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NEW MALE, LARVA AND PUPARIUM OF *ODONTOMYIA PULCHERRIMA* BRUNETTI (INSECTA: DIPTERA: STRATIOMYIDAE) FROM THE ORIENTAL REGION

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ABSTRACT. – Males, larvae and puparia of *Odontomyia pulcherrima* Brunneti, 1920, are described for the first time and the female is redescribed. The larvae are unique among the *Odontomyia* species in that they live on wet rocks at waterfalls and are adapted to hygropetric conditions. The adults were reared from pupae collected in the field. *O. pulcherrima* is a widespread species occurring in India, Thailand, Malaysia and Indonesia. Relationships of *O. pulcherrima* are briefly discussed and a preliminary key to the four Oriental *Odontomyia* larvae known so far is given.

KEY WORDS. – Stratiomyidae, *Odontomyia*, adults, larvae, puparia, hygropetric mode of life, Oriental region, Malaysia, taxonomy, morphology

INTRODUCTION

There are at least 25 species of *Odontomyia* occurring in the Oriental region (cf. James, 1975; Rozkošný & Kovac, 1994). They are poorly known and badly need a taxonomic revision. *Odontomyia* larvae are aquatic and prefer stagnant waters such as lakes or ponds. Other species occur at the margins of slow-running rivers (see Rozkošný, 1982). *Odontomyia latitibia* Rozkošný & Kovac was found in bamboo phytotelmata (Rozkošný & Kovac, 1994).

Recently we discovered a remarkable and distinct *Odontomyia* larva occurring on seeping rocks at waterfalls at various locations in Southeast Asia. All available adults were bred from puparia collected in the field and proved to be *Odontomyia pulcherrima* Brunetti, 1920. This species was described by Brunetti on the basis of a single female specimen from western Bengal, India. The female has a characteristic colour pattern on the thorax, thus confusion with other described *Odontomyia* species can be excluded.

In the present study we describe the male, larva and puparium of *O. pulcherrima* and redescribe the female. Furthermore, a preliminary key to the four known larvae of the Oriental species of *Odontomyia* is presented. We use the terminology according to Rozkošný (1982).

TAXONOMY

FAMILY STRATIOMYIDAE

Odontomyia pulcherrima Brunetti, 1920
(Figs. 1-22)

Material examined. - **MALAYSIA:** West Malaysia: Genting Highlands, waterfall, 1000 m a.s.l., rock wall splashed by waterfall, 7 Sep.1995, 17 larvae, 11 puparia, 3 males and 1 female ex puparia, 24 Sep.1995, 5 larvae, 30 Sep.1995, 1 male ex puparium, 16 Oct.1995, 2 females ex puparium. Gombak River near Kuala Lumpur, 300 m a.s.l., waterfall, 10 Sep.1995, 2 larvae; East Malaysia: Sabah, Poring Hot Springs, Langanan waterfall, 24 Oct.1996, 1 larva; **THAILAND:** North Thailand: Mokfa waterfall near Chiang Mai, 8 Apr.1998, 2 larvae; Central Thailand: Khlong Lan National Park, Khlong Lan Waterfall, 22 Nov.1996, 3 larvae; Khlong Lan National Park, waterfall further up the Khlong Namlai Waterfall, 3 May 1999, 14 larvae; **INDONESIA:** Bali, Gitgit Waterfall near Singaraja, 17 Jun.1995, 2 larvae. All specimens leg. by D. Kovac.

Description. – Size. – Male: Length: body (without antenna) 9.9-10.6 mm, wing 7.8-8.4 mm (based on 2 males). Female: body (without antenna) 9.2-9.8 mm, wing 7.5-8.0 mm. (based on 2 females). Larva: length: 7.16-20.89 mm, maximum width: 1.34-4.78 mm (based on 41 larvae and 14 puparia).

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Male. – Head (Fig. 1): slightly broader than thorax in dorsal view, subshining to shining black, only narrow stripes on face along eye margins yellowish transparent. Eyes bare, contiguous for a relatively long distance which is somewhat longer than the combined length of the two basal flagellomeres of antenna. Facets in lower third much smaller than upper ones. Ocellar triangle very slender in front of anterior ocellus, posterior ocelli in middle between anterior ocellus and occipital margin of head. Small frontal triangle above antennae much broader than high. Antennae black, inserting on a low and rounded protuberance; antennal index (i.e. ratio flagellum length to length of both basal segments) 2.2-2.4, scape barely longer than pedicel. From 5 flagellomeres 3 basal with usual scattered sensorial pits, apical flagellomere only little distinct, broader than long. Face unusually flat and almost straight in profile. Postocular area narrow, distinct only in lower third of head in lateral view. Proboscis short, labellae relatively large and stout. Head pubescence short and black on anterior part of ocellar triangle and vertex but dense, silverish white on face and cheeks.

Thorax: subshining black, only propleura (partly and indistinctly) and posterior stigma yellowish. Discal part of scutum and scutellum short black haired, scutellar spines yellow with black apices. Pleura and a broad lateral stripe on each side of scutum with dense and long, silverish white pubescence. Whitish haired area of scutum reaching from humeri to wing base, broader than both basal antennal segments are long. Also postalar calli long whitish haired and middle part of prescutum with some longer pale hairs.

Wing: Brownish infuscated, only apical half indistinctly paler, strong veins and pterostigma at anterior wing margin dark brown to black, so that anterior margin of wing above anterior cross vein largely black (darkening about three times as long as discal cell). Vein R4 present, also veins M1, M2 and M4 distinct but only basal part of M3 visible. Wing base and squamae darkened, almost black, particularly thoracic squama blackish haired and provided with long black fringe. Halters pale yellow, their stem brownish basally.

