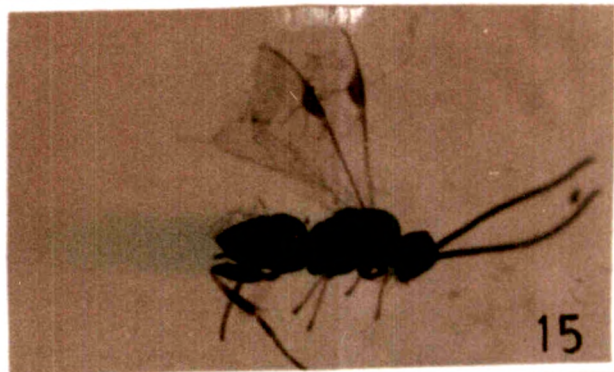
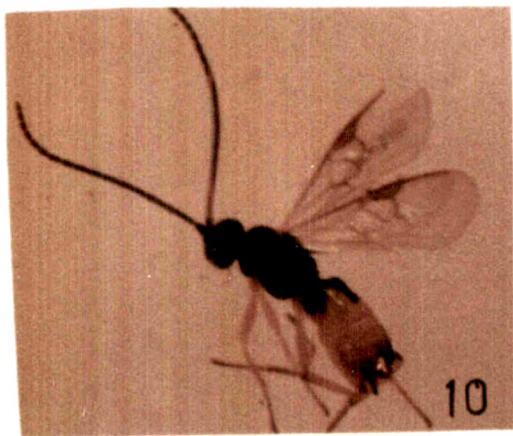
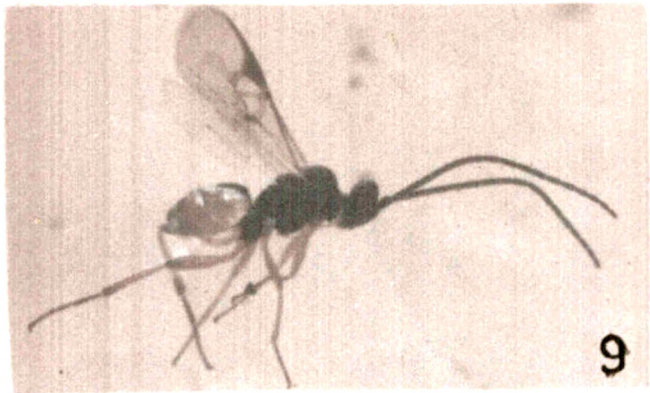
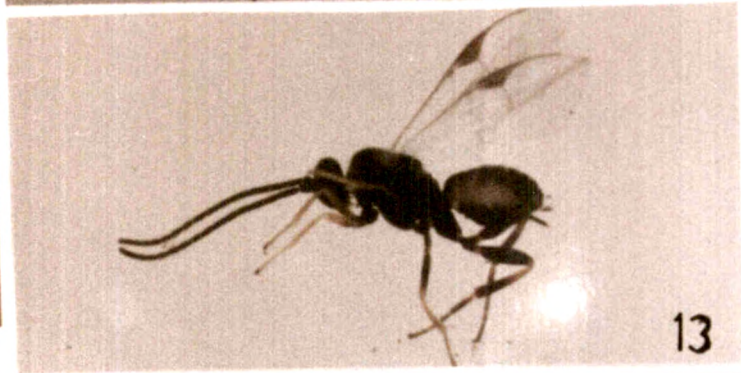
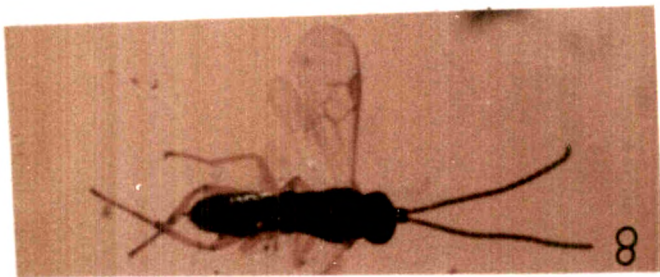
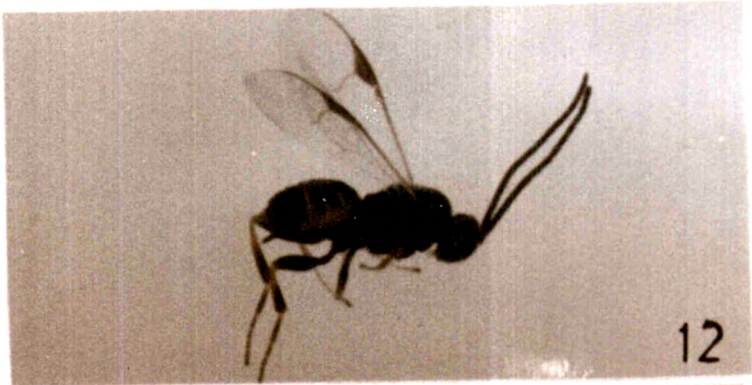
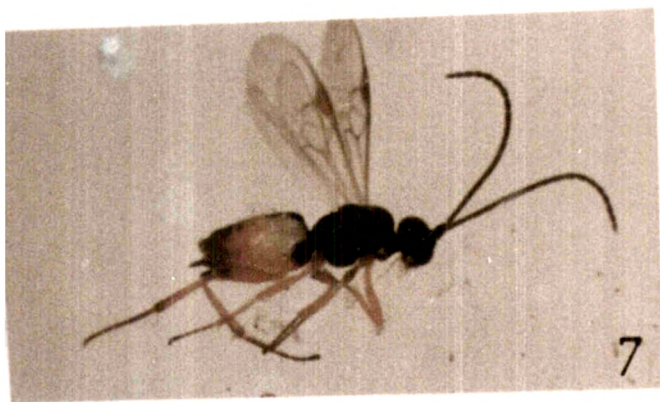
CHAPTER-III

TAXONOMY

CAPTION TO FIGURES, PLATE-VII

- Fig. 7 Cotesia gramini - sp.nov.
Fig. 8 Cotesia indica sp.nov.
Fig. 9 Cotesia karviri sp.nov.
Fig. 10 Cotesia lepidopteri sp.nov.
Fig. 11 Dolichogenidea parijatki sp.nov.
Fig. 12 Dolichogenidea revati sp.nov.
Fig. 13 Dolichogenidea sathei sp.nov.
Fig. 14 Dolichogenidea tarvadi sp.nov.
Fig. 15 Dolichogenidea ujlai sp.nov.
Fig. 16 Dolichogenidea yamini sp.nov.

Plate-7



GENUS COTESIA CAMERON 1891

- Type : Cotesia flavipes Cameron 1891
- Synonyms : Cryptapanteles Viereck 1990
- Type : (C. rileyanus Viereck 1910)
- Apanteles congregatus Var scitulus 1881
- Stenopleura Viereck 1911
- Type : Apanteles sesamiae Cameron 1906

The genus Cotesia was erected by Cameron in 1891 and Mason (1981) supported by adding very large number of Apanteles species. Recently, the genus is recognized as the segregates of old Apanteles. It is group of 'I' of Reinhard and Marshall, 'F' of Wilkinson and de Saeger, and the 'glomeratus' and 'Pistrinariae' groups of Nixon. Under the genus Cotesia, Protapanteles Ashmead was included by Reinhard and Wilkinson, by Marshall and Ashmead separated it again. The 'mianje' subgroup of group 'F' was also kept under this genus by Wilkinson (1932) and de Saeger (1944) which includes number of African species. However, Mason separated the subgroup 'mianje' from the genus Cotesia in 1981, since it is generically distinct from Cotesia.


The genus Cotesia, the largest segregate of the old 'Apanteles' in temperate region, includes 32 to 40% species of Apanteles. In the tropics Cotesia is partly displaced, ecologically by Clyptapanteles and comprises 10 to 20% Apanteles fauna. The genus Cotesia is the commonest and the ubiquitous

genus of Microgastrinae which contain about 1500 to 2000 species. Mason included the following species which are new combinations except Cotesia flavipes Cameron; Microgaster acaudus, Provancher, Apanteles acronyctae Riley, A. agricola Viereck, A. alonquorum Vier. A. alypiae Muesbeck, M. americanus Lepeletier, A. ammalonis Mues, A. anisotae Mues, A. argynnidis Riley, M. atlantae Packard, A. autographae Mues, M. carduicola Pack, A. ceruae Mues, A. characterae Mues, A. cingiliae Mues; A. clisiocampae Ashmead, M. congregata Say, A. crambi Weed, A. cyaniridis Riley, A. delicatus Howard, A. depressus Vier; A. diacrisiae Gahan, A. diversus Muesbeck and Walkley, A. electrae Vier; A. empretiae Vier; A. enypiae Mason, A. euchaetis Ash; A. euphydraxidis Mues; A. fiskei Vier; A. flaviconchae Riley, A. flavicornis Riley; A. gillettei Baker, Ichneumon glomeratus Linneus, A. gordii Mues, A. griffini Vier; A. halisiotae Mues, M. hallii Pack, A. hemileuca Riley, A. hesperidivorus Vier, A. hyphantriae Riley, A. junoniae Riley, A. koebelei Riley, A. laeviceps Ash, A. langei Mues, M. lingei Mues; M. limentidis Riley, M. lunatus Pack; A. lyciae Mues; A. mahoniae Mason; M. marginiventris Cresson, A. medicaginis Mues; M. melanoscelus Ratzeburg, A. murtfeldtae Ash; A. nemoriae Ash; A. nitens Mues; A. noctuidiphagus Mues; A. obscuricornis Vier; A. olenidis Mues; A. orobenae Forbes; A. parastictidis Mues, A. phobetri Rohwer, A. pholisora Riley, A. plathypenae Mues, A. pordunkorum Vier; A. prenidis Mues, A. pxralidis Mues; A. pyraustae Vier; A. pyrophilae Mues; A. rubecula Marshall, A. rufocoxalis Riley,

A. schaffneri Mues, A. schizurae Ash; A. scitulus Riley, A. smerintheta Riley, A. teleae Riley, A. tmetocerae Mues; M. unicolor Curtis, A. winkleyi Vier; M. xyliana Say, A. yakutatensis Ash, other areas - Cotesia flavipes Cameron, A. sesamiae Cameron. A. pistrinariae Wilkinson, A. plutellae Kurdjinox, M. ruficrus Haliday, A. chrysipi Vier; A. flagellator Wilkinson; A. aluis Mues; A. ayerzae Brethes, A. kraussi Mues; A. maxaguezensis Vier; A. ornatrix Mues; A. schini Mues.

Most of the species of genus Cotesia are gregarious as larvae, about 1/4 of them are solitary. The larvae of gregarious species all emerge from the host in a short time, by breaking the body wall and thus killing the hosts. They make a common mass of cocoon after the emergence from their hosts. The form and location of cocoon mass varies greatly interspecifically. The characteristics of cocoon mass are very useful for identifying species. The complete cocoon masses associated with host remains, are very distinct, but the individual parasitoid cocoons are identical.

HOSTS - Larvae of Macrolepidoptera.

The Apanteles is still a huge genus, besides narrow concept. Mason estimated about 2000 species from all parts of the world, which he included under this genus. The genus Apanteles is characterised by long hairy ovipositor sheath, margin of vannal lobe shape  to straight with hairless

or sometimes sparsely hairy, shape of tergite I parallel sided to strongly tapered apically, II tergite wider than long, while the genus Cotesia is easily separated from Apanteles by having the following characters -

Propodeum mostly rugose, and without areola, usually with median carina or none and a short transverse carina running mesad^{ly} from near the spiracle,

Hypopigium short ovipositor short, stout basally,

Sheath short with hairs^{ly} concentrated apically,

Tergite II atleast half as long as III and usually subrectangular,

Vannal lobe of hindwing is obviously convex margin, varying from bare to evenly hairy.

