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A REVIEW OF THE GENUS *EPSILON* DE SAUSSURE (HYMENOPTERA: VESPIDAE: EUMENINAE) FROM INDIA

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Abstract: The potter wasp genus *Epsilon* de Saussure is reviewed from India. *Epsilon manasicum* Girish Kumar & Carpenter sp. nov. and *Epsilon chikmagalurensis* (Lambert, 2008) comb. nov. are established. A key to species of India and a world checklist are also given.

Keywords: *Epsilon*, Eumeninae, Indian subcontinent, review, Vespidae.

Abbreviations: BMNH - British Museum (Natural History), London, England; DEI - Deutsche Entomologische Institut, Müncheberg, Germany; NZC - 'National Zoological Collections' of Zoological Survey of India, Kolkata, India; F1-F2 - Flagellar segments 1 to 2; H - Head; M = Mesosoma; OOL - Ocellular distance; POL - Post ocellar distance; S1-S2 - Metasomal sterna 1 & 2; T1-T2 - Metasomal terga 1 & 2.

De Saussure (1855) provided the name *Epsilon* for division III of the subgenus *Leionotus* de Saussure of the genus *Odynerus* Latreille (subfamily Eumeninae of the family Vespidae). This genus is distributed in the Australian and oriental regions. Fourteen species are recorded under this genus from the world, of which two species, namely, *Epsilon burmanicum* (Bingham, 1897) and *E. tinctipenne* (Walker, 1860) are recorded from the Indian subcontinent. Lambert et al. (2008) described a

new species as *Antepipona chikmagalurensis* Lambert from Chikmagalur, Karnataka, India. During our studies we found that this species belongs to *Epsilon* and not *Antepipona*. Therefore, we establish a new combination for this species here. In addition to this a new species, *Epsilon manasicum* Girish Kumar & Carpenter is described here from Assam and West Bengal. A key to species of India and a world checklist of *Epsilon* de Saussure are provided.

Material and Methods

The specimens were studied and photographed by using a Leica Stereo microscope with LAS software version 3.6.0. The types of the new species described are deposited in the 'National Zoological Collections' of the Zoological Survey of India, Kolkata (NZC).

Genus *Epsilon* de Saussure

Epsilon de Saussure, 1855, *Ét. Fam. Vesp.*, 3: 229, 252. Type species: *Odynerus dyscherus* de Saussure, 1852, by subsequent designation of van der Vecht, 1967,

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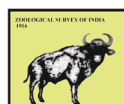
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Bull. Zool. Nomencl., 24: 31.

Diagnosis: Anterior face of pronotum with a group of transverse striations medially, without foveae; tegula not evenly rounded posteriorly, emarginate adjoining parategula and equalling parategula posteriorly; axillary fossa narrower than long; metanotum without tubercles, angled; propodeum with submarginal carina projecting as rounded lobe above valvula, without dorsolateral projections; without superior carinae, not raised shelf-like to the same level as metanotum; second submarginal cell not petiolate, with second recurrent vein nearly or completely interstitial with third submarginal cell; midtibia with 1 spur; T1 sessile, in dorsal view about as wide as T2, not carinate; T2 with apical lamellae. Female with cephalic fovea, not in raised area. Male midfemur not toothed.

Distribution: Australian and oriental regions.

***Epsilon burmanicum* (Bingham, 1897)**

Odynerus burmanicus Bingham, 1897, *Fauna Brit. India, Hym.*, 1: 362 (key), 371, Female, "Rangoon; Toungoo; Pegu" (BMNH, no. 18.282, Rangoon).

Rhynchium taprobanae Cameron, 1901, *Proc. Zool. Soc., London*, 1901: 31, Female, "Ceylon" (BMNH).

Odynerus kanthaleyensis Giordani Soika, 1935, *Arb. Morph. Tax. Ent. Berlin-Dahmel*, 2: 245, lectotype Female (DEI). Lectotype designated by Giordani Soika (1973) and Borsato & Ratti (1999) synonymised it under *Epsilon burmanicum* (Bingham).

Epsilon burmanicum Bingham: Giordani Soika, 1994, *Annali del Mus. Civ. St. Nat. "G. Doria"*. 90: 272 (key), 274, 275, 276. Additional citation: Gusenleitner, 2006, *Linzer biol. Beitr.*, 38(1): 692 (Karnataka: Shimoga).