Legs including coxae chiefly black and black haired, only mid tibia with a pale yellow ring occupying its middle third. Fore tibia markedly dilated in distal half and provided by a dense fringe of stiff black hairs on dorsal side (Fig. 3). Basal halves of all femora somewhat brownish as well as mid and hind tarsi pale brown ventrally. Extreme basis of hind femur and hind coxa partly yellowish.

Abdomen mainly black dorsally (Fig. 5) and completely pale yellow ventrally. Dorsal part of abdomen with usual sidemarkings at posterolateral corners of tergites 2-4 and an apical spot on tergite 5. Lateral sidemarkings narrowly overreaching boundaries of tergites and occupying also narrow anterolateral parts of tergites 3-5. Abdominal pile chiefly black, short and indistinct, longer only on anterolateral corners of abdomen. Yellow parts with very short pale pubescence.

Male genitalia (Figs. 7-9): Proctiger relatively small, epandrium deeply emarginate proximally (Fig. 9). Median process of synsternite semicircular, regularly rounded. Gonostylus flat, with a subapical and pointed inner tip (Fig. 7). Phallic complex slightly constricted before apex, parameres slender and shorter than aedeagus (Fig. 8).

Female (Redescription). – Head (Fig. 2): Yellow, ocellar triangle, antennae and proboscis black. Eyes bare, much smaller than in male, facets small and uniform. Frons subquadrate, occupying about middle third of head, slightly broadened towards the level of antennae, with a distinct median groove. Ocellar triangle equilateral, posterior ocelli situated very close to occipital head margin. Antennae as in male, inserted on a low tubercle. Face almost straight in profile, cheeks barely broader than scape is long. Postocular area somewhat narrower than pedicel is long. Head pile sparse, blackish on frons, ocellar triangle and upper half of postocular area but whitish to yellow on face and cheeks. Hairs on labellae mainly pale.

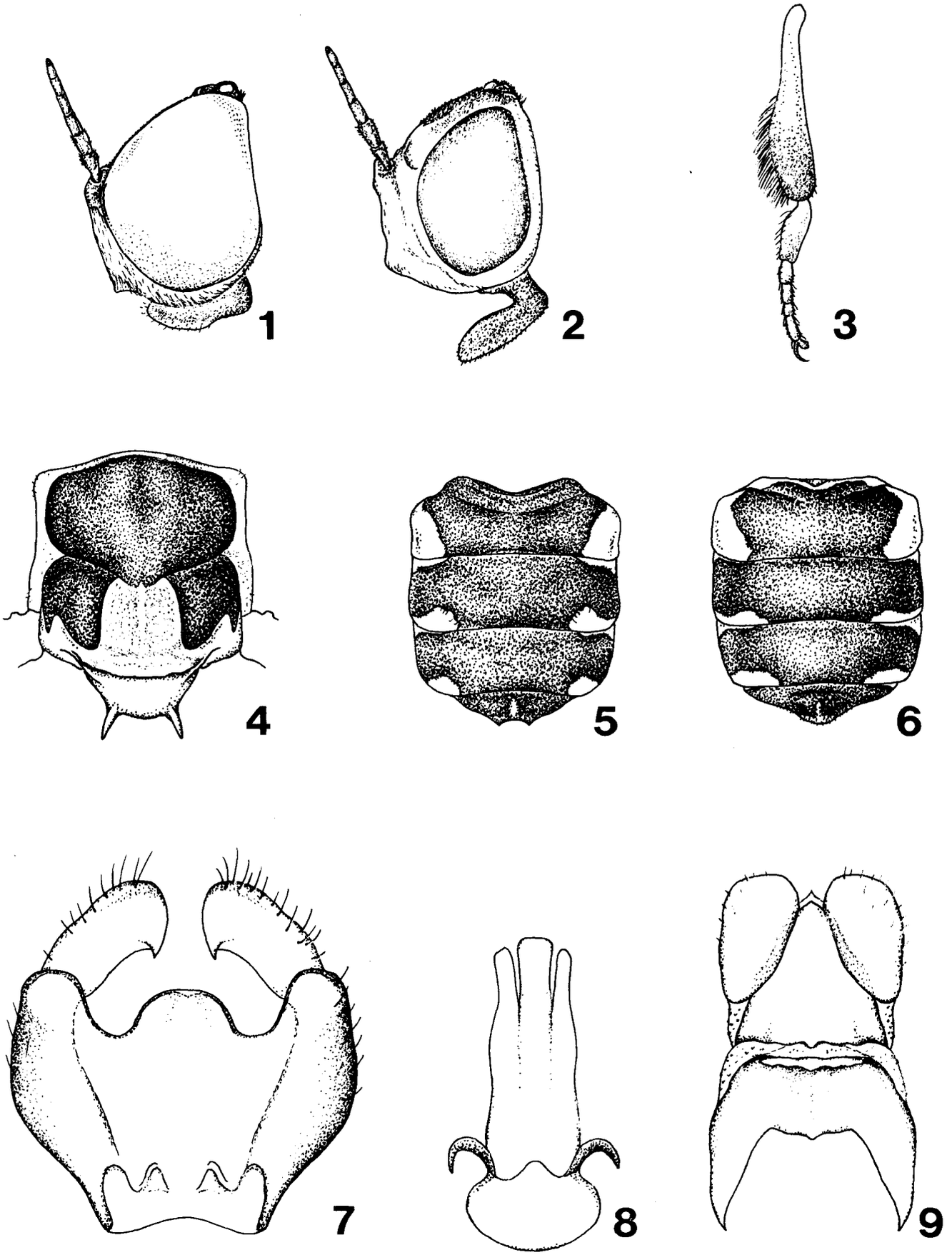
Thorax (Fig. 4): Ground colour black but upper half of pleura and broad lateral stripe on each side of scutum pale yellow. Also postallar calli yellow. A subquadrate mid spot between transverse suture and scutellum as well as scutellum and mediotergite orange to reddish brown. Scutellar spines apically darkened. Thoracic pile pale yellow on pale parts and black on the rest.