From India Chalikwar et al 1984, described two new species of Cotesia viz. C.orientalis Chalikwar and Nikam; and C.diurnii Rao and Nikam; From Marathwada, India. Further Inamdar (1990) reported the species, C.hansdhvani in her Ph.D. thesis. Dawale, et al (1993) described the new species C.meghrangini from Western Maharashtra and very recently, Sathe et al (1994) added two new species, C.shrii and C. suvarnii from Western Maharashtra to this genus.

FEMALE - (Plate : 7 and 8⁽¹⁸⁾ Fig, 7, 17-22, 77 & 78) length 2.60 mm long & antenna 16 segmented, 2.37 mm; Forewing 2.17mm long. Propodcum without^{areola} and ovipositor 0.17 mm long.

HEAD -

Roughly circular in dorsal view, black, pubescent; 0.62 mm long and 0.50 mm broad; vertex, frons sparsely punctate, pubescent; Frons depressed due to antennal socket, face rectangular, moderately hairy with long hair; clypeus blackish, sparsely hairy, narrow plate like; labrum broad, semicircular platelike hairy; ocelli in triangle, reddish, shiny rounded tubercles; interocellar space 0.12 mm long, front ocellar space 0.050 mm; ocelloocular space 0.15 mm long. Eyes large, ovoid convex, mandible strong, inwardly curved, shiny, pubescent; interorbital distance 0.32 mm. Antenna (Fig. 17,18) 2.37 mm long, 16 segmented, brownish, hairy, shorter than body placodes arranged in 3 longitudinal rows, scape 0.050 mm long (Fig. 17), last antennal segment short conical (Fig. 18). 0.12mm long & 0.075 mm broad. Penultimate segment 0.1 mm long, 0.050 mm broad.

FLAGELLAR FORMULA

$$2 \text{ L/W} = 3.5, 8 \text{ L/W} = 3.0, 14 \text{ L/W} = 2.0, L_{2/14} = 1.7$$

$$W_{2/14} = 1.0.$$

THORAX -

0.90 mm long, dark black, hairy roughly spindle shaped; Pronotum large, convex densely hairy, semicircular; scutellum large, convex; mesoscutellum small, convex; tegulae slightly depressed due to wing bases; mesosternum large, broad,

platelike; all carinae and sutures distinct, thorax coarsely sculptured
 Propodeum (Fig. 19) broader than long, 0.25 mm long and 0.62 mm
 broad, without areola, rugose, median longitudinal carina absent,
 lateral longitudinal carinae strong with short side branches
 carinae forming network, rugoso-reticulate, with basal two strong
 lateral carinae present on either side. Forewing (Plate : 18,
 Fig. 77) 2.17 mm long, straight, transparent hairy except anal
 margin; narrow basally, flattened apically; costa thick, hairy,
 brownish 0.95 mm long; pterostigma black, hairy 0.47 mm long,
 and 0.17 mm broad; metacarpus thick, hairy, black 0.60 mm,
 as long as pterostigma; radius, cubitus and sub discoideus are
 0.77 mm, 0.87 mm and 0.75 mm long respectively, poorly seen;
 medius 0.70 mm long, first anal 0.85 mm long, lateral 0.25 mm,
 discoideus 0.12 mm, nervellus 0.10 mm, recurrent vein 0.15 mm
 and 2nd radiomedial 0.10 mm long. Hindwing (Plate : 18, Fig.78)
 1.72 mm long, straight transparent, hairy except subcostal
 margin, subcostella 1.075 mm long, Basella 0.10 mm long,
 nervellus 0.20 mm, intercubitella (2r-m) absent, interradiella
 0.15 mm long, radiella 0.70 mm, cubitella 0.70 mm long very
 poorly seen. Vannal lobe convex small, leaflike hairy, long
 hairs basically and sparsely hairy throughout. Hindleg (Fig.21)
 2.67 mm long, blackish yellow, coxa triangular, stout, hairy
 0.45 mm long; trochanter yellow short, curved, slender, hairy,
 0.20 mm long; Femur stout, flattened, hairy 0.57 mm long; tibia
 elongated, straight, narrow basally, flat apically, 0.65 mm long,
 tibial spurs unequal, pointed, outer 0.17 mm, inner short,

0.15 mm long, basitarsus short, slender, hairy, 0.30 mm long 28
tarsal segments 2nd, 3rd, 4th and 5th are 0.15 mm, 0.12 mm,
0.10 mm, 0.10 mm long respectively; claw short, 0.075 mm long
pointed.

ABDOMEN -

1.15 mm long excluding ovipositor, brown sparsely
hairy; first tergite (Fig.20) reddish brown, punctate, sparsely
hairy, rugose, narrow apically much broad basally, 0.35 mm
long 0.32 mm broad; IInd tergite sparsely rugose at base, long
as III, brownish, broader than long, 0.40 mm broad, 0.15 mm
long; III tergite yellow, smooth 0.55 mm broad, 0.15 mm long;
I & II tergite subrectangular. Ovipositor (Fig.22) yellow,
straight 0.17 mm long, pointed, longer than ovipositor sheath,
sheath short, shiny, smooth, brownish sparsely punctate, hairy
apically, hypopygium short.

MALE - Same resembling as female, except antenna longer than
females and smaller in size.

COCOON - White cottony, 2.90 mm long; 1.12 mm broad,
gregarious each cocoon colony contain about 40
individuals.

HOST - Unknown lepidopterous larva.

HOST PLANT - Grass, gramineae Family. | ——— Identification

HOLOTYPE - Female, India, Maharashtra, Coll. 14/X/1994
Dahiwadi, Satara, Rokade A.G. on grass, antenna,
wings, leg, propodeum, tergites and ovipositor on slide
labelled as above.

PARATYPE - Male 22, Female 358, sex ratio (M:F) 1:16.4, Coll.
from Aug. 1994 to Nov. 1994, same data as above.

DISCUSSION

Cotesia gramini sp.nov. runs close to species Apanteles papilionis Viereck in Rao's key by having (1) first tergite reddish brown. (2) 2nd tergite sparsely rugose to smooth, (3) propodeum without an areola. It also runs close to A. accuminatus Reinhard in Papp's (1987) key by

- (i) Hypopygium short and ovipositor straight
- (ii) I & II tergite smooth.
- (iii) Tibial spurs unequal

It also resembles with C. meghrangini (Dawale, et al 1993) by Tibial spurs unequal, propodeum rugoso reticulate.

However it differs from above species by following characters :

- (1) Propodeum without median longitudinal carina, two basal strong lateral carinae present on either side.
- (2) R_1 longer than pterostigma.
- (3) First tergite rugose, longer than broad; II and III tergites subrectangular.
- (4) II tergite sparsely rugose.
- (5) Antennal Penultimate segment 0.12 mm long and 0.075 mm broad, last segment short conical.
- (6) Flagellar formula - 2 L/W = 3.5, 8 L/W = 3.0, 14 L/W = 2.0, L 2/14 = 1.7, W 2/14 = 1.0

CAPTION TO FIGURES, PLATE-VIII

Cotesia gramini sp.nov.

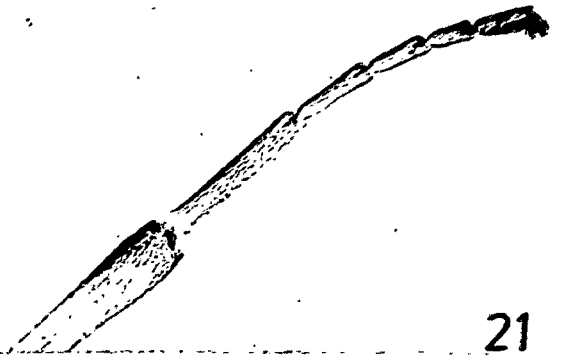
- | | |
|---------|------------|
| Fig. 17 | Antenna |
| Fig. 18 | Antenna |
| Fig. 19 | Propodeum |
| Fig. 20 | Tergites |
| Fig. 21 | Leg |
| Fig. 22 | Ovipositor |

difference

Plate-8



17



21



18



20



19



22

COTESIA INDICA SP. NOV.

FEMALE : (Plate 7, 9, 18 Fig. 8, 23-28, 79 & 80)

2.25 mm long, antenna 16 segmented, 2.0 mm long, last antennal segment short cone shaped, forewing 1.92 mm long, propodeum without areola, ovipositor short 0.12 mm long.

HEAD :

Roughly circular in dorsal view, 0.57 mm long, 0.50 mm broad, black, hairy; vertex, frons sparsely punctate, setose; face comparatively densely punctate than vertex and frons; frons depressed at antennal sockets; ocelli in triangle, dark, brown, shiny spots; interocellar distance 0.10 mm long, frontocellar space 0.050 mm long; Eyes are large, black, shiny, convex, pubescent; interorbital distance 0.27 mm long, labrum broad, platelike mandibles strong, curved. Antenna (fig. 23, 24) 2.00 mm long, 16 segmented, brown, scape (fig. 23) 0.075 mm long, placodes arranged in 2 longitudinal rows penultimate segment longer than last antennal segment, 0.12 mm long and 0.050 mm broad, last antennal segment short conical 0.10 mm long (fig. 24).

FLAGELLAR FORMULA :

2 L/W = 3.0, 8 L/W = 2.5, 14 L/W = 1.5, L 2/14 = 2.0

W 2/14 = 1.0

THORAX :

1.05 mm long, black, punctate and hairy; pronotum densely hairy; convex, tegulae not depressed, scutellum, mesoscutellum convex, mesosternum large plate-like. Propodeum

(Fig. 25) without areola, 0.25 mm long, 0.57 mm broad, Propodeum rugosoreticulate with median longitudinal carina, which is trifurcated, two submedian carinae on each side and three lateromedian carinae forming network medially and apically; metanotum with 3 sublatero basal glabrous lobes, spiracles two, elliptical;

FOREWING : (Plate 18, Fig. 79)

1.92 mm long, transparent, straight and hairy; costa is 0.87 mm long, pterostigma faint black, 0.57 mm long; metacarpus 0.55 mm long, radius, 0.77 mm, cubitus 0.80 mm and subdiscoideus 0.47 mm long, medius 0.45 mm long, first anal 0.87 mm long, basal 0.22 mm long, recurrent vein 0.12 mm in length, nervulus 0.10 mm, cubitus 0.12 mm long, entire wing margin hairy except anal lobe. Basal cubitus very short. Hind radiomedial angular.

HINDWING : (Fig. 80)

Transparent, hairy 1.62 mm long, subcostella 0.65 mm long, metacarpella 0.87 mm long, interradiella 0.15 mm long, poorly seen, radiella slightly distinct, 0.67 mm long, cubitella 0.70 mm long, basella 0.15 mm long, intercubitella absent, nervellus 0.13 mm long, vannal lobe, small, convex, bare basally, hairy apically. Hindleg (fig. 27) 2.45 mm long, longer than body, coxa black, entire leg yellow hairy; coxa triangular, stout 0.25 mm long trochanter slightly curved 0.20 mm long, femur straight stout, 0.62 mm long; tibia 0.60 mm long, stout, straight, tibial spurs unequal, outer 0.15 mm long, inner 0.12 mm

long, basitarsus straight 0.27 mm long, tarsal segments 2nd, 3rd, 4th and 5th are 0.12 mm, 0.10 mm, 0.075 mm, 0.01 mm long respectively; claw is 0.075 mm long, tibial and tarsal segments are more hairy.