Diagnosis: Body black with brown and pale yellow markings. Brown maculations are as follows: mandibles, scape, ventral side of flagellar segments, legs, posterior and lateral sides of T1; last tergite and sternite. Pale yellow colour as follows: a triangular spot at the base of mandibles, clypeus with a broad band basal and apical specks on the teeth, the lower edge of ocular sinus, a speck on the temples, a narrow band on the dorsal surface of pronotum, two spots on metanotum, the tegulae, except for a dark central spot, the parategula, the apex of fore femora, almost all of the external face of all tibiae, a transverse band of medium width on T1, a little wider apical band on T2, narrow apical bands on T2 and S2. Wings almost hyaline. Punctuation of T2 large and dense, with the distance between the punctures, in average, equal to or even less than the diameter of punctures; T3 & T4 with punctuation coarse and dense; clypeus more deeply emarginated at apex, with apical

teeth thin and sharp; posterior lobe of the tegulae very short.

Distribution: India (Gujarat, Karnataka, Odisha, Pondicherry, Tamil Nadu); Myanmar; Sri Lanka; Thailand (Bingham 1897; Soika 1994; Gusenleitner 1988, 2006).

Remarks: No material was available for our studies; hence the diagnostic characters were taken from Soika (1994).

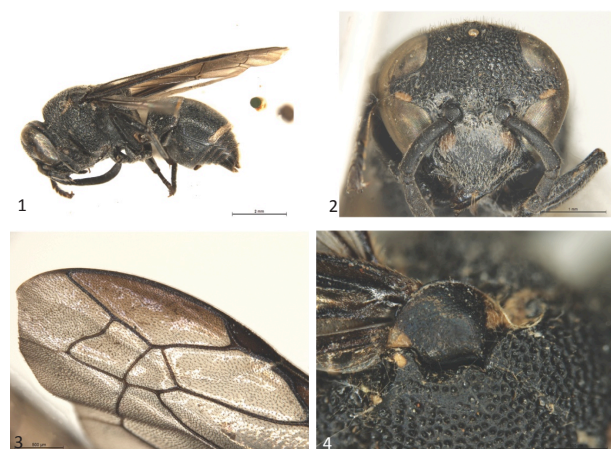
***Epsilon chikmagalurensis* (Lambert, 2008) comb. nov.
(Images 1–4)**

Antepipona chikmagalurensis Lambert, 2008, *Uttar Pradesh J. Zool.*, 28 (1): 121, Holotype Female, Chikmagalur (NZC). Type examined.

Material examined: Holotype: NZC Regd. No. 13860/H3, 25.iv.2005, female, Chikmagalur, Karnataka, India, coll. Lambert Kishore.

Lambert et al. (2008) described this as a species belonging to the genus *Antepipona* de Saussure. But the study of the holotype of this species reveals that all the characters match the characters of the genus *Epsilon* de Saussure. Therefore, we herewith place this species in the genus *Epsilon* de Saussure.

Diagnosis: Female (Image 1): Body length (H+M+T1+T2) 7.2mm; Black with yellow markings as follows: two spots at the base of clypeus, a small spot on ocular sinus at lower eye margin, an elongated spot on upper part of temple near to eye margin, a narrow band on pronotum dorsally, spots on anterior and posterior margins of tegula, a spot on parategula, two spots on metanotum, narrow apical band on T1, broadened apical band on T2. Apex of mandible and apical tarsal segments of legs brownish. Wings hyaline, thickly infumate at



Images 1–4. *Epsilon chikmagalurensis* (Lambert) comb. nov. (Female)
1 - Body profile; 2 - Head front view; 3 - Distal portion forewing;
4 - Mesosoma showing tegula and parategula. © P. Girish Kumar