Wings as in male, i.e. brownish infuscated and with an elongate black pterostigma. Especially thoracic squama black haired and with a long marginal fringe. Legs as in male including characteristically dilated and haired fore tibia but somewhat paler: yellow middle ring of mid tibia broader and basal halves of femora paler, almost yellowish on hind pair of legs. All coxae at least partly yellowish. Mid and hind tarsi predominantly brownish.

Abdomen (Fig. 6) resembling male as regards yellow pattern. However, in addition to sidemarkings and an apical spot, anterior margin also narrowly yellow. Abdominal pile as in male.

Compared with Brunetti's original description the basal halves of mid and hind femora may be as pale as the yellow mid ring on the mid tibia. Hairs on lateral parts of the thorax may be almost golden yellow but in the examined females they are rather pale yellow. Some differences have been stated in the extent of thoracic black ventral parts.

Mature larva (Fig. 22). – Dark brown in ground colour, head and broad lateral margins of body segments often reddish brown. Thoracic segments 2 and 3 reddish brown also in central area, each with almost orange longitudinal mid stripe. Abdominal segments 2-7 with paired pale mid spots at posterior margins. Lateral parts of all body segments with ornamentation consisting of dark, small and circular cuticular plates. Venter generally paler, with more conspicuous dark ornamentation.



Figs. 1-9. *Odontomyia pulcherrima* Brunetti, characters of adults. 1, Male head in lateral view; 2, Female head in lateral view; 3, Male fore tibia and tarsus; 4, Female thorax in dorsal view; 5, Male abdomen in dorsal view; 6, Female abdomen in dorsal view; 7-9, Male genitalia: synsternite with gonostyli (7), phallic complex (8), cerci, proctiger and epandrium (9).

Head (Fig. 10) short and stout, only slightly longer than broad in dorsal view, head index about 1.2. Dorsal grooves along each side of clypeofrons deep. Labrum longer than distal part of genal lobes, eyes relatively small but distinctly prominent. Basal segment of antenna only about twice as long as broad, apical segment short, semiglobular. One long and 3 short sensillae visible besides apical segment, all being slender and rodlike (Fig. 18). Labrum continuing ventrally as a ramified pennate mid appendage. Ventral margin of each genal lobe with long and dense hair fringe (Figs. 16-17). Mandibular maxillary complex denselly haired, with more or less distinct transverse rows of flat setae, fingerlike maxillary palpus relatively long. Ventral opening of head capsule well developed though probably covered with fine membrane (Fig. 11).

Anterior spiracle on thoracic segment 1 small, oblique oval. Usual lateral spiracles on thoracic segment 3 and abdominal segments 1-7 very small, circular and black, very probably non-functional. Abdominal segment 6 in basal third with a mid line consisting of 1-2 longitudinal rows of about 20 pale cells. Similar mid line on abdominal segment 7, but longer, occupying almost basal half of segment. Strong ventral hooks developed on posterior margin of abdominal segment 7. Anal segment relatively short (index about 1.4), slightly broadened towards posterolateral corners (Fig. 13). Longitudinal anal slit occupying somewhat more than third of segment length. Margins of anal slit with minute, subquadrate teeth. Transverse spiracular opening at apex of anal segment, surrounded by pinnate float hairs. These float hairs much shorter than marginal setae and about twice as long on ventral lip than those of dorsal lip (Fig. 12).

Chaetotaxy: Position and number of constant setae as in other known larvae of *Odontomyia* but pubescence and species-specific marginal setae very original. Head virtually without dense hairs (except for conspicuously haired mouth parts), thus constant setae well visible (cf. Figs. 10-11). Setae usually flattened (especially in basal half) and more or less pinnate. Clypeofrontal and anterior labral setae broadly pinnate, posterior labral setae (Lb2) bushlike (Fig. 10, 15). Cf2 seta on level of posterior eye margin. Dorsolateral seta beyond eye and lateral seta just below it. All ventral setae (Fig. 11) ramified and bushlike, V3 seta largely fanlike and transverse with its numerous branches, shifted anterolaterally, and well visible on sides of head even in dorsal view. V1 close to ventral head opening, almost invisible among marginal hairs on genal lobes. Insertions of slender ventrolateral setae forming an elongate triangle: Vl3 in front of V3, Vl2 between lateral seta and antenna but more ventrally, and Vl1 in middle of genal lobe.

Body segments with very characteristic groups of hairs and long lateral setae on all segments. Dense and longer pale hairs forming two dorsal hair stripes along mid third on all thoracic and first seven abdominal segments. These hair stripes interrupted on boundaries of segments. Similarly dense growth of pale hairs much extensive ventrally where occupying more than mid third on each body segment. Such hair pillows leaving only sublateral parts of segments bare. Lateral margin of all body segments provided with bunches of long setae being often longer than relevant segment. Virtually all body parts (except for head) thus bordered by a complete lateral fringe of dense setae.