ABDOMEN -

1.12 mm long including ovipositor, spindle shaped, I tergite (Fig. 26) little longer than broad, brown, strongly and regularly constricted to apex, 0.30 mm long, 0.22 mm broad, IInd tergite rugose basally and rectangular as long as IIIrd 0.32 mm long, 0.12 mm broad, III tergite smooth, rectangular, and yellow. Ovipositor (Fig. 28) short, smooth, shiny, straight yellow, spiny, 0.12 mm long, longer than ovipositor sheath; shorter than abdomen. 0.10 mm long, brownish, punctate apically; hypopygium short.

MALE : Same resembling as female, slightly smaller than female.

COCOON : 2.75 mm long, 1.12 mm broad, cottony white. gregarious, each cocoon colony contain about 56 individuals.

HOST : Unknown lepidopterous larva.

HOST PLANT : Grass, gramineae family, — *Idanli fuscation*

HOLOTYPE : Female, India, Maharashtra, Coll., 17/IX/1994, Kolhapur, Rokade A.G., on grass; antenna, wings, leg, propodeum, tergites, ovipositor on slide, labelled as above.

PARATYPE : Male 22, Female 27 sex ratio (M:F) 1:1.2 coll. from Aug. 1994 to Dec. 1994 same data as above.

DISCUSSION -

Cotesia indica sp.nov. runs close to species
A.papilionis Viereck in Rao's key by

- (1) Propodeum without areola and
- (2) IInd tergite as long as IIIrd.

It also resembles with A. accuminatus Reinhard in
Papp's (1987) key by

- (1) Hypopygium short and ovipositor straight and
- (2) Tibial spurs unequal.

It also runs close to C. meghrangini (Dawale et al
1993) by

- (1) Tibial spurs unequal and
- (2) Propodeum rugoso - reticulate.

This species also resembles to A.lautellus Marshall
in Wilkinson's key by

- (1) Ist tergite strongly and regularly constricted to apex
and
- (2) Ovipositor sheath considerably shorter than abdomen.
However, (if) differs from above species by having the
following characters.

- (1) Propodeum with median longitudinal trifurcated carina,
two submedian carinae on each side and three
lateromedian carinae arise from basolaterally, carinae
form a network medially and apically.

- (2) Hind tergite rugose basally and rectangular.
- (3) RI is as long as pterostigma.
- (4) Metanotum with 3 sublaterobasal glabrous lobes.
- (5) Last antennal segment short cone shaped.
- (6) Basal cubitus very short and 1st radiomedial curved.
- (7) Flagellar formula :

2 L/W = 3.0, 8 L/W = 2.5, 14 L/W = 1.5,

L 2/14 = 2.0, W 2/14 = 1.0.

CAPTION TO FIGURES, PLATE-IX

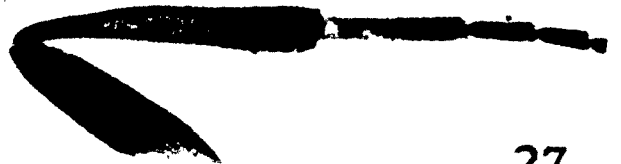
Cotesia indica sp.nov.

- | | |
|---------|------------|
| Fig. 23 | Antenna |
| Fig. 24 | Antenna |
| Fig. 25 | Propodeum |
| Fig. 26 | Tergites |
| Fig. 27 | Leg |
| Fig. 28 | Ovipositor |

Plate - 9



23



27



24



26



25



28

FEMALE : (Plate 7, 10, 18 Fig. 9, 29-34, 81 & 82)

2.25 mm long, including ovipositor, antenna 16 segmented,
2.27 mm long, Forewing 2.05 mm long, Propodeum without areola,
ovipositor 0.12 mm long.

HEAD :

Circular in dorsal view, black, hairy, 0.57 mm long,
0.52 mm broad with strong punctures, vertex, frons, sparsely
punctate, setose; face densely setose, ocelli in triangle, dark
brown, shiny tubercles; interocellar distance 0.12 mm, front ocellar
space 0.050 mm long; Eyes large, black, convex, pubescent;
interorbital distance 0.30 mm long, labrum platelike, mandibles
stout, curved inwardly. Antenna (Fig. 29,30) 16 segmented,
brownish, hairy, 2.27 mm long, longer than body, placodes
arranged in 2 rows. Scape (Fig.29) small, 0.050 mm long,
penultimate segment 0.12 mm long, 0.050 mm broad, last antennal
segment elongately cone shaped (Fig.30) 0.15 mm long and 0.050 mm
broad.

FLAGELLAR FORMULA :

2 L/W = 3.5, 8 L/W = 3.0, 14 L/W = 2.0,

L 2/14 = 1.15, W 2/14 = 1.0

THORAX :

0.80 mm long, black, hairy; pronotum convex, densely
setose; scutellum large, convex; mesoscutellum small convex, tegulae
not depressed; mesosternum large shieldlike, various sutures

distinct, metanotum with single sublateral glabrous lobe, spiracles rounded on either side. Propodeum (Fig. 31) with without areola, 0.20 mm long, 0.55 mm broad, median short longitudinal carina present, sublateral median carinae on either side, strong lateral carinae with side branches on either side, originate from latero-apical corners and forming network. Propodeum rugoso-reticulate.

FOREWING (Plate 18, Fig.81) :

2.05 mm long, straight transparent, hairy except and margin; costa 0.95 mm long, stigma, black 0.50 mm long, 0.15 mm broad; metacarpus 0.55 mm long; radius cubital, subdiscoideus, 0.75 mm, 0.85 mm, 0.77 mm long respectively, poorly seen; medius 0.70 mm, First anal 0.80 mm, long, basal 0.20 mm, discoideus 0.10 mm, nervulus 0.075 mm long recurrent vein 0.12 mm long; Basal cubitus short, 1st radiomedial angular.

HINDWING (Fig.82)

1.62 mm long, subcostella 0.72 mm long, interradiella 0.17 mm, radiella 0.82 mm long, poorly seen, cubitella 0.70 mm long, nervellus 0.17 mm, intercubitella absent; vannal lobe small leaflike; convex, not uniformly hairy, bare basally, hairy apically; entire wing hairy except subcostal margin. Hindleg (Fig.33) 2.92 mm long, longer than body, coxa black, remaining segments brown, hairy; coxa triangular dull, rugose, deeply punctate stout, 0.40 mm, trochanter weak, slightly curved, 0.25 mm long, femur large, straight, stout, 0.60 mm long, tibia slender, straight 0.72 mm long, tibia and tarsal segments densely hairy, tibial spurs unequal,

outer long, 0.15 mm, inner short, 0.12 mm; basitarsus slender, straight, 0.35 mm long, tarsal segments 2nd, 3rd, 4th and 5th are 0.17 mm, 0.12, 0.10 mm and 0.12 mm long respectively; claw 0.075 mm long pointed.

ABDOMEN :

1.05 mm long, excluding ovipositor, narrow basally, broad distally, black dorsally, brownish ventrally. 1st tergite (Fig. 33) little longer than wide, somewhat barrel shaped without median longitudinal depression apically, rugose, brownish, 0.27 mm long, 0.25 mm broad, 11nd tergite rectangular as long as 111rd, 0.32 mm long, 0.15 mm broad, sparsely rugose, 111rd tergite smooth, shiny not rugose, yellow; ovipositor yellow, spinelike, straight 0.12 mm long, longer than ovipositor sheath, sheath brownish short, smooth, shiny sparsely punctate apically, pointed, with few hairs apically.

- MALE : Same resembling as female, except sexual characters, smaller than females.
- COCOON : 2.40 mm long, 1.10 mm broad, cottony white; gregarious, each cocoon colony contain about 45 individuals.
- HOST : Unknown lepidopterous larva.
- HOST PLANT : Grass, gramineae family
- HOLOTYPE : Female, India, Maharashtra, coll. 25/XI/1994, Kolhapur, Rokade A.G., on grass, antenna, wings, leg, propodeum, tergites, ovipositor on slide labelled as above.
- PARATYPE : Male 16, Female 9, sex ratio (m : f) 1:0.5.

DISCUSSION :

Cotesia karviri sp.nov. runs close to A.pratapas in Rao's key by

- (1) Head with strong punctures;
- (2) Hind coxae smooth and
- (3) Propodeum without areola.

This species also runs close to A.antipoda Ashmead in Wilkinson's key by

- (1) Hind coxae closely rugose and dull
- (2) IIIrd tergite smooth, shiny.

It also runs close to A. scabriculus Reinhad in Papp's key (1987) by

- (1) Ovipositor sheath exerted, tapering, pointed apically with unstanding hairs.

It also resembles with C. meghrangini (Dawale et al 1993) by

- (1) Propodeum rugoso-reticulate and
- (2) Tibial spurs unequal.

However, it differs from above species by having following characters.

- (1) Last antennal segment elongately conical.
- (2) Propodeum with short, median longitudinal carina and with a sublateral median carina on either side, strong lateral carina with sidebranches on either side.

- (3) A carina originate from lateroapical corner and forming network.
- (4) Metanotum with single sublateral glabrous lobe.
- (5) 1st radiomedial angular.
- (6) FLAGELLAR FORMULA :
- 2 L/W = 3.5, 8 L/W = 3.0, 14 L/W = 2.0,
L 2/14 = 1.15, W 2/14 = 1.0.

CAPTION TO FIGURES, PLATE-X

Cotesia karviri sp.nov.

- | | |
|---------|------------|
| Fig. 29 | Antenna |
| Fig. 30 | Antenna |
| Fig. 31 | Propodeum |
| Fig. 32 | Tergites |
| Fig. 33 | Leg |
| Fig. 34 | Ovipositor |

Plate -10



29



33



30



32



31



34

COTESIA LEPIDOPTERI SP. NOV.

FEMALE: (Plate: 7,11,18 Fig.10,35-40,83 & 84) 2-47 mm long, antenna 16 segmented, 2.25 mm long, Forewing, 2.07 mm long, Propodeum without areola, ovipositor 0.12 mm long.

HEAD :

Roughly circular in dorsal view, black 0.57 mm broad, 0.60 mm long; vertex, frons sparsely punctate with small hairs; face densely hairy frons depressed due to antennal socket; ocelli in triangle, brownish-red, shiny rounded, small tubercles; interocellar distance 0.15 mm; front ocellar space 0.075 mm; Eyes large convex, black, pubescent, interorbital distance 0.35 mm long; labrum small; platelike, mandibles, strong, inwardly curved; Antenna (Fig. 35, 36) 2.25 mm long, 16 segmented, brownish-black, hairy, placodes arranged in 2 longitudinal ranks, scape (fig. 35) 0.20 mm long, Penultimate segment 0.10 mm long, 0.050 mm broad, last antennal segment (fig. 36) short conical 0.12 mm long, and 0.050 mm broad.

FLAGELLAR FORMULA : 2 L/W = 2.6, 8 L/W = 3.0,
14 L/W = 2.0, L 2/14 = 2.0, W 2/14 = 1.5.

THORAX :

0.80 mm long, dark black, densely punctate, broad anteriorly, narrow posteriorly; pronotum semicircular, convex, pubescent; scutellum large convex; mesoscutellum small and

convex; tegulae not depressed; mesosternum large shield like Propodeum (Fig. 37) broader than long, 0.25 mm long, 0.62 mm broad, without areola, rugose, without median longitudinal carina, a lateral strong carina with side branches on either side forming network, two weak carinae arise from basolaterally, two rounded spiracles on apicolaterally.

FOREWING (Plate : 18, Fig. 53)

2.07 mm long, transparent, straight, hairy except anal margin; costa 0.92 mm long, thick rownish, densely hairy; stigma black 0.47 mm long, 0.17 mm broad; metacarpus 0.62 mm long, radius, ^bcubitus, subdiscoidcus 0.75 mm, 0.87 mm and 0.72 mm long respectively; medius 0.72 mm, first anal 0.90 mm, basal 0.25 mm long, discoideus 0.15 mm long, nervulus 0.075 mm long, reurrent vein 0.12 mm, second anal 0.12 mm in length. 1st radio medial curved, Basal cubitus vanished.