stigma, slightly infumate at the apex of median cell and upper half of radial cell. Clypeus (Image 2) with the extreme apex with two teeth, the area in between them incised, with minute punctures, almost impunctate; frons closely, strongly and rugosely punctured, margins carinate; cephalic fovea strongly developed with two fused deep pits; anterior face of pronotum smooth with a group of transverse striations at the middle and few punctures on lateral sides; posterior face and lateral sides of pronotum, mesoscutum and scutellum strongly (Images 1 & 4), closely and rugosely punctate; metanotum without tubercles, angled; mesopleuron rugosely punctured except large area of epicnemium and posterior margin smooth (Image 1); epicnemial carina distinct; propodeum vertical, posterior concave area of propodeum smooth with few (about ten on either side) transverse striations radiating towards outer sides, with strong punctures on outer sides, median carina distinct, two large, oval-shaped pits are present on either side above median carina (size of one pit equal to the combined size of two strong propodeal punctures), submarginal carina projecting as a small rounded lobe above propodeal valvula; posterior lobe of the tegulae well developed (Image 4), and almost equal to parategula at apex; axillary fossa narrowed, slit-like; forewing (Image 3) with both recurrent veins received in submarginal cell II; T2 with a distinct apical lamellae; punctation of T2 large and dense (Image 1), with the distance between the punctures, in average, equal to or even less than the diameter of punctures.

Discussion: Lambert et al. (2008) wrongly described the metanotum with two minute indistinct teeth. This species has strong carinate punctures on the metanotum and Lambert et al. (2008) wrongly described these as minute indistinct teeth. This character led them to *Antepipona*.

Distribution: India (Karnataka).

***Epsilon manasicum* Girish Kumar & Carpenter sp. nov.**
(Images 5–12)

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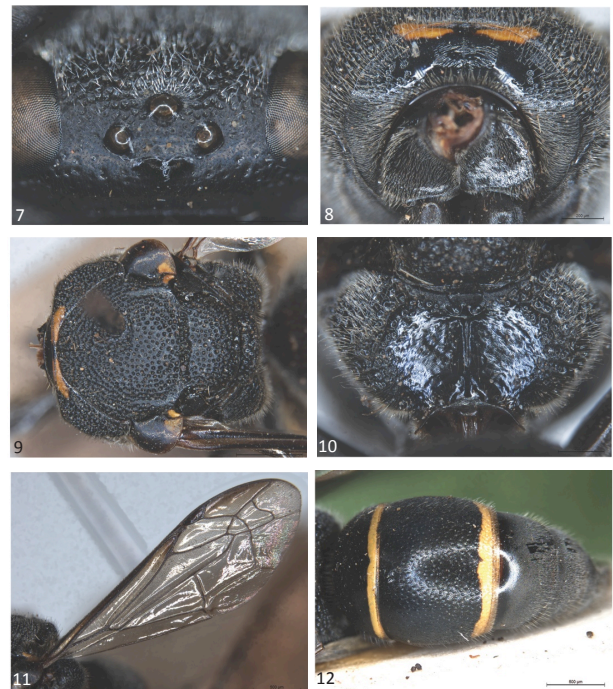
Material examined: Holotype: 13857/H3, 10.iv.1986, female, Doimari, Manas National Park, Assam, India, coll. S.S. Saha & Party. Paratypes: 13858/H3, 31.iii.1986, 1 female, Kahitama, Manas National Park, Assam, India, coll. S.S. Saha & Party; 13859/H3, 10.ix.1904, 1 female, Kolkata, West Bengal, India, coll. Brunetti.

Description: **Holotype female (Image 5):** Body length (H+M+T1+T2) 6.5–7 mm; Forewing length 6.5–7 mm. Body black with the following yellow markings: two spots at



Images 5–6. *Epsilon manasicum* Girish Kumar & Carpenter sp. nov. (Female) (holotype NZC 13857/H3).

5 - Body profile; 6 - Head front view. © P. Girish Kumar



Images 7–12. *Epsilon manasicum* Girish Kumar & Carpenter sp. nov. (Female). © P. Girish Kumar

7 - Head dorsal view showing ocellar area (holotype NZC 13857H3); 8 - Mesosoma front view showing anterior face of pronotum (Paratype NZC 13859/H3); 9 - Mesosoma dorsal view (Paratype NZC 13859/H3); 10 - Propodeum (Paratype NZC 13859/H3); 11 - Forewing (Paratype NZC 13859/H3); 12 - Metasoma (Paratype NZC 13858/H3). © P. Girish Kumar

the base of clypeus, a small spot on ocular sinus at lower eye margin, an elongated spot on upper part of temple near to eye margin, a median interrupted transverse band on pronotum, two spots on tegula at both apex, a small spot on the apex of forefemur, an elongated mark on hind tibia at inner side and narrow transverse band at the apex of T1 and T2, the band on T2 slightly thicker than T1 (Image 12). Apex of mandible and apical tarsal segments blackish brown. Wings hyaline, thickly infumated at stigma (Image 11), slightly infumated at the apex of median cell and upper half of radial cell; veins brown. Body with rather sparsely to moderately

dense fine silvery white pubescence; in between the small dense silvery white pubescence, moderately large elongate silvery white pubescence (Images 6 & 9) are present on head and dorsal side of body.