Constant setae on thoracic segments mostly distinguishable, darker than other pubescence, though often barely visible among growth of long hairs. Thoracic segment 1 (Fig. 10) with usual two pairs of anterodorsals and 3 pairs of dorsals, all being simple, at most shortly pubescent. D2 setae shifted anteralad as in other *Odontomyia* species and in this position also on thoracic segments 2 and 3 where only 3 dorsal setae present. Dorsolateral and ventrolateral setae usually darker than other setae on lateral wall, constant lateral setae virtually indistinct within bunches of long and numerous setae forming lateral fringe. Only thoracic leg groups, i.e. doubled 2nd ventral setae on each thoracic segment visible among pale, dense and long ventral pubescence.

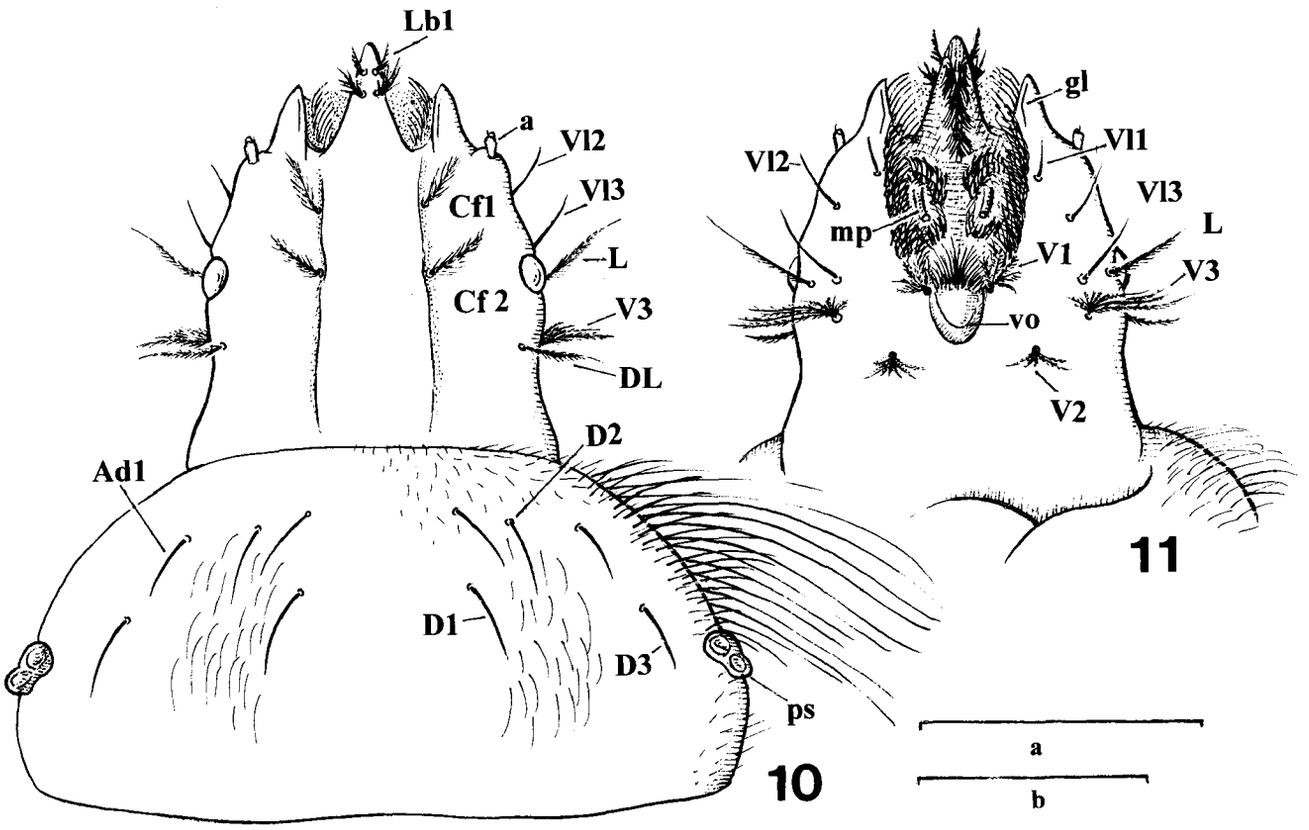
Configuration of dorsal setae on abdominal segments 1-7 virtually the same as in thoracic segments 2 and 3, dorsolateral and ventrolateral setae more or less distinct, 2 constant lateral setae invisible. Three pairs of ventral setae barely distinct among ventral pubescence though usually somewhat darker than ventral pubescence, arranged in a semicircular position, V3 being inserted most distally, slightly above middle of segment. Anal segment (Fig. 12) bearing one pair of short dorsal setae and bare laterally in basal quarter or somewhat more. Longest lateral setae on posterolateral corners where longer than anal segment. Ventral side with relatively long pale hairs being, however, at least in basal part, not as dense as on preceding abdominal segments. Five pairs of ventral setae more or less visible (Fig. 13).