HINDWING (Fig. 84)

1.72 mm long, straight, transparent, hairy, subcostella 1.05 mm long, interradiella 0.12 mm long mediella 0.95 mm long, cubitella 0.80 mm long, basella 0.12 mm in length nervellus 0.15 mm long; vannal lobe convex, small uniformly hairy throughout; entire wing flat hairy except the subcostellor margin. Hindleg (Fig. 39) 2.77 mm long, longer than body, hairy; coxa black, remaining segments pale yellow, coxa rugose and dull, stout, strong, triangular 0.40 mm long, I and IInd trohanter slightly curved 0.22 mm long; femur strong, straight, flat, 0.65 mm long; tibia straight, 0.62 mm long; tibial spurs unequal, outer long, 0.15 mm, inner short 0.12 mm in length;

basitarsus straight 0.32 mm long; tarsal segments 2nd, 3rd, 4th and 5th 0.17 mm, 0.10 mm, 0.10 mm long respectively; claw 0.075 mm long, pointed, curved.

ABDOMEN :

1.07 mm long, excluding ovipositor, black, dorsally, yellow ventrally, sparsely hairy; first tergite (Fig. 38) - brownish, longer than broad, 0.32 mm long, 0.32 mm broad, rugose, without median apical depression. Second tergite brown, rectangular, broader than long - 0.42 mm broad, 0.17 mm long, IInd tergite as long as IIIrd, sculptured, slightly rugose, IIIrd tergite smooth shiny, brownish; ovipositor (Fig. 40) pointed, spinelike, yellow slightly longer than ovipositor sheath 0.12 mm long, ovipositor sheath brownish hairy apically; hypopygium slightly more truncate apically; abdominal tip hairy.

- MALE : Same resembling as female, slightly smaller than female.
- COCOON : 2.60 mm long, 1.15 mm broad, cottony white, gregarious, each cocoon contain about 40 individuals.
- HOST : Unknown lepidopterous larva.
- HOST PLANT : Pomegranate Punica granatum
- HOLOTYPE : Female, India, Maharashtra, coll. 23/X/1994, Dahiwadi, ^{Salem}Rokade A.G. on pomegranate, Punica granatum antenna wings, leg propodeum, tergites, ovipositor on slide labelled as above
- PARATYPE : Male 2, female 47 sex ratio (m:f) 1:23.5.
- DISCUSSION : Cotesia lepidopteri sp.nov. resembles with A.cirphicola Bhatnagar in Rao's key by

- (1) Propodeum always without areola, IInd tergite as long as IIIrd.
- (2) IInd tergite sculptured and
- (3) Subscutellar disc with large scattered punctures. This species also runs close to A. antipoda Ashmead in Wilkinson's key by

- (1) Hind coxae rugose and dull and
- (2) IIIrd tergite smooth shiny.

In Papp's (1987) key C. lepidopteri resembles with A. vanessae Reinhard by

- (1) Hypopygium slightly more truncate apically.

It also resembles with C. suvarni (Sathe et al 1994) by tiial supurs unequal and propodeum without areola.

However, it differs from above species by following characters :

- (1) Last antennal segment slight-elongate cone shaped.
- (2) Hair on abdominal tip.
- (3) Propodeum with a strong lateral carina with side branches on either side forming network, two weak carinae arise basolaterally.
- (4) Ovipositor slightly longer than ovipositor sheath.
- (5) Placodes arranged in 2 longitudinal ranks
- (6) Basal cabitus vanished
- (7) Hind leg longer than body.
- (8) Flagellar formula : 2 L/W = 2.6, 8 L/W = 3.0, 14 L/W = 2.0, L 2/14 = 2.0, W 2/14 = 1.5.

CAPTION TO FIGURES, PLATE-XI

Cotesia lepidopteri sp.nov.

- | | |
|---------|------------|
| Fig. 35 | Antenna |
| Fig. 36 | Antenna |
| Fig. 37 | Propodeum |
| Fig. 38 | Tergites |
| Fig. 39 | Leg |
| Fig. 40 | Ovipositor |

Plate - 11



35



39



36



38



37



40

GENUS - DOLICHOGENIDEA VIERECK 1911

Type - Apanteles (D.) banksi Viereck 1911.

The genus Dolichogenidea was erected by Viereck in 1911. It is abundant and ubiquitous genus which contain about 1000 species. Viereck described Dolichogenidea as subgenus of Apanteles merely because of its elongated gena and included only A. (D.) banksi Viereck. Except for the long cheeks this is typical species of Nixon's laevigata group. However Nixon (1965) placed D.banksi in his Crassicornis group, without having seen any specimens. Recently Mason (1981) recognized Dolichogenidea as ubiquitous genus. He placed Uitor group^(Nixon, 1967) of Apanteles and the following species, all new combinations under Dolichogenidea.

A.lacteicolor - Viereck, A. bushnelli Mues, A.phthorimiae Mues, A. californicus Mues; A. tischeriae Mues; A. absonus Mues; A. acrobasidis Muesbeck; A. coleophorae Wilkinson, A. oidematophori Mues, A. renaulti Mason, A. melanopus Vier, A.homeosamae Mues, A. miantonomoi Vier, A. pterophori Mues, A. (D.) banksi Vier, A. thujae Mues, A. halidaii Marshall, M.dilectus Hal, M. emarginatus Nees, M. gagales Nees, A.gracillariae Wilkn., A. imperator Wilkn., M. infimus Hal., M. laevigatus Ratzeburg, A. lemariei Nixon M. lineipes Wesmael, M. langicauda Wesm., A. mesoxanthus Ruschka, A. phaloniae Wilkn., A. sicarius Marshall, A. praeter Marshall, A. princeps A. szelenxii Papp., A. victor Wikn., A. paralechiaae Mues., A.cacoeciae Riley.

A

Dolichogenidea is separated from apanteles by :

- (1) Punctures of mesonstum typically distinctly separated and never breaking into aciculations posteriorly.
- (2) Margin of vannal lobe convex and evenly thickly hairy.
- (3) First tergite parallel sided or slightly wider apically.
- (4) Apicolateral areas of propodeum (if distinct) wider than high

HOST :

Solitary caterpillar of microlepidoptera, occasionally gregarious larvae of both microlepidoptera & macrolepidoptera.

PHYLOGENY OF APANTELES AND DOLICHOGENIDEA

The ater group and ultor group have been included under Dolichogenidea by Nixon (1965). The ater group contains obscurus type of Apanteles Foester. The ultor group includes many intermediate forms, into the laevigate group which contains banksi, the type of Dolichogenidea Viereck. The above groups are typically possess fully carinated propodeum, a feature that Mason hold Plesiomorphic in the subfamily.

These two groups are separated by the following characters. (Table-1).

TABLE - 1

	Dolicogenidea (<u>ultor</u> group)	Apanteles (<u>ater</u> group)
Margin of vannal lobe; shape, hairs	Convex, rarely flattened; Uniformly hairy	Concave to straight, Hairless or sometimes sparsely hairy
Punctures on scutum	Well separated never aciculate Posteriorly.	Often confluent, usually aciculate Posteriorly.
Shape of tergite I	Slightly broader apically to parallel sided	Parallel sided to strongly tapered apically.
Posterolateral area of Propodeum	wider than tall	About as wide as tall

FEMALE - (Plate : 7 and 12, 18 Fig. 11, 41-46, 85 & 86) Length 3.17 mm long, excluding ovipositor antenna 3.0 mm long; 16 segmented, forewing 2.77 mm long ovipositor 0.75 mm long.

HEAD -

Roughly elliptical in dorsal view, black densely punctate, 0.65 mm long and 0.57 mm broad. Vertex, frons sparsely punctate; face and gena densely punctate; face slightly convex, medially elevated with long hairs compared to latter; frons depressed due to antennal socket; ocelli in triangle, brownish-red coloured, small rounded, like shiny tubercles; interocellar distance 0.12 mm, front ocellar space 0.050 mm long; Eyes large, convex, elliptical, pubescent, shiny; interorbital distance 0.35 mm long. Antenna (fig. 41, 42) 3.0 mm long, shorter than body; 16 segmented, dark brown hairy, scape (41) 0.05 mm wide and 0.07 mm long, placodes arranged in 4 longitudinal rows, last antennal segment elongately conical (Fig. 42);

FLAGELLAR FORMULA -

2 L/W = 4.5; 8 L/W = 4.0; 14 L/W = 2.5

L 2/14 = 1.8; W 2/14 = 1.0

THORAX -

Thorax black, 1.15 mm long, broad anteriorly, narrow posteriorly, entire thorax deeply hairy. Pronotum convex large; mesonotum shiny, coarsely punctured; metanotum strong coarsely sculptured, sublateral side with few hairs; tegulae not

depressed; mesosternum large, plate or shieldlike; scutellum large, convex, mesoscutellum small and convex. Propodeum (Fig.43) 0.25 mm long and 0.77 mm broad, coarsely sculptured to smooth, without median longitudinal carina with well defined areola, areola is pentagonal with median transverse and basal transverse carinae on either side with two strong lateral longitudinal carinae with some lateral branches, carination suppressed; Propodeum spiracles elliptical.

FOREWING (Plate 18, Fig. 77)

2.77 mm long, thin, transparent, hairy throughout except anal margin. Costa thick, brown densely hairy, 1.35 mm long; stigma creamy coloured 0.62 mm long, 0.17 mm broad; metacarpus (R1) densely setose, brownish, 0.75 mm long; radius, cubitus and subdiscoideus 1.0 mm, 1.12 mm and 0.95 mm long respectively, poorly seen; medius 0.92 mm long, submedius 1.12 mm long, basal 0.40 mm, discoideus (culb) 0.17 mm long, nervulus 0.15 mm, recurrent vein (m-cu) 0.17 mm long, second anal 0.15 mm long; intercubital absent.

HINDWING (Fig. 78)

2.12 mm long, transparent hairy, subcostella 1.40 mm long, metacarpella 0.67 mm long, basella 0.17 mm, intercubitella (2r-m) absent, areolet open, nervellus 0.25 mm; Vannal lobe small, convex, uniformly hairy. Hindleg - (Fig.45) 2.82 mm long, back, hairy. Coxa triangular, stout, black, 0.35 mm long; trochanter curved, weak, 0.25 mm; femur stout, strong, straight,

0.60 mm long; tibia elongated, straight, 0.70 mm; tibial spurs unequal, outer being long, 0.17 mm, inner short 0.15 mm long; basitarsus straight, slender, 0.37 mm long; tarsal segments 2nd 3rd, 4th and 5th 0.15 mm, 0.12 mm, 0.10 mm, and 0.12 mm long respectively; claw pointed, 0.075 mm long; tibia and tarsal segments more hairy than remaining segments.

ABDOMEN -

1.62 mm long, roughly spindle shaped, slightly broad, anteriorly and narrow posteriorly, brownish coloured, bands dorsally, sparsely punctate with long hairs, Tergite I (Fig.44) black, punctate, rugose, 0.47 mm long; 0.27 mm broad, barrel shaped; tergite II wider than long but shorter than tergite III; tergite III yellow, rectangular, soft and sparsely punctate; hypopygium short. Ovipositor - (Fig. 46) Yellow, spine like 0.75 mm longer than ovipositor sheath; ovipositor sheath dark brown to black, pointed apically and hairy.

MALE : Same resembling as female.

COCOON : White, cottony 3.50 mm long.

HOST : Unknown lepidopteran larvae.