Head: 1.15x as wide as long in front view (Image 6); clypeus slightly convex, pyriform, the extreme apex with two teeth, the area in between them incised, maximum width 1.54x length medially, with minute punctures, almost impunctate; mandibles on inner side with four teeth; maxillary palp 6-segmented; labial palp 4-segmented; interantennal space almost smooth; a hump-like transverse carina present at the middle of interantennal space; a short but distinct longitudinal carina originate from the middle of transverse carina extends to the base of clypeus; frons closely, strongly and rugosely punctured, margins carinate; ocular sinus with weak punctures (Image 6); area between the antennal toruli and inner eye margin smooth; POL 1.5x OOL; diameter of anterior ocellus as long as the distance between anterior ocellus and posterior ocelli; vertex and temple weakly punctured (Image 5); cephalic fovea strongly developed with two pits (Image 7), the outer margins of pits produced in to a hump-like structure; temple 0.48x as wide as eye in profile (measured through its ocular sinus); interocular distance 1.02x greater on vertex than at clypeus; occipital carina strong, complete and narrowed ventrally. Antenna 2.46x farther from each other than from eyes; antennal scrobe granulately punctured; scape 3.17x as long as F1, 4.06x as long as wide; pedicel 0.70x as long as F1, as long as wide; F1 1.28x as long as F2, 1.31x as long as wide; flagellar segments slightly widening towards apex except last antennal segment; apical antennal segment 1.13x as long as wide.

Mesosoma (Image 9): Anterior face of pronotum smooth with a group of transverse striations at the middle and a few punctures on lateral sides (Image 8); pronotal carina strong and reaching the lateral margin of pronotum; posterior face and lateral sides of pronotum, mesoscutum and scutellum strongly, closely and rugosely punctate (Image 9); mesoscutum 0.85x as long as wide; metanotum somewhat compressed medially, without tubercles, angled with depressed broad irregular punctures except at posterior portion smooth; propleuron almost smooth; mesopleuron rugosely punctured except large area of epicnemium and posterior margin smooth; epicnemial carina distinct; upper metapleuron weakly transversely striated at lower portion and strongly punctate at upper portion, lower metapleuron almost impunctate with a few weak incomplete transverse striations at anterior margin.

Propodeum (Image 10) vertical, concavo-truncate posteriorly, punctures on dorsolateral area of propodeum as that of punctures of metanotum, posterior concave area of propodeum smooth with a few transverse striations radiating towards outer sides (Image 10), with strong punctures on outer sides, median carina distinct but slightly faint sub posteriorly, two large, oval-shaped pits are present on either side above median carina (Image 10), the segment at the base of propodeum above these two large pits are semi oval shaped, lateral sides of propodeum with strong and deep punctures towards posterior margins and transverse striations towards metapleuron; submarginal carina projecting as a small rounded lobe above propodeal valvula. Tegula not evenly rounded posteriorly, emarginated adjoining parategula and almost equal to parategula at apex; axillary fossa narrowed, slit-like. Midtibia with 1 spur. Forewing (Image 11) length 2.98x its maximum width, prestigma 0.46x pterostigma, second submarginal cell not petiolate, first recurrent vein received in submarginal cell II and second recurrent vein received at the interstitial.

Metasoma (Image 12): T1 without transverse carina, 2.93x as wide as long, 0.92x as wide as T2 in dorsal view; T2 with apical lamellae; the narrow basal part of S1 smooth, posterior transverse area of S1 granulately punctured with rather irregular vertical striations; T1, T2 and S2 with distinct but sparse punctures, the diameter of most of the punctures less than interspaces; visible part of remaining tergites and sternites almost impunctate.

Male: Unknown.

Variation: In both paratypes the tegula has a yellowish mark; in the Paratype from Kahitama there are two yellow spots on metanotum; in both paratypes no yellow marks are on forefemur at apex; in the paratype from Kolkata the median portion of posterior face of propodeum is almost completely smooth without transverse striations.