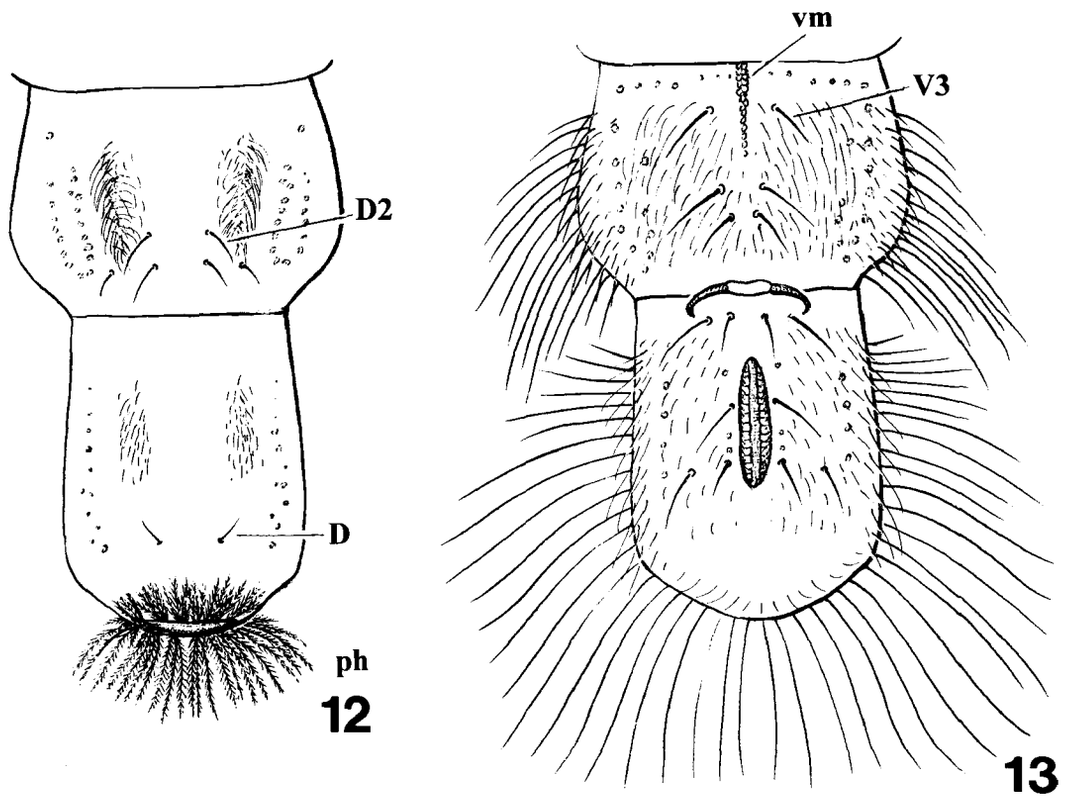
Puparium. – The pupa is formed within the skin of the last instar larva which is transformed into a puparium. Puparia are motionless but they retain all morphological structures characteristic for the last instar larvae including mouthparts, cuticular structures as well as the arrangement of surface pubescence. The length and the maximum width of puparia is the same as in the mature larvae.

Distribution. – India (West Bengal), Thailand, Malaysia (West Malaysia, East Malaysia), Indonesia (Bali).

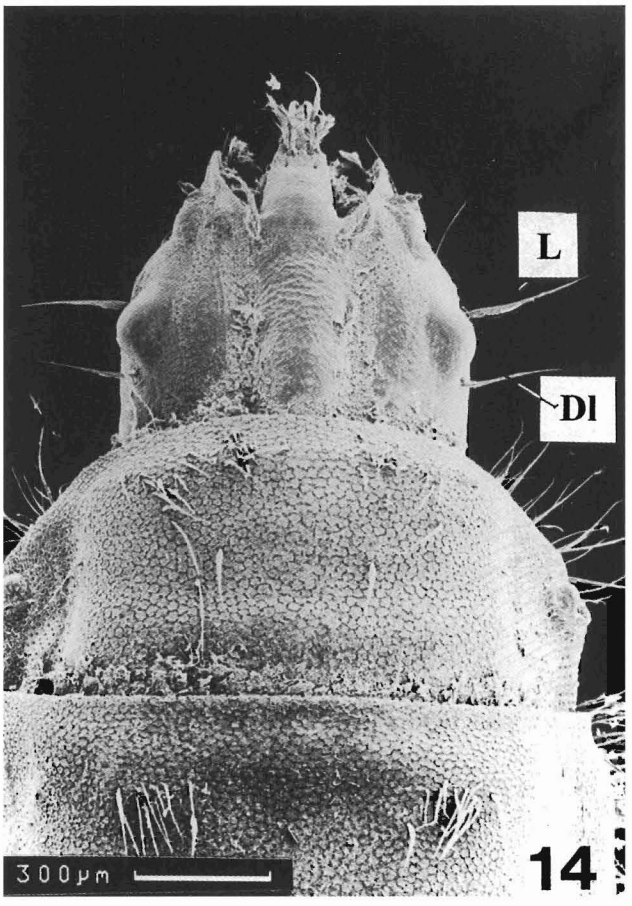
Habitat and biology. – The larvae of *O. pulcherrima* live on rock faces splashed by waterfalls. They also occur on spring-fed seeping rock faces, i. e. not necessarily close to free-flowing water. The larvae crawl on the wet rocks and are probably micropantophagopus scavengers feeding on organic detritus and microscopic fauna. The puparia can be found in the same habitat. However, they are hard to detect, because they hide between debris and soil particles. In puparia the hind part of abdomen is strongly curved upward.