HOST PLANT : ? Nyctanthes Arbor-tristis (Parijat)

HOLOTYPE : Female, India, Maharashtra, Kolhapur, collected on ? Nyctanthes Arbor tristis, 30/VIII/94, Mr. Rokade A.G., Antenna, wings, propodeum, tergites, leg, ovipositor on slides labelled as above.

PARATYPE : Male 34, female 11, sex ratio (M:F) 1:0.34, Coll. from Aug. 1994 to Sept., 1994 Mr. Rokade A. G., same data as above.

DISTRIBUTION : Western Maharashtra, India.

DISCUSSION :

Dolichogenidea parijatki sp.nov. runs close to Apanteles significance (Walker) in Rao's (1961) key in it's characters, length of vein R distinctly greater than the breadth of pterostigma. It also resembles with D. darbari sp.nov. (Inamdar 1990) in it's characters.

(1) Propodeum with areola,
 (2) Tergite I usually parallel sided and as per Nixon (1967) it runs close to Apanteles amaris sp.nov. by tergite I parallel sided & ovipositor sheath slightly longer than hind tibia. However, it differs from above species by having following characters :

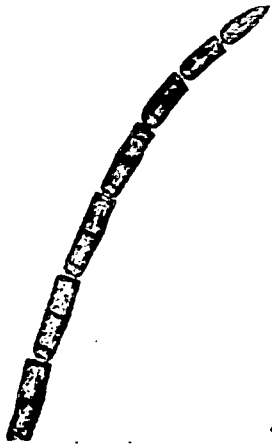
- 1) Tergite I much longer than wide, median apical longitudinal depression not present.
- 2) Ovipositor longer than ovipositor sheath and sheath sparsely hairy apically.
- 3) Last antennal segment elongately ^{and.} cone shaped.
- 4) Metanotum sublateral lobes with few hairs.
- 5) Flagellar formula : 2 L/W = 4.5, 8 L/W = 4.0, 14 L/W = 2.5, L 2/14 = 1.8, W = 2/14 = 1.0.

CAPTION TO FIGURES, PLATE-XII

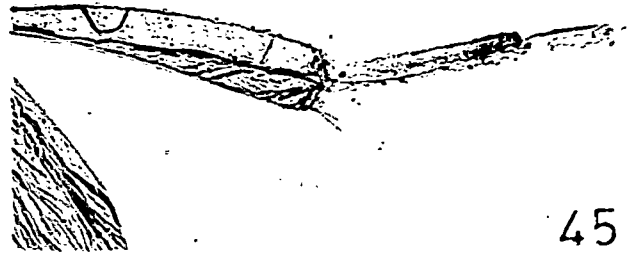
Dolichogenidea parijatki sp.nov.

- | | |
|---------|------------|
| Fig. 41 | Antenna |
| Fig. 42 | Antenna |
| Fig. 43 | Propodeum |
| Fig. 44 | Tergites |
| Fig. 45 | Leg |
| Fig. 46 | Ovipositor |

Plate -12



41



45



42



44



43



46

DOLICHOGENIDÉA REVATI SP. NOV.

FEMALE : (Plate 7, 13; Fig. 12, 47-52, 87 & 88)

2.62 mm long, antenna 16 segmented, 2.40 mm long, propodeum areolate, forewing 2.55 mm long, ovipositor 0.20 mm long.

HEAD :

Black, elliptical in dorsal view, pubescent, 0.67 mm in length, 0.57 mm broad; vertex, frons sparsely punctate, hairy; frons depressed due to antennal socket; face rectangular, moderately hairy; ocelli in triangle, small rounded, brownish tubercles; interocellar distance 0.15 mm long, front ocellar space 0.050 mm long; ocelloocular space 0.15 mm; eyes large black, pubescent, convex, shiny; interorbital distance 0.37 mm long; clypeus narrow, black, hairy, platelike; labrum broad, platelike, hairy; mandibles strong, curved inwardly.

Antenna (Fig. 47, 48) black, hairy 16 segmented, 2.40 mm long, 4th last segment longer than penultimate segment, last antennal segment elongately conical (Fig. 48).

FLAGELLAR FORMULA :

$$2 \text{ L/W} = 2.6, \quad 8 \text{ L/W} = 2.5, \quad 14 \text{ L/W} = 2.0$$

$$\text{L } 2/14 = 2.0, \quad \text{W} = 2/14 = 1.5$$

THORAX :

1.17 mm long, black, densely hairy, sculpture rough; pronotum large, semicircular; mesonotum shiny, black, sparsely punctured, tegulae black slightly depressed due to wing attachment;

scutellum large, convex; mesoscutellum small convex; mesosternum large, broad shieldlike; metanotum lateral glabrous lobes with 4 carinations, propodeum (Fig - 49) with areola, areola somewhat hexagonal, hairy, 0.27 mm long, 0.80 mm broad; coarsely sculptured to smooth, without median longitudinal carina, two lateral transverse carinae present. Carination suppressed, two rounded spiracles on either side.

FOREWING (Fig. 87)

2.55 mm long, straight, transparent, hairy except anal margin, narrow basally, flat distally, costa thick, hairy, 1.22 mm long, stigma pale black with darker border, hairy, 0.62 mm long, 0.22 mm broad; metacarpus thick, hairy, black 0.75 mm long, radius, cubitus subdiscoideus are 0.17 mm, 1.12 mm, 0.92 mm long respectively, poorly seen; medius 0.92 mm long, hairs on median cell evenly distributed, first anal 1.05 mm long, basal 0.35 mm, discoideus 0.15 mm, nervulus 0.15 mm, recurrent vein 0.15 mm long, 2nd radio-medial 0.15 mm long, intercubital absent.

HINDWING (Fig. 88)

2.05 mm long, straight, transparent, hairy except subcostal margin, subcosta thick, without hairs, 1.32 mm long, radiella, mediella, basella are 0.15 mm, 0.97 mm, 0.75 mm long respectively, poorly seen; nervellus, 0.25 mm long, intercubitella absent; vannal lobe large, convex not hairy uniformly. Hindleg (Fig. 51) 3.20 mm long, black densely hairy, coxa black, stout, triangular 0.47 mm long, trochanter curved, short, hairy 0.25 mm long, femur stout, flattened, straight 0.65 mm long; tibia

elongated, narrow basally, flat apically, straight hairy 0.80mm long, tibial spur unequal, hairy, pointed, outerlong 0.20 mm, inner short 0.15 mm; basitarsus moderately long, 0.42 mm, tarsal segments, 2nd, 3rd, 4th and 5th are 0.17 mm, 0.12 mm, 0.10 mm, 0.10 mm, long respectively; claw 0.10 mm long, pointed.

ABDOMEN -

1.05 mm long, excluding ovipositor, spindle shaped, hairy, hairs long arranged roughly parallelly over abdominal tergites; 1st tergite (Fig. 50) parallel sided with carination basally and rugose apically, black, punctate, longer than broad, 0.62 mm long, 0.42 mm broad; 2nd tergite broader than long, 0.40 mm broad, 0.15 mm long, 3rd tergite smooth, punctate, 0.50 mm broad, 0.15 mm long, ovipositor (Fig. 52) long, pointed, curved downwardly, 0.20 mm long, longer than ovipositor sheath, ovipositor sheath sparsely hairy apically; hypopygium very short, abdominal sculpture smooth.

MALE : Same resembling as female, except sexual characters and slightly smaller than Female.

COCOON : White cottony 2.80 mm long, 1.15 mm broad, gregarious, each cocoon contain about 38 individuals.

HOST : Unknown lepidopterous larva.

HOST PLANT : Congress grass, Parthenium hysterophorus.

HOLOTYPE : Female, India, Maharashtra, Coll, 25/XII/94, Dahiwadi, Satara on Parthenium, Rokade A.G. antenna, wings, leg, propodeum, tergites, ovipositor on slide labelled as above.

PARATYPE : Male 34, female 66, sex ratio (M:F) 1:1.2 }
 coll. from Aug. 1994 to Feb. 1995, same data
 as above.

DISCUSSION :

Dolichogenidea revati sp.nov. runs close to A. arasceri
 Wilkinson in Rao's key by

- (1) Tegulae black and
- (2) Propodeum with areola

This species also resembles with A. baoris Wilkinson
 in Nixon's key by

- (1) Stigma pale with darker border.
- (2) Hairs on median cell evenly distributed and
- (3) Ovipositor sheath shorter than ovipositor.

However, it differs from above species by having
 following characters.

- (1) Last antennal segment elongately conical, and 4th last
 segment is longer than the penultimate segment.
- (2) Hypopygium very short.
- (3) Ovipositor sheath sparsely hairy apically.
- (4) 1st tergite parallel sided with carination basally and
 rugose apically.
- (5) Tibial spurs unequal.
- (6) Areola somewhat hexagonal.

(7) Metanotum lateral globrous lobe with 4 carination.

(8) Ovipositor longer than ovipositor sheath.

(9) FLAGELLAR FORMULA :

2 L/W = 2.6, 8 L/W = 2.5, 14 L/W = 2.0,

L 2/14 = 2.0, W 2/14 = 1.5.

CAPTION TO FIGURES, PLATE-XIII

Dolichogenidea revati sp.nov.

- | | |
|---------|------------|
| Fig. 47 | Antenna |
| Fig. 48 | Antenna |
| Fig. 49 | Propodeum |
| Fig. 50 | Tergites |
| Fig. 51 | Leg |
| Fig. 52 | Ovipositor |

Plate -13



47



51



48



50



49



52

DOLICHOGENIDEA SATHEI SP.NOV.

FEMALE : (Plate 7, 14, 19 Fig. 13, 53-58, 89 and 90)

2.40 mm long, black, antenna, 16 segmented, 2.12 mm long, propodeum areolate, forewing as long as antenna, ovipositor 0.20 mm long.

HEAD :

Elliptical in dorsal view, 0.77 mm long, 0.60 mm broad, black, punctate, densely hairy; frons sparsely punctate with short fine hairs, depressed due to antennal socket; face densely setose with long hairs as compared to the later; ocelli in triangle, brown, red, shiny, tubercles, interocellar distance 0.15 mm, front ocellar distance 0.10 mm long; eyes large, elliptical, pubescent, shiny, black interorbital ^{distance} 0.37 mm long, clypeus narrow, black, hairy; labrum platelike, hairy mandibles strong, curved inwardly.

Antenna (Fig. 53, 54) dark brown, hairy, 16 segmented, 2.12 mm long, scape (fig. 53) 0.15 mm long, pale red setaceous, last antennal segment more elongately conical (fig. 54), placodes arranged in 3 longitudinal rows.

FLAGELLAR FORMULA :

2 L/W = 2.5, 8 L/W = 2.0, 14 L/W = 1.5, L 2/14 = 2.3,
W 2/14 = 1.5.

THORAX :

1.05 mm long, 0.62 mm broad, black, hairy; pronotum

densely hairy, large, semicircular, mesonotum shiny, black sparsely hairy, tegulae not depressed, scutellum convex, mesosternum large platelike, mesoepimeron distinct; metanotum lateral glarous lobes with two carination, sub lateral lobes with hairs. Propodeum (fig. 55) with areola, sparsely punctate, hairy broader than long, 0.22 mm long, 0.77 mm broad, without median longitudinal carina, with a strong basal lateral carina, and with 2-3 lateroapical carinae on either side; spiracles rounded.

FOREWING : (Fig. 89)

2.12 mm long, straight, transparent shiny, hairy, costa thick, brownish, hairy, 1.12 mm long, stigma pale black, 0.50 mm long, 0.15 mm broad, metacarpus (R1) 0.52 mm longer than stigma, radius, cubitus, subdiscoideus (are) 0.67 mm, 0.77 mm, 0.70 mm long respectively, poorly seen; medius 0.82 mm long, first anal 1.0 long, basal 0.25 mm long, disoideus 0.12 mm nervulus 0.12 mm long, recurrent vein 0.10 mm long entire wing margin hairy, hairy except anal lobe.