Etymology: The species is named after the locality (Manas National Park) where the holotype was collected.

Discussion

This new species comes close to *Epsilon tinctipenne* (Walker) in having the punctation of T2 fine and sparse, with the distance between the punctures more than the diameter of punctures. But it distinctly differs from *E. tinctipenne* in having: (i). The clypeus slightly incised at apex (Image 6) (in *E. tinctipenne* clypeus deeply incised at apex (Soika 1994: fig. 62); (ii). Legs not entirely black, a small yellow spot on the apex of forefemur and an

elongated yellow mark on hind tibia at inner side (in *E. tinctipenne* legs entirely black).

This new species distinctly differs from *Epsilon burmanicum* (Bingham) and *E. chikmagalurensis* (Lambert) comb. nov., in having the punctation of T2 fine and sparse, with the distance between the punctures more than the diameter of the punctures (in *E. burmanicum* and *E. chikmagalurensis* punctation of T2 large and dense, with the distance between the punctures, on average, equal to or even less than the diameter of punctures).

***Epsilon tinctipenne* (Walker, 1860)**

Odynerus tinctipennis Walker, 1860, *Ann. Mag. Nat. Hist.*, (3) 5: 304, male (in subgenus *Ancistrocerus*), "Ceylon" (BMNH, type no. 18. 311).

Ancistrocerus tinctipennis; Motschulsky, 1863, *Bull. Soc. imp. Nat. Moscou*, 36 (2): 23 (cat.).

Epsilon tinctipenne (Walker): Giordani Soika, 1994, *Annali del Mus. Civ. St. Nat. "G. Doria"*. 90: 272 (key), 282, 283.

Diagnosis: Body black, yellow colour as follows: two spots at the base of the clypeus, a narrow band, very short on the sides, on the pronotum, the front and rear ends of the tegulae, the parategulae, an interrupted band in the middle on metanotum, narrow and regular apical bands on T1 and T2. Wings moderately browned. Clypeus more widely emarginated at apex, the distance that separates the apical teeth is equal to about 1/3rd of the maximum width of the clypeus; punctures on clypeus very small, almost indistinct; ocelli of normal size; interocellar area not densely punctured; behind the ocelli there is a slight depression, with a central smaller and less deep pit, flanked by two small teeth; front with punctures more superficial, flat bottom, separated by interspaces subtly cariniform; posterior lobe of tegulae well developed; punctation of T2 fine and sparse, with the distance between the punctures more than the diameter of punctures; T3 & T4 with punctation fine and sparse.

Distribution: India (Maharashtra, southern India); Sri Lanka (Bingham 1897; Soika 1994).

Remarks: No material was available for our studies; hence the diagnostic characters were taken from Soika (1994).

Check list of World species of *Epsilon* de Saussure

1. *Epsilon achterbergi* Giordani Soika, 1995—Solomon Islands.
2. *Epsilon burmanicum* (Bingham, 1897)—India, Myanmar, Sri Lanka.

3. *Epsilon chartergiforme* (Soika, 1962)—Australia.
4. *Epsilon chikmagalurensis* (Lambert, 2008) comb. nov.—India.
5. *Epsilon dyscherum* (de Saussure, 1853)—Philippines.
6. *Epsilon excavatum* (Borsato, 1994)—Australia.
7. *Epsilon fujianense* Lee, 1981—China.
8. *Epsilon grandipunctatum* Gusenleitner, 1996—Philippines.
9. *Epsilon incola* Giordani Soika, 1994—Papua New Guinea.
10. *Epsilon laboriosum* (Smith, 1864)—Indonesia, Papua New Guinea (Bismarck Island, New Ireland Island).
11. *Epsilon manasicum* Girish Kumar & Carpenter sp. nov.—India.
12. *Epsilon manifestum* (Smith, 1858)
 - a). *Epsilon manifestum crassipunctatum* Gusenleitner, 1991—Indonesia (Sulawesi).
 - b). *Epsilon manifestum manifestum* (Smith, 1858)—Brunei, Indonesia (Java), Malaysia (Sabah, Sarawak), Singapore.
13. *Epsilon rubromaculatum* Gusenleitner, 2011—Laos.
14. *Epsilon subfistulosum* (Wickwar, 1908)—Sri Lanka.
15. *Epsilon tinctipenne* (Walker, 1860)—India, Sri Lanka.
16. *Epsilon vechti* Soika, 1995—Indonesia (Sulawesi).