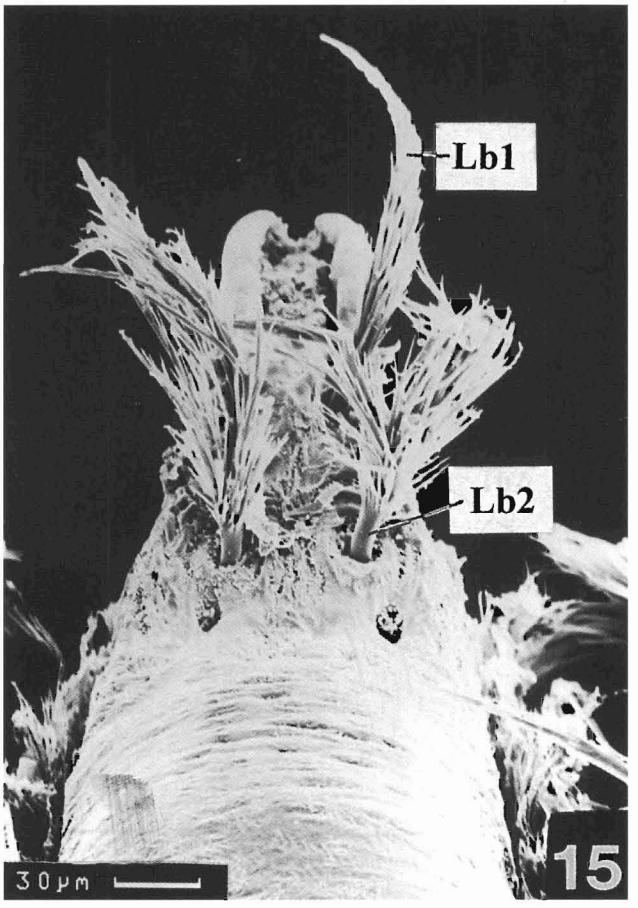
Remarks. – The female cannot be mistaken for any other Oriental species of the genus due to the species-specific colour pattern on the thorax. Also the male seems to be well characterized by its pale long hairs on the upper part of the

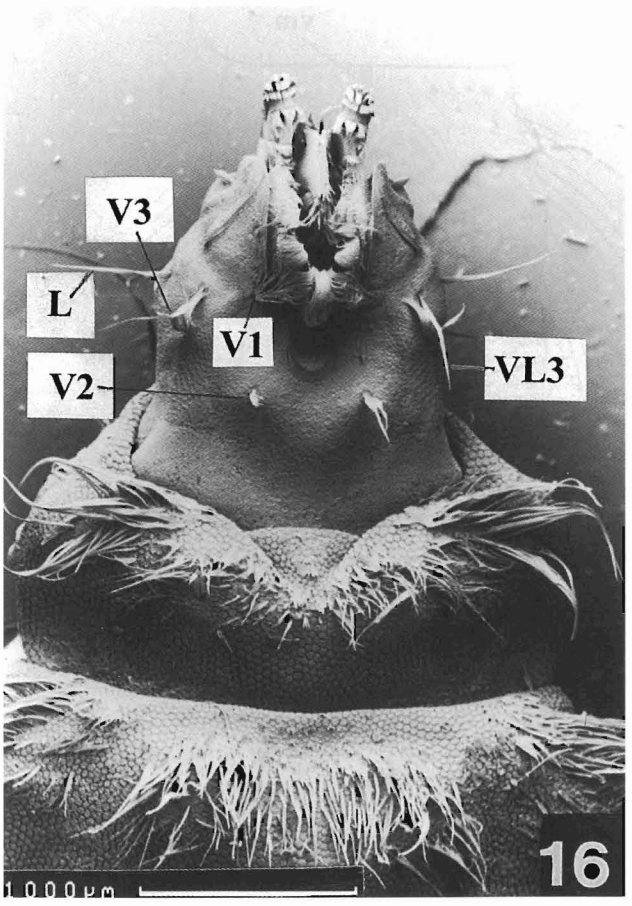


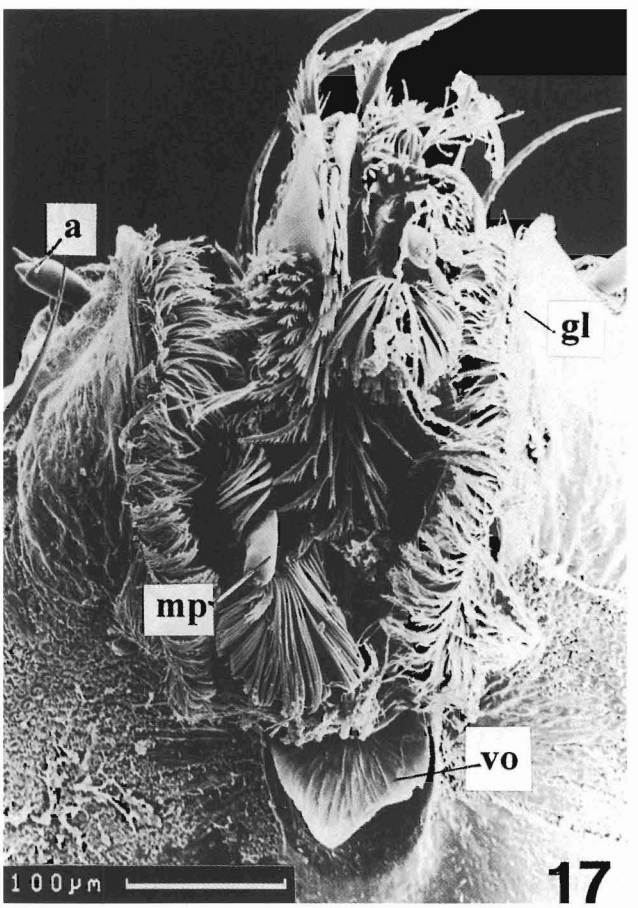


Figs. 10-13. *Odontomyia pulcherrima* Brunetti, mature larva. 10, Head and thoracic segment 1 in dorsal view; 11, Head in ventral view; 12, Last two abdominal segments in dorsal view (lateral setae omitted); 13, Last two abdominal segments in ventral view (pinnate float hairs omitted). a – antenna, Ad – anterodorsal setae, Cf – clypeofrontal setae, D – dorsal setae, Dl – dorsolateral seta, gl – genal lobe, L – lateral seta, Lb – labral setae, mp – maxillary palpus, ph – pinnate float hairs, ps – prothoracic stigma, V – ventral setae, Vl – ventrolateral setae, vm – ventral midline, vo – ventral orifice. Scales 1.0 mm. a: 10-11, b: 12-13.

