

A Taxonomic Study on Potter Wasps of the Genus *Delta* de Saussure 1885 (Hymenoptera: Vespidae: Eumeninae) of Buldhana District, Maharashtra

Diksha D. Salve and Dr. Vijayshree M. Hemke

Department of Zoology

Shri Shivaji Science and Arts College Chikhli, Buldhana, India

dikshasalve23@gmail.com

Abstract: *Vespid wasps are belongs to family Vespidae. The present study was aimed to find out the fauna of the solitary wasps and to document the diversity of the genus Delta wasps (Hymenoptera: Vespidae: Eumeninae) in the Motala Taluka (Grassland), Girda (Hilly area), Rohda (Agricultural land), Wasali (Unprotected Forest), Khadakpurna dam area located in the Buldhana district region of Maharashtra, India.*

A total of 5 species of the subfamily Eumeninae and the genus Delta Saussure: Delta campaniforme (Fabricius, 1775), Delta dimidiatipenne, (Saussure, 1852), Delta pyriforme (Fabricius, 1775), Delta conoideum (Gmelin, 1790), Delta euseriens (Fabricius, 1787) were collected from different areas of Buldhana district through active search with the use of the hand net. The study shows presence of six species of the subfamily Eumeninae of the family Vespidae.

The species of the genus Delta, family Vespidae are here for the first time and newly recorded from the Buldhana district, Maharashtra.

Keywords: Vespidae, Eumeninae, genus Delta, Potter wasps, Distribution

I. INTRODUCTION

Vespidae is an important cosmopolitan, most varied, omnipresent and the largest family of the order Hymenoptera (Insecta) popularly known as wasps. Among Hymenopterans, the family Vespidae is distributed in all parts of the world, with the major number of species in tropical regions and only few are reported from temperate climate. Most species are solitary like the genus delta wasps.

The subfamily Eumenine is by far the largest subfamily of solitary wasps within the family Vespidae with over 3,000 species and almost 200 genera worldwide. The subfamily Eumeninae is subdivided into two tribes: Eumenini and Odynerini (Bank et.al. 2017). The Eumeninae wasps are commonly called as potter wasp or mason wasps.

The genus *Delta* de Saussure 1885 is an old world genus of potter wasp with comprises 49 species world wide. The genus *Delta* belong to a distinct lineage of the subfamily Eumeninae. The subfamily Eumeninae is the largest and most diverse subfamily of the family Vespidae. *Delta* belongs to the *Eumenes* group of genera, in which the first segment of the metasoma is very long and slender. The Eumeninae wasps are commonly called as potter wasp or mason wasps. It is a more abundant and varied group having many species as compared to other subfamilies of the Vespidae.

A taxonomic work of this genus from Buldhana district, of Maharashtra has not been available until now. The present study will pave way for further studies on the diversity.

II. MATERIAL AND METHODS

Study area:

The study was conducted in the Buldhana district region of Maharashtra, India. Five sites, (Fig.-1) Motala Taluka (Grassland), Girda (Hilly area), Rohda (Agricultural land), Wasali (Unprotected Forest), Khadakpurna dam area were selected as the study area.



The Buldhana district is one of the most diversified regions in Maharashtra State of India, with respect to biodiversity. Buldhana district has lush green deciduous forests which are home to a variety of flora and fauna.

Specimen collection: The specimens were collected from different areas of Buldhana district through active search with the use of the hand net. The specimens were captured from five ecological belts (Fig.1) of the Buldhana district.

Species identification

Vespidae specimens were identified with the aid of following identification keys viz., Carpenter and Nguyen, 2003; Das and Gupta, 1989; Girish Kumar (2010a, 2010b, 2013a, 2013b, 2013c); Girish Kumar et al. (2013a, 2013b, 2013c, 2014a, 2014b, 2014c, 2015a, 2015b, 2016a, 2016b, 2016e, 2017a, 2017b, 2017d); Girish Kumar and Carpenter, 2013; Girish Kumar and Sharma, 2013; Kojima et al., 2007; Nguyen et al., 2016; Pannure et al., 2016; Srinivasan and Girish Kumar, 2010; Tan et al., 2018. Chalcididae specimens were identified using the following keys viz., Narendran, 1989;

Narendran and Achterberg, 2016; Emiliyamma, 2016; Gowriprakash, 2019. A brief description of all identified species along with diagnostic characters were provided.