HINDWING : (Fig. 90)

Straight, transparent, shiny, 1.75 mm long, subcostella 0.90 mm long, basella 0.15 mm long, nervellus 0.25 mm long, intercutitella^b absent; vannal lobe small, convex not hairy uniformly, remaining veins reduced. Hindleg (Fig. 57) 2.92 mm long, coxa stout strong black, 0.40 mm long, trochanter, slender, slightly curved 0.22 mm long, femur black, straight, stout, 0.60 mm long, tibia, straight 0.77 mm long, tibial spurs

unequal, outer long 0.12 mm, inner 0.10 mm long, apices of femur and tibia apparently not nigrescent; basitarsus 0.37 mm long, a tarsal segments 2nd, 3rd, 4th and 5th are 0.15 mm, 0.12 mm, 0.10 mm, 0.10 mm long respectively claw 0.075 mm long, curved; entire leg hairy but tibial and tarsal segments densely hairy.

ABDOMEN :

Black, roughly sculptured 0.87 mm long, including ovipositor, smaller than thorax, sparsely hairy, hairs arranged somewhat parallelly over tergites, 1st tergite (Fig 56) longer than broad, 0.45 mm long, 0.37 mm broad, parallel sided, rugose; IInd tergite than long, 0.45 mm broad, 0.12 mm long, rugose; IIIrd tergite smooth, longer than II; ovipositor (Fig. 58) 0.20 mm long, yellow spiny, ovipositor thicken towards base; ovipositor sheath brownish, slightly longer than ovipositor.

MALE : Same resembling as female, except sexual characters and slightly smaller than female.

COCOON : White cottony, 2.65 mm long, 1.10 mm broad, gregarious, each cocoon contain about 35 individuals.

HOST : Unknown lepidopterous larva.

HOST PLANT : Ground nut, Arachis hypogea.

HOLOTYPE : Female India, Maharashtra, Coll. 22/X/94, Gokul Shirgaon, Kolhapur Rokade A.G., on groundnut, antenna, wings, propodeum, tergites, ovipositor on slide laelled as above.

PARATYPE : Male 18, Female 27, sex ratio (m:f) 1:1.5.

DISCUSSION :

Dolichogenidea sathai sp.nov. runs close to A.significance Walker in Rao's key by -

- (1) Vertex longer than stigma.

This species also runs to A. deliadis. Bingham in Wilkinson's key by

- (1) Scape pale red setaceous and
 (2) Apices of hind femora and hind tibia apparently not nigrescent.

The species also resembles with A. arelia Nixon in Nixon's key by

- (1) Tergite 1st parallel sided.
 (2) Ovipositor base thicken.

However, it differs from above species by having following characters -

- (1) Last antennal segment more elongately cone shaped.
 (2) Placodes arranged in 3 ranks.
 (3) Propodeum with a strong basal lateral carina and with 2-3 latero-apical carinae on either side.
 (4) Metanotum lateral glarous lobe with two carinations.
 (5) Ovipositor sheath slightly longer than ovipositor.
 (6) FLAGELLAR FORMULA :

2 L/W = 2.5, 8 L/W = 2.0, 14 L/W = 1.5,

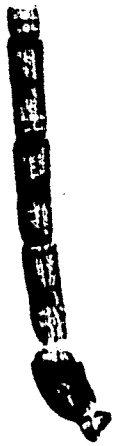
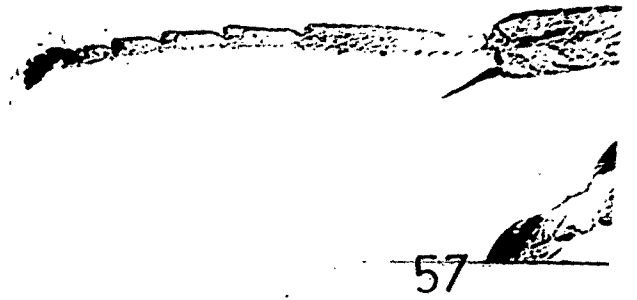
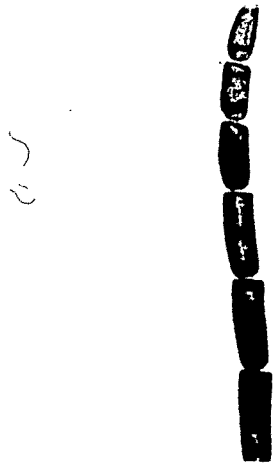
L 2/14 = 2.3, W 2/14 = 1.5

CAPTION TO FIGURES, PLATE-XIV

Dolichogenidea sathei sp.nov.

- | | |
|---------|------------|
| Fig. 53 | Antenna |
| Fig. 54 | Antenna |
| Fig. 55 | Propodeum |
| Fig. 56 | Tergites |
| Fig. 57 | Leg |
| Fig. 58 | Ovipositor |

Plate-14



DOLICHOGENIDEA TARVADI SP.NOV.

FEMALE (Plate 7, 15, 19, Figs. 14, 59-64, 91 and 92)

2.95 mm long, antenna 16 segmented, 2.42 mm long, Propodeum areolate, forewing 2.95 mm long, ovipositor 0.27 mm long.

HEAD :

Black, elliptical in dorsal view, 0.57 mm long, 0.60 mm broad; vertex, frons, moderately hairy, frons depressed at the bases of antennae; face densely hairy, hairs long as compared to vertex and frons; ocelli in triangle, brownish, small, shiny tubercles, interocellar distance is 0.12 mm long, front ocellor space 0.075 mm long; eyes large, black, convex, pubescent, shiny; interorbital distance 0.35 mm long, clypeus narrow, black, hairy platelike, labrum broad, hairy, mandibles stout, pointed, curved inwardly, Antenna (Fig. 59, 60) black hairy 16 segmented, 2.42 mm long, shorter than body, scape (Fig. 59) 0.01 mm long, placodes arranged in 2-4 longitudinal rows, last antennal segment (Fig.60) short conical and equal to the 4th last segment.

FLAGELLAR FORMULA :

2 L/W = 2.6, 8 L/W = 2.3, 14 L/W = 2.0,

L 2/14 = 2.0, W 2/14 = 1.5.

THORAX :

1.15 mm long, black, densely hairy, narrow at both the ends, pronotum large, roughly semicircular, metanotum shiny

with separated punctures, mesoscutum highly polished, scutellum large convex, mesoscutellum small, convex; scutellar disc not entirely smooth, strongly rugoso-reticulate; metanotum lateral glabrous lobes with 2 carination and with pentagonal depression at middle, Propodeum (Fig. 61) broader than long, 0.77 mm broad, 0.27 mm long, with saucer shaped areola, areola open apically, two longitudinal carinae arise from base crossing areola and forming triangles on either side, lateroapical and lateromedian carinae present, carination reduced.

FOREWING (Fig. 91)

2.95 mm long, equal to the body length, straight, transparent, thin, hairy, except anal margin; costa 1.60 mm long, yellowish, thick, hairy; stigma, black, 0.57 mm long, 0.20 mm broad; metacarpus 0.77 mm long, radius, cubitus and subdiscoideus 0.97 mm, 1.12 mm, 0.92 mm long respectively, poorly seen; cubitus vein distinct basally; first anal 1.37 mm long, nervulus 0.12 mm, discoideus 0.12 mm, basal 0.37 mm, recurrent vein 0.15 mm.

HINDWING (Fig. 92)

1.97 mm long, transparent, membranous, thin, hairy; subcostella 1.25 mm long, metacarpella 0.62 mm; radiella and cubitella 0.17 mm, 0.72 mm long respectively, poorly seen; intercubitella absent, nervellus 0.22 mm; vannal lobe large, convex, leaflike, uniformly hairy.

Hindleg (Fig. 63) 3.20 mm long, brownish-black, densely hairy; coxa stout, strong roughly triangular, 0.45 mm long; trochanter

small, curved, slender 0.30 mm long; femur dark brown, strong, flattened, straight, 0.70 mm long, hairy; tibia elongated, straight narrow basally, flat apically, hairy, 0.82 mm long; tibial spurs unequal, outer long 0.20 mm, inner short 0.17 mm long; basitarsus 0.42 mm long, tarsal segments 2nd, 3rd, 4th and 5th 0.15 mm, 0.12 mm, 0.10 mm, 0.10 mm respectively; claw 0.10 mm long curved.

ABDOMEN :

0.17 mm long, excluding ovipositor, brownish-black sparsely hairy, hairs arranged parallelly over abdominal tergites; 1st tergite (Fig. 62) much longer than wide, 0.40 mm long, 0.25 mm broad, rugose, barrel shaped, slightly narrow apically, median apical depression present, 1st tergite more or less longitudinal, and striate, slightly broad medially; 2nd tergite broader than long, rugose but shorter than 3rd; 3rd tergite smooth; 2nd and 3rd tergites much wider than base of 1st tergite, ovipositor (Fig. 64) 0.27 mm long pointed, yellowish, longer than ovipositor sheath, slightly curved with broad base; Hypopygium very short.

MALE : Same resembling as female, except sexual characters and slightly smaller than female.

COCOON : 2.75 mm long, 1.25 mm broad colony white, gregarious, each cocoon contain about 64 individuals.

HOST : Unknown lepidopterous larva.

HOST PLANT: Cassia auriculata Linnaeus.

HOLOTYPE : Female, India, Maharashtra, Coll. 23/X/94, Dahiwadi, Satara, Rokade A.G. on Cassia auriculata

Linnaeus antenna, wings, leg, propodeum tergites, ovipositor on slide, labelled as above.

PARATYPE : Male 15, female 55, sex ratio (m : f) 1:3:6, Coll. from Sept. 1994 to Nov. 1994 same as above.

DISTRIBUTION : Western Maharashtra, India.

DISCUSSION :

Doilichogenidea tarvadi sp.nov. runs close to A.phycodis Viereck in Rao's key by

- (1) Scutellar disc not entirely smooth.
- (2) 1st tergite more or less longitudinally striate and
- (3) Propodeum areolate.

This species ~~also~~ also resembles with A.significance Walker in Wilkinson's key by

- (1) Disc of scutellum strongly rugoso-punctate.

This species also runs close to A platyedrae Wilkinson in Nixon's key by

- (1) Hind femur dark brown
- (2) Antenna shorter than body
- (3) Mesoscutum highly polished.

However, it differs from above species by having following characters.

- (1) Last antennal segment medium cone shaped and equal to the 4th last.

- (2) Areola saucer shaped and open apically, two longitudinal carinae arise from base crossing areola and forming triangles on either side, laterapical & lateromedian carinae present.
- (3) Metanotum lateral glabrous lobe with 2 carination; middle pentagonal depression.
- (4) Cubitus vein distinct at base.
- (5) IInd and IIIrd tergites much wider than base of Ist tergite, IInd tergite entirely rugose.
- (6) Ovipositor longer than sheath and slightly curved.
- (7) Hypopygium very short.
- (8) FLAGELLAR FORMULA :
2 L/W = 2.6, 8 L/W = 2.3, 14 L/W = 2.0
L 2/14 = 2.0, W 2/14 = 1.5.

CAPTION TO FIGURES, PLATE-XV

Dolichogenidea tarvadi sp.nov.

- | | |
|---------|------------|
| Fig. 59 | Antenna |
| Fig. 60 | Antenna |
| Fig. 61 | Propodeum |
| Fig. 62 | Tergites |
| Fig. 63 | Leg |
| Fig. 64 | Ovipositor |

Plate-15



59



63



60



62



61



64

DOLICHOGENIDEA UJLAI SP. NOV.