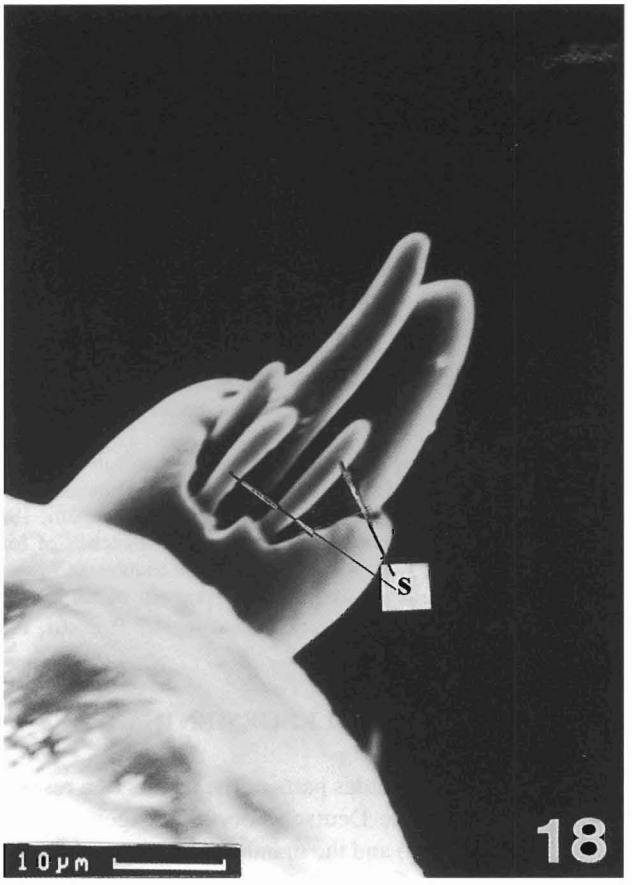


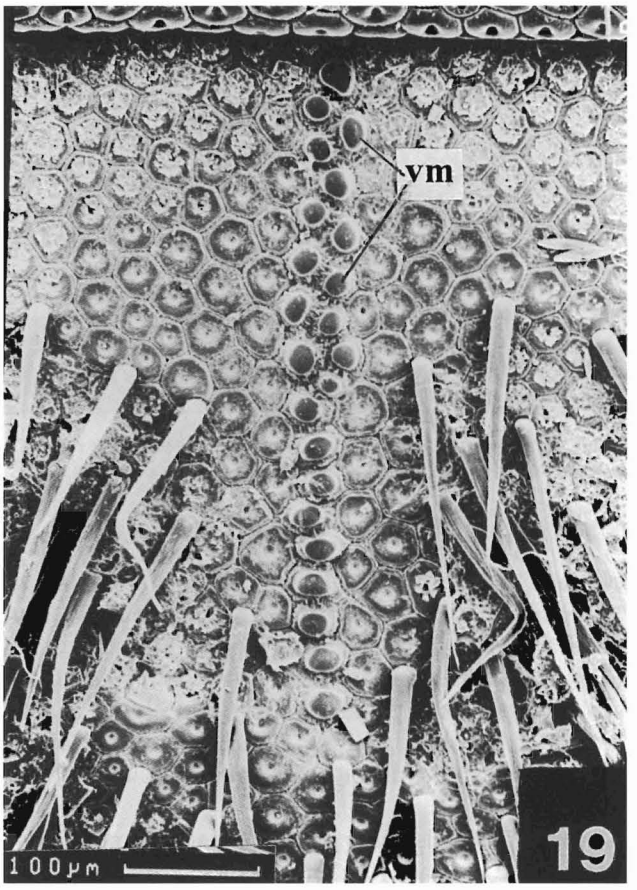


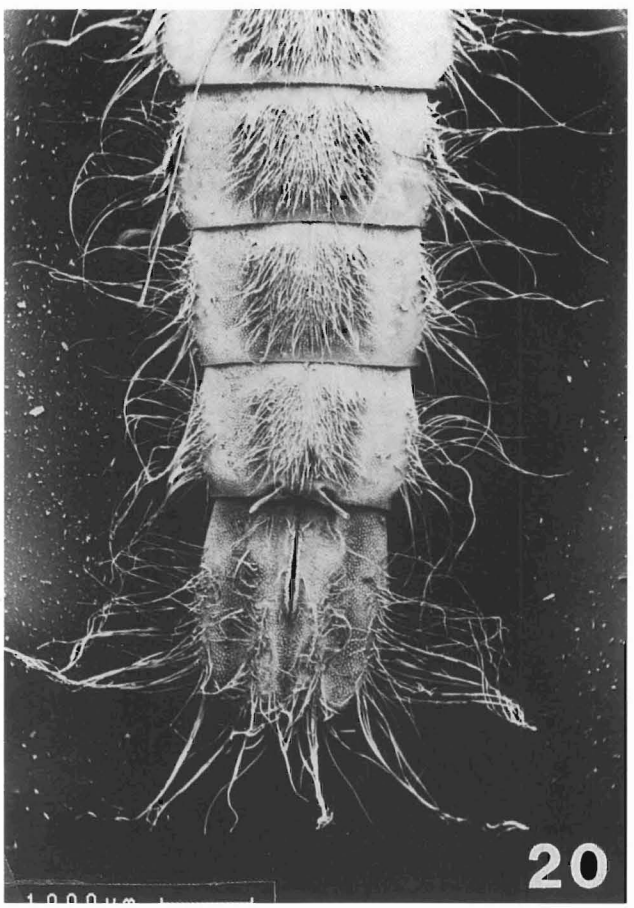


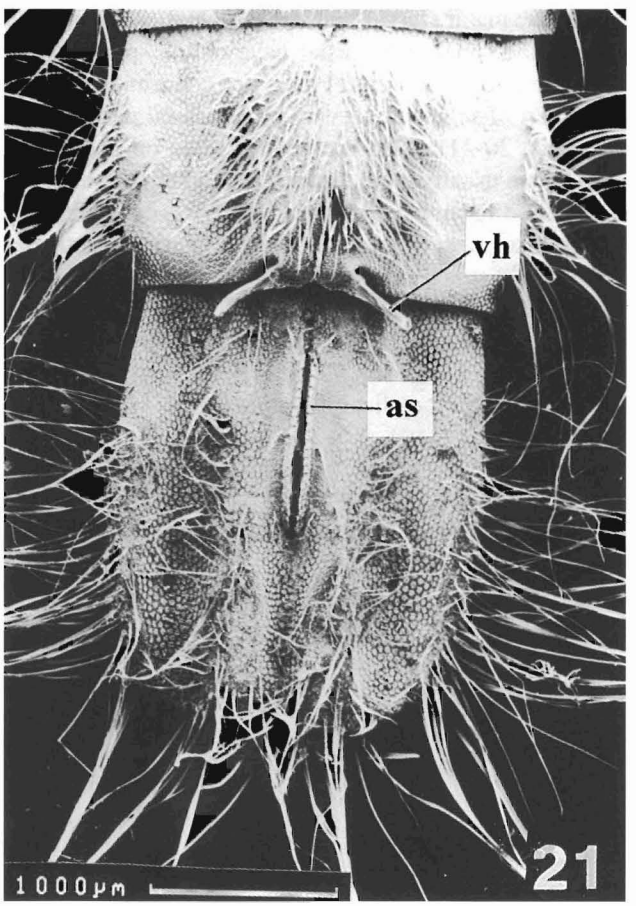


Figs. 14-17. *Odontomyia pulcherrima* Brunetti, larva of penultimate instar. 14, Anterior end in dorsal view; 15, Labrum with two pairs of labral setae; 16, Anterior end in ventral view; 17, Mouthparts in ventral view. a – antenna, Dl – dorsal seta, gl – genal lobe, L – lateral seta, Lb – labral setae, mp – maxillary palpus, V – ventral setae, VL – ventrolateral setae, vo – ventral orifice.









Figs. 18-21. *Odontomyia pulcherrima* Brunetti, larva of penultimate instar. 18, Antenna with sensillae; 19, Ventral midline on abdominal segment 6; 20, abdominal segments 4-8 in ventral view; 21, Last two abdominal segments in ventral view. as – anal slit, s – sensillae, vh – ventral hooks, vm – ventral midline.

Fig. 22. Larva of *Odontomyia pulcherrima* Brunetti on a wet rock at a waterfall (Genting Highlands, West Malaysia). Length c. 1.5 cm.

pleura and lateral stripes on the scutum. The fore tibia is as dilated as in *O. latitibia* Rozkošný & Kovac, though without a dorsal fringe of hairs in the latter species. The structure of the antennal flagellum, especially the very short and rounded apical style consisting of the two last flagellomeres and the structure of the male genitalia indicate a rather isolated position among the Oriental *Odontomyia* species.

In larvae an unusually dense growth of long hairs on all body segments and especially on lateral parts seems to be very characteristic. However, we found distinct differences between the mature larvae and larvae of earlier instars. The larvae of the penultimate instar have only a sparse lateral hair fringe and dense ventral hairs are concentrated at the