III. RESULT

Systematic List

Order Hymenoptera

Family Vespidae

Subfamily Eumeninae (Plate.1)

Genus: Delta de Saussure, 1885

1. Delta campaniforme (Fabricius, 1775)
2. Delta dimidiatipenne, (Saussure, 1852)
3. Delta pyriforme (Fabricius, 1775)
4. Delta conoideum (Gmelin, 1790)
5. Delta euseriens (Fabricius, 1787)

Systematic account

1. Delta campaniforme (Fabricius, 1775)

Diagnosis: Female ♀ : Size (H+M+T) 23-28.4 mm.

Head (Figs 2a-c)

Head As broad as long in frontal view. Clypeus longer than wide, (Fig.2a) without a median black spot. truncate at apex and impunctate (not marks or holes or spots). Clypeus broad triangle shape, shiny and smooth; frons and ocular sinus closely and strongly punctured; vertex and temple with scattered minute punctures; clypeus pyriforme, its apex truncate; Mandibles greater than the height of clypeus and cross each other at the tip. Antennal toruli closer to eyes than to each other. Head yellow, a broad transverse black band between the eyes on the vertex through ocellar area; occiput mostly black; antenna reddish brown; Frons and vertex of the head with close shallow punctures.

Mesosoma (Figs 2d-f)

Mesosoma. Globular, as wide as high in lateral view. Pretegular carina present. Pronotum, scutum, scutellum, metanotum and propodeum with dense punctures, Tegulae elongate and not exceeding parategulae posteriorly; pronotum entirely yellow (Fig.2e) and mesoscutum anteriorly black (Fig.2e); the later posteriorly reddish brown; scutellum, tegula, parategula, and propodeum, yellow metanotum, legs reddish brown with variegated black markings; the sutures between scutellum, metanotum and propodeum black; pronotum strongly and closely punctured except anterior face almost smooth; mesoscutum and metanotum strongly and closely punctured; scutellum punctured except at posterior margin smooth; posterior margin of upper part of propodeum strongly punctured except at dorsolateral angle smooth; lower part of propodeum strongly punctured except the inner concavity almost smooth; lateral areas of



propodeum almost smooth(Fig 2f); propodeum reddish-brown with a narrow medial vertical black line. tarsal claws bifid (Fig 2j). Mid leg with one tibial spur.

Metasoma (Figs 2g-h)

Metasoma petiolate, The first segment of the metasoma T1 is very long and slender, Petiole and basal third of the second gastral segment reddish brown, the former black at base and with a sub-apical black band, the middle of the later black, its posterior third and the visible part of the remaining abdominal segments yellow (Fig 2g). petiole smooth, the rest of the abdomen with the surface finely longitudinally aciculate; gaster almost smooth with minute scattered punctures. T1 less than the length of mesosoma. T1 less than half as broad as T2 in dorsal view. T1 and T2 smooth and shiny. petiole broadening towards the apex and slightly flattened.

Wing (Fig 2i)

Wings fuscohyaline (dark colored), translucent, purplish iridescence with a narrow infumation on the apical margin of fore-wing. First discoidal cell longer than sub-median cell. Fore wing with prestigma as long as pterostigma. Fore wing longitudinally folded when at rest.(Fig 2i).

Distribution.

India: West Bengal, Arunachal Pradesh, Uttarakhand, Sikkim.

Elsewhere: Australia; China; Cambodia; Malaysia; Laos; Indonesia; Nepal; Myanmar; Pakistan; Papua New Guinea; Philippines; Thailand; Singapore; Vietnam; U.S.A. (adventive). (Khan et al., 2018; Nguyen, 2015b; Pham and Li, 2015; Srinivasan and Girish Kumar, 2013; Nugroho et al., 2013).