FEMALE (Plates 7, 16, 19 Figs. 15, 65-70, 93 & 94)

2.37 mm long black, antenna 2.25 mm long, 16 segmented, Propodeum areolate, forewing 2.27 mm long, ovipositor 0.20 mm long.

HEAD :

Elliptical, in dorsal view, black, 0.57 mm long, 0.60 mm broad; vertex, frons, moderately hairy, frons depressed due to antennal socket; face densely hairy with long hairs, ocelli in triangle, brownish-yellow, small, shiny tubercles; interocellar distance 0.12 mm long, front ocellar distance 0.075 mm long. Eyes large, black, convex, pubescent, shiny interorbital distance 0.35 mm long; clypeus narrow, black, hairy, platelike, labrum broad, mandibles strong inwardly curved. Antenna (Fig. 65, 66) black, with short hairs, 2.25 mm long, 16 segmented, scape short 0.050 mm long (fig. 65), last antennal segment short cone shaped (Fig. 66).

FLAGELLAR FORMULA :

2 L/W = 2.5, 8 L/W = 3.0, 14 L/W = 2.0

L 2/14 = 1.7, W = 2/14 = 1.5

THORAX :

0.82 mm long, black, narrow at base, broad at apex, densely hairy; pronotum large, rounded, convex; mesonotum shiny sparsely punctured, closely rugose, dull and strongly setigerous, tegulae not depressed, scutellum large, convex mesoscutellum

small, convex; disc of scutellum largely closely but shallowly punctate and also setigerous; mesopleurum in front with large area of dull, coarse, rugoso-punctation; mesosternum large, platelike, coarsely sculptured, metanotum middle depression 'D' shaped with 4 lateral glabrous carination. Propodeum (Fig. 67) broader than long, 0.70 mm broad, 0.25 mm long with pentagonal areola and with strong lateral carina on each side, middle carina joins the areola and lateral carina, forming somewhat, hexagonal areolation on either side and apically spindle shaped areolation covering spiracles on either side, carination depressed.

FOREWING (Fig. 93)

2.27 mm long, straight, transparent hairy, except the anal margin; costa thick, brownish densely hairy, 1.07 mm long; stigma black 0.62 mm long, 0.17 mm broad; metacarpus 0.57 mm long, radius cubitus, subdiscoideus 0.95 mm, 0.97 mm, 0.97 mm long respectively, poorly visible; medius 0.97 mm long, setae of median cell evenly distributed over entire surface of cell; first anal 1.0 mm long, basal 0.30 mm, discoideus 0.12 mm, nervulus 0.12 mm, recurrent vein 0.12 mm, 2nd radiomedial 0.12 mm long.

HINDWING (Fig. 94)

2.0 mm long, straight, transparent, hairy except subcostal margin; subcostella 1.25 mm long, intercubitella absent, metacarpella 0.67 mm long, radiella, cubitella 1.17 mm, 0.87 mm long respectively, poorly distinct; nervellus 0.22 mm, vannal lobe small, leaflike, convex not hairy uniformly. Hindleg (Fig. 69) 2.87 mm long, longer than body, coxa black, remaining segments

brownish black; coxa stout, triangular, 0.45 mm long, I & II trochanter short, weak, curved, 0.22 mm long; femur stout, straight, flattened, 0.60 mm long; tibia long straight flat distally. 0.70 mm long; tibial spurs unequal, outer long 0.15 mm, inner short 0.12 mm long; basitarsus slender, long 0.30 mm long, tarsal segments 2nd, 3rd, 4th and 5th 0.15 mm, 0.12 mm, 0.10 mm 0.10 mm respectively; apical segment of front tarsus without trace of spine; claw short, 0.075 mm long, curved; entire leg hairy but tibial and tarsal segments densely hairy.

ABDOMEN :

0.82 mm long, black, excluding ovipositor, narrow basally, broad distally, sparsely hairy; 1st tergite (Fig.68) brownish, rugose, parallel sided, much longer than broad, 0.40 mm long, 0.35 mm broad; 2nd tergite yellow-brownish, wider than long, 0.45 mm wide, 0.10 mm long; 2nd & 3rd tergites much wider, subrectangular, 2nd tergite rugose entirely and 3rd tergite half rugose, abdomen coarsely sculptured. Ovipositor (Fig. 70) yellow, spinelike, slightly longer than sheath, 0.20 mm long, sheath sparsely hairy throughout, brownish, punctate apically.

MALE : Same resembling as female, except sexual characters and slightly smaller than female.

COCOON : 2.50 mm long, 1.20 mm broad, cottony white, gregarious, each cocoon colony contain about 45 individuals.

- HOST : Unknown lepidopterous larva.
- HOST PLANT : Grass, gramineae family. — *J. deub. B. ent. in*
- HOLOTYPE : Female, India, Maharashtra, Coll. 10/1/95
Ujalaiwadi, Kolhapur, Rokade A.G., on grass;
antenna, wings, leg, propodeum, tergites,
ovipositor on slide, labelled as above.
- PARATYPE : Male 5, female 19, sex ratio (m : f) 1:3.8 Coll.
from Dec. 94 to Jan. 95, same data as above.
- DISTRIBUTION : Western Maharashtra, Not found in Marathwada.

DISCUSSION :

Dolichogenidea ujlai sp.nov. runs close to
A. singaporensis Sezpligiti in Rao's key by

- (1) Mesonotum closely rugose, dull, and strongly setigerous.
- (2) Disc of scutellum largely closely but shallowly punctate and also setigerous.

The species also runs close to A. cleo in Nixon's key by

- (1) Apical segment of front tarsus without trace of spine.
- (2) Setae of median cell evenly distributed over entire surface of cell.
- (3) Mesopleurum in front with large area of dull, coarse, rugoso-punctation.

However it differs from above species by having following characters :

- (1) Antenna with very short hairs, last antennal segment cone shaped.
- (2) Propodeum with pentagonal areola and with strong, lateral, carina on each side, middle carina joins the areola and lateral carina forming somewhat hexagonal areolation on either side and spindle shaped areolation apically covering spiracles from either side.
- (3) Metanotum middle depression 'D' shaped with 4 lateral glabrous carination.
- (4) Ovipositor straight, slightly longer than sheath, sheath sparsely hairy throughout.
- (5) Tergite II and III much wider, subrectangular, tergite II entirely rugose and III tergite half rugose.
- (6) FLAGELLAR FORMULA :
 $2 L/W = 2.5, 8 L/W = 3.0, 14 L/W = 2.0$
 $L 2/14 = 1.7, W 2/14 = 1.5$

CAPTION TO FIGURES, PLATE-XVI

Dolichogenidea ujlai sp.nov.

- | | |
|---------|------------|
| Fig. 65 | Antenna |
| Fig. 66 | Antenna |
| Fig. 67 | Propodeum |
| Fig. 68 | Tergites |
| Fig. 69 | Leg |
| Fig. 70 | Ovipositor |

Plate-16



65



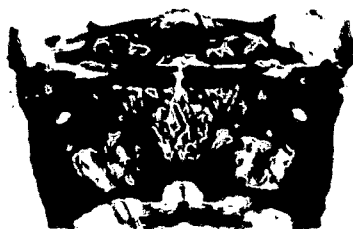
69



66



68



67



70

DOLICHOGENIDEA YAMINI SP.NOV.FEMALE (Plates 7, 17, 19; Fig. 16, 71-76, 95-96)

2.55 mm long, antenna brownish, 16 segmented, 2.12 mm long, forewing 2.45 mm long, propodeum areolate, ovipositor 0.22 mm long.

HEAD :

Elliptical, in dorsal view, black, 0.70 mm long, 0.65 mm broad, hairy; vertex, frons sparsely punctate, frons depressed at base of antenna; face densely hairy, ocelli in triangle, dark-brown rounded, shiny, interocellar space 0.15 mm long, front ocellar space 0.050 mm long; eyes large, pubescent, convex, compound, interorbital distance 0.40 mm long, clypeus narrow, labrum broad, mandibles strong curved. Antenna (Fig. 71,72) 2.12 mm long, black, entirely, hairy, 16 segmented, scape 0.010 mm long (Fig. 71), placodes arranged in 3 longitudinal rows.
 ♀ | Last antennal seg (Fig. 72) long, lanceolate.

FLAGELLAR FORMULA :

$$2 \text{ L/W} = 1.5, \quad 8 \text{ L/W} = 2.0, \quad 14 \text{ L/W} = 2.0$$

$$\text{L } 2/14 = 1.5, \quad \text{W } 2/14 = 2.0$$

THORAX :

1.12 mm long, 0.80 mm broad, hairy; pronotum densely hairy, large, convex, semicircular; mesonotum rugosely striate, with clear separated punctures; tegulate black, not depressed; scutellum convex mesosternum large, shield like; metanotum lateral.

glabrous lobe with 4-5 carinations. Propodeum (Fig.73) shiny, hairy, broader than long, 0.97 mm broad, 0.30 mm long, Propodeum with areola, smooth except areola, basal lateral areolation somewhat quadrangular and apical carinations, spindle shaped excluding spiracles, spiracles two, elliptical.

FOREWING (Fig. 95)

narrow basally, flat apically, 2.45 mm long straight transparent, hairy; stigma pale black, 0.62 mm long, 0.20 mm broad, densely hairy; costa very thick, brownish, hairy 1.65 mm long; metacarpus, thick black, 0.62 mm long; radius, cubitus and subdiscoideus 0.90 mm, 1.10 mm and 0.92 mm long respectively, poorly seen; cubitus basal part prominent, medius 0.95 mm long, first anal 1.15 mm long, nervulus 0.12 mm long, basal 0.35 mm long, discoideus 0.15 mm long, recurrent vein 0.15 mm long, subdiscoideus 0.95 mm long, entire wing hairy except anal lobe.

HINDWING (Fig. 96)

2.07 mm long, straight transparent; subcostella 1.25 mm long, hairy, intercubitella absent, basella 0.15 mm long, nervellus 0.22 mm long, vannal lobe small, convex, not uniformly hairy, other veins not seen. Hindleg (Fig. 75) 2.82 mm long, brown to black, hairy; coxa triangular, stout, 0.47 mm long; trochanter slightly curved, 0.17 mm long; femur 0.60 mm long, tibia 0.75 mm long; tibial spurs unequal, outer long 0.15 mm, inner short 0.12 mm long; basitarsus 0.35 mm long, tarsal segments 2nd, 3rd, 4th and 5th 0.15 mm, 0.10 mm, 0.10 mm and 0.10 mm long respectively; claw 0.075 mm long, curved.

ABDOMEN :

1.12 mm long, coarsly sculptured, narrow basally, broad distally. Ist tergite (Fig. 94) longer than broad, rugose, barrel shaped, 0.32 mm long, 0.27 mm broad, IInd tergite broader than long, 0.42 mm broad, 0.12 mm long, smooth, shorter than IIIrd, IInd and IIIrd tergites distal to the basal area almost as rugose as the basal area, basal field of tergite IInd + IIIrd very much wider than the apical width of tergite Ist. Ovipositor (Fig.76) straight, 0.22 mm long, much longer than sheath; sheath short 0.20 mm long, not longer than hind tibia; hypopygium short.

MALE : Same resembling as Female except sexual characters and slightly smaller than female.

COCOON : 2.60 mm long, 1.15 mm broad, cottony white gregarious, each cocoon colony contain about 37 individuals.

HOST : Unknown lepidopterous larva.

HOST PLANT: Congress grass, Parthenium hysteroforus Linnaeus.