middle part of segments leaving broad lateral parts almost bare (Figs. 20-21). Also the ventral setae on abdominal segments are usually more distinct, V3 (outer ventral setae) being shifted far in front of setae V2. The antepenultimate abdominal segment bears a mid line of 1-2 rows of cuticular cells which distinctly differ from surrounding fields (Fig. 19). The mature larvae show a very dense and almost complete lateral hair fringe and ventral hair pillows are distinctly larger. Moreover, V2 setae on the head are slender, narrowly pinnate in earliear larval instars.

A PRELIMINARY KEY TO THE ORIENTAL *ODONTOMYIA* LARVAE

In addition to our description of the larva of *Odontomyia latitibia* (Rozkošný & Kovac, 1994), only the larva of *O. cyanea* was described in detail (Mathur, 1933). Brunetti (1920) mentioned some distinguishing characters of *O. dorsoangulata* larvae.

1. Second abdominal segment with a pair of ventral hooks at posterior margin. 2
– Second abdominal segment at most with a transverse row of six small spines along posterior margin 3

2. Ventral hooks developed on abdominal segments 2, 6 and 7, anal segment about four times as long as broad .... *O. latitibia* Rozkošný & Kovac, 1994
– Ventral hooks developed on abdominal segments 2 and 7, anal segment about twice as long as broad .... *O. cyanea* Brunetti, 1920

3. Lateral margins of body segments with bunches of long setae (Fig. 13), ventral hooks developed only at posterior margin of abdominal segment 7 .. *O. pulcherrima* Brunetti, 1920
– Lateral margins of body segments without bunches of long lateral setae, ventral hooks or at least transverse rows of spines developed at posterior margin of abdominal segments 2-7 ..... *O. dorsoangulata* Brunetti, 1920

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