References

- Bingham, C.T. (1897).** *The Fauna of British India, including Ceylon and Burma, Hymenoptera, I. Wasps and Bees.* Taylor and Francis, London, 579pp+i-xxix.
- Borsato, W. & E. Ratti (1999).** Antonio Giordani Soika (1913–1997): l'opera scientifica. *Memorie della Societa Entomologica Italiana*, 77: 43–103.
- Cameron, P. (1901).** On the Hymenoptera collected during the "Skeat Expedition" to the Malay Peninsula, 1899–1900. *Proceedings of the Zoological Society, London* 1901(2): 16–44.
- de Saussure, H.F. (1852–1858).** *Etudes sur la famille des vespides.* Vols. 1–3. V. Masson & Cherbuliez, Paris & Geneva. [For dates of publication of various parts, see Griffin, 1939].
- Griffin, F. J. (1939).** On the dates of publication of de Saussure (H. de): *Etudes sur la famille des Vespides* 1–3. 1852–1858. *Journal of the Society for the Bibliography of Natural History* 1: 211–212.
- Gusenleitner, J. (1988).** Über Eumenidae aus Thailand, mit einer Bestimmungstabelle für orientalische *Labus*-Arten. *Linzer Biologische Beiträge* 20(1): 173–198.
- Gusenleitner, J. (2006).** Über Aufsammlungen von Faltenwespen in Indien (Hymenoptera, Vespidae). *Linzer Biologische Beiträge* 38(1): 677–695.
- Gusenleitner, J. (2011).** Eine Aufsammlung von Faltenwespen aus Laos im Biologiezentrum Linz (Hymenoptera: Vespidae: Vespinae, Stenogastrinae, Polistinae, Eumeninae). *Linzer Biologische Beiträge* 43(2): 1351–1368.
- Lambert, K., P.G. Kumar & T.C. Narendran (2008).** A new species of *Antepipona* Saussure (Hymenoptera: Vespidae). *Uttar Pradesh Journal of Zoology* 28(1): 121–123.

Key to species of the genus *Epsilon* de Saussure from India
(Based on females)

1. Punctuation of T2 large and dense (Image 1), with the distance between the punctures, on average, equal to or even less than the diameter of punctures. 2
- Punctuation of T2 fine and sparse (Image 12), with the distance between the punctures more than the diameter of punctures 3
2. Posterior lobe of the tegulae very short; punctuation of T2 larger and denser, dense as that of pronotum, or even bigger. *burmanicum* (Bingham)
- Posterior lobe of the tegulae well developed (Image 4); punctuation of T2 not as large and dense as above, not as dense that of pronotum, distinctly less. *chikmagalurensis* (Lambert) comb. nov.
3. Clypeus deeply incised at apex (Giordani Soika, 1994: fig. 62); legs entirely black. *tinctipenne* (Walker)
- Clypeus slightly incised at apex (Image 6); Legs not entirely black, a small yellow spot on the apex of forefemur and an elongated yellow mark on hind tibia at inner side..... ***manasicum* Girish Kumar & Carpenter sp. nov.**

Motschulsky, V. de. (1863). Essai d'un Catalogue des Insectes de Ceylon. *Bulletin de la Société Impériale des Naturalistes de Moscou* 36(2): 23.

Soika, A.G. (1935). Su alcuni Eumenini del Deutsches entomologisches Institut di Berlin-Dahlem. *Arbeiten über Morphologische und Taxonomische Entomologie, Berlin-Dahlem* 2(4): 242–252+3 figs.

Soika, A.G. (1973). Designazione di Lectotipi ed Elenco dei Tipi di

Eumenidi, Vespidi e Masaridi Dame Descritti Negli Anni 1934–1960. *Bollettino del Museo Civico di Storia Naturale di Venezia*, 24: 7–53.

Soika, A.G. (1994). Ricerche sistematiche su alcuni generi di Eumenidi della Regione Orientale e della Papuasiasia. *Annali del Museo Civico di Storia Naturale "G. Doria"* 90: 1–348.

Walker, F. (1860). Characters of some apparently undescribed Ceylon insects. *Annals and Magazines of the Natural History* 5(3): 304–311.