HOLOTYPE : Female, India, Maharashtra, Coll. 3/XI/94 Ashta, Beed, Maharashtra, Rokade A.G. on Congress grass; antenna, wings, leg, propodeum, tergites, ovipositor on slide, labelled as above.

PARATYPE : Male 7, female 40, sex ratio (m : f) 1:5.7, Coll. from Nov. 94 to Dec. 94 same data as above.

DISTRIBUTION: Marathwada, not found in Western Maharashtra.

DISCUSSION :

Dolichogenidea yamini sp.nov. runs close to A.ricini Bhatnagar in Rao's key by

- (1) Tegulae black.
- (2) Mesonotum rugosely striate and
- (3) Propodeum smooth except for areola.

This species also runs close to A.hemitheae Wilkinson in Nixon's key by

- (1) Tergite II and IIIrd distal to the basal area almost as rugose as the basal area.
- (2) Ovipositor sheath not longer than hind tibia.
- (3) Propodeum with areola.

However it differs from the above species by having following characters :

- (1) Antenna black entirely with last antennal segment lanceolate.
- (2) Propodeum basal lateral areolation somewhat quadrangular and apical carinations, spindle shaped excluding spiracles.
- (3) Basal field of tergite IIrd + IIIrd very much wider than the apical width of tergite Ird.
- (4) Ovipositor much longer than ovipositor sheath.
- (5) Metanotum lateral glarous lobe with 4-5 carinations.
- (6) Wing narrow basally and flat apically, costal margin very thick, cubitus basal part prominent.
- (7) FLAGELLAR FORMULA : 2 L/W = 1.5, 8 L/W = 2.0, 14 L/W = 2.0, L 2/14 = 1.5, W 2/14 = 2.0.

CAPTION TO FIGURES, PLATE-XVII

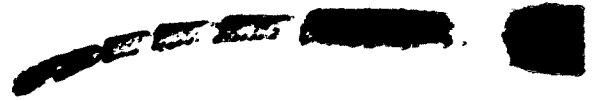
Dolichogenidea yamini sp.nov.

- | | |
|---------|------------|
| Fig. 71 | Antenna |
| Fig. 72 | Antenna |
| Fig. 73 | Propodeum |
| Fig. 74 | Tergites |
| Fig. 75 | Leg |
| Fig. 76 | Ovipositor |

Plate-17



71



75



72



74



73

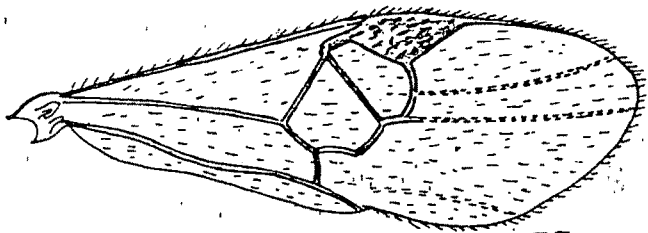


76

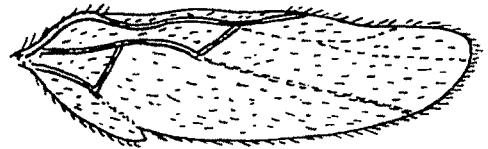
CAPTION TO FIGURES, PLATE-XVIII

Fig. 77	Forewing]	<u>C. <u>gramini</u></u>
Fig. 78	Hindwing]	
Fig. 79	Forewing]	<u>C. <u>indica</u></u>
Fig. 80	Hindwing]	
Fig. 81	Forewing]	<u>C. <u>karviri</u></u>
Fig. 82	Hindwing]	
Fig. 83	Forewing]	<u>C. <u>lepidopteri</u></u>
Fig. 84	Hindwing]	
Fig. 85	Forewing]	<u>D. <u>parijatki</u></u>
Fig. 86	Hindwing]	

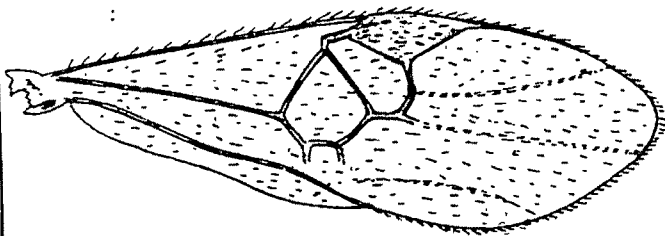
PLATE - XVIII



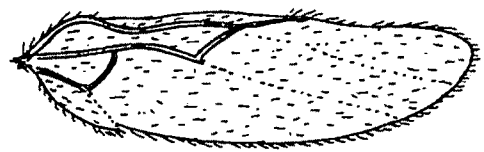
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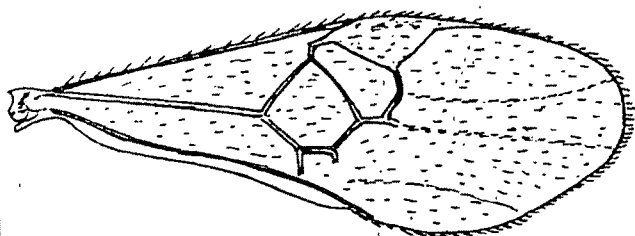
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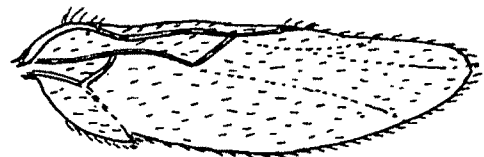
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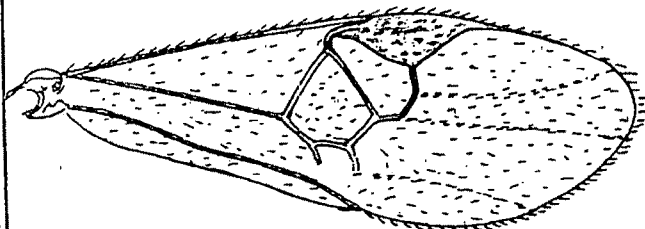
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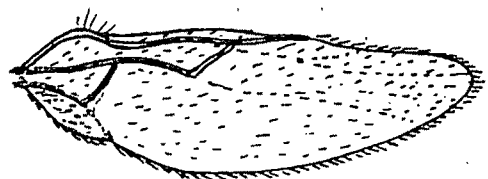
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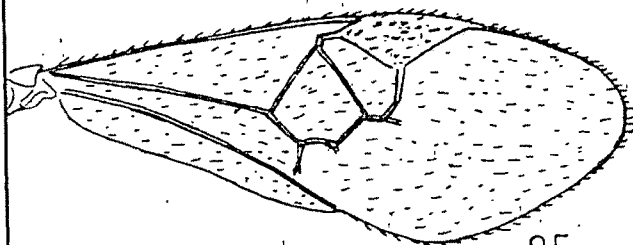
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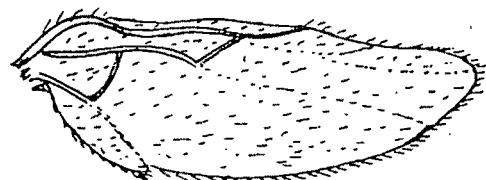
83



84



85

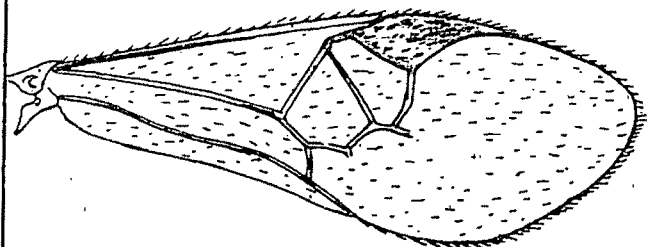


86

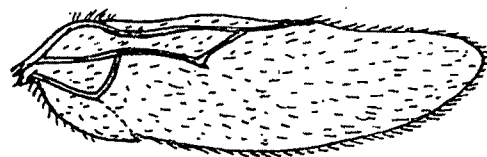
CAPTION TO FIGURES, PLATE-XVIV

Fig. 87	Forewing	}	
Fig. 88	Hindwing	}	<u>D. revati</u>
Fig. 89	Forewing	}	
Fig. 90	Hindwing	}	<u>D. sathei</u>
Fig. 91	Forewing	}	
Fig. 92	Hindwing	}	<u>D. tarvadi</u>
Fig. 93	Forewing	}	
Fig. 94	Hindwing	}	<u>D. ujlai</u>
Fig. 95	Forewing	}	
Fig. 96	Hindwing	}	<u>D. yamini</u>

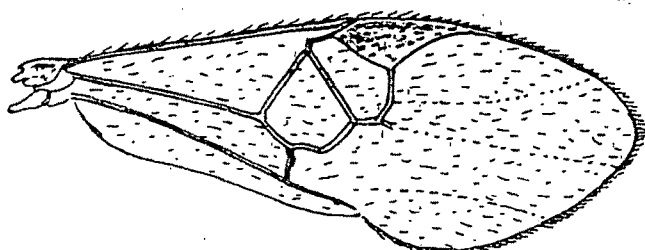
PLATE - XIV



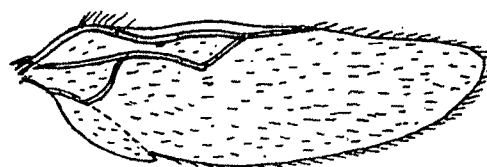
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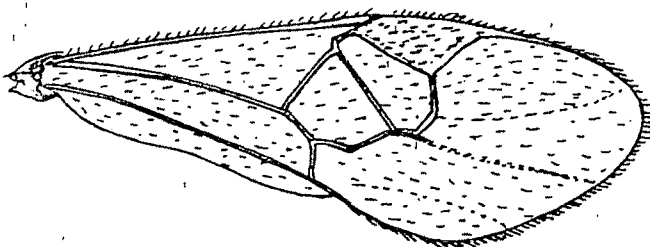
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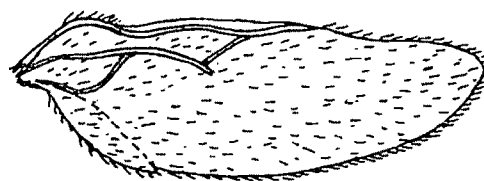
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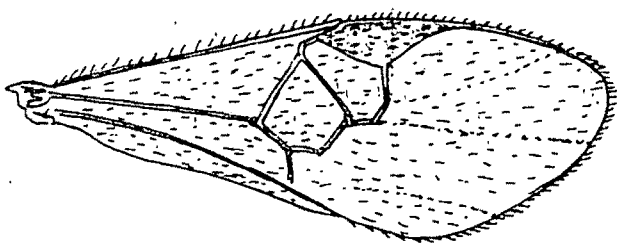
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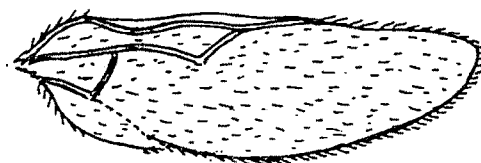
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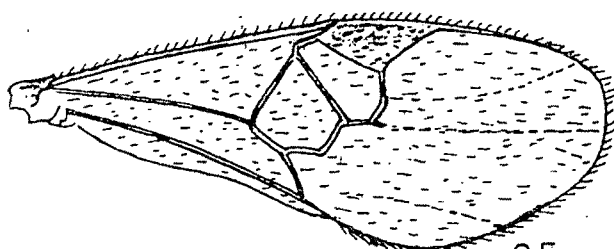
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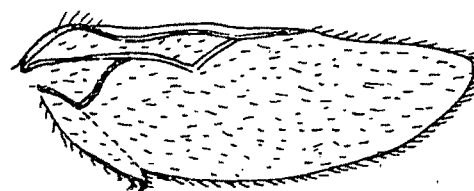
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