2. Delta dimidiatipenne, (Saussure, 1852)

Diagnosis: Female ♀: Size (H+M+T) 22-24.4 mm.

Head (Figs.3a-c)

The head is dark reddish with black markings. The head has a broad band between the eyes(Fig.3b).the antennae are reddish brown with black tips,clypeus smooth, oval, convex, long anterior margin transverse(Fig.3c); body obscure dark red with following black markings;vertex,extending to occiput usually at the apex of antennae.

Mesosoma (Figs.3d-f)

Mesosoma globular, dark red with entirely black mesoscutum, propleuron, mesopleuron except two red patches, metapleuron except a red path on upper mesopleuron,mesoscutum,abdomen smooth and shiny. Propodeum dark red with broad black median line,with basolateral apex, parategula present,

Metasoma (Fig.3g)

Metasoma petiolate.The first segment of the metasoma is very long and slender,dark red with base of petiole, apical half of second tergite T2 dark red with black band at their base and whole of the remaining tergites dark red.T2 is swollen dorsally.

Wings (Fig.3h)

Wings ferruginous with apical half of fore-wing fucous having a purple reflection . Fore wing with prestigma as lengthy as pterostigma. Fore wing longitudinally folded when at rest.

Distribution.

India: Maharashtra, Arunachal Pradesh, Delhi, Gujarat, Chhattisgarh, Jammu and Kashmir, Jharkhand, Himachal Pradesh, Kerala, Punjab, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Rajasthan.



Elsewhere: Arabia; Africa; Algeria; Afghanistan; Chad; Djibouti; Ethiopia; Eritrea; Egypt; Iran; Mauritania; Madagascar; Niger; Nepal; Palestine; Spain; Somalia; Syria; South Africa; Sudan; Uganda; Turkey; Yemen. (Rafi et al., 2017; Sheikh et al., 2017; Pannure et al., 2016; Girish Kumar and Sharma (2014a, 2015b); Srinivasan and Girish Kumar, 2013; Dvorak and Castro, 2007; Gupta, 1997).

3. Delta pyriforme (Fabricius, 1775)

Diagnosis: Female ♀ : Size (H+M+T) 23-24.5 mm.

Head (Figs.4a-b)

Head as broad as long in frontal view. Clypeus longer than wide, truncate at apex and impunctate. Mandibles greater than the height of clypeus and cross each other at the tip. Antennal toruli closer to eyes than to each other. Head yellow, a broad transverse black band between the eyes on the vertex through ocellar area; occiput mostly black; antenna reddish brown; Frons and vertex of the head with close shallow punctures. Clypeus smooth; frons and ocular sinus closely and strongly punctured; vertex and temple with scattered minute punctures; clypeus pyriforme, its apex truncate; petiole broadening towards the apex and slightly flattened.

Mesosoma (Figs4c-e)

Mesosoma globular, as wide as high in lateral view. Pretegular carina present. Pronotum, scutum, scutellum, metanotum and propodeum with dense punctures, Tegulae elongate, parategula present. pronotum entirely and mesoscutum anteriorly yellow; the later posteriorly black; tegula, parategula, scutellum and metanotum reddish brown; propleuron black; mesopleuron, metapleuron, propodeum and legs reddish brown with variegated black markings; the sutures between scutellum, metanotum and propodeum black; pronotum strongly and closely punctured except anterior face almost smooth; mesoscutum and metanotum strongly and closely punctured; scutellum punctured except at posterior margin smooth; mesepisternum densely punctate; epinemium, lower margin and posterior margin of mesopleuron smooth; metapleuron almost smooth; upper part of propodeum strongly punctured except at dorsolateral angle smooth; lower part of propodeum strongly punctured except the inner concavity almost smooth; lateral areas of propodeum almost smooth; ; propodeum reddish-brown with a narrow medial vertical black line. tarsal claws bifid. Mid leg with one tibial spur.

Metasoma(Fig.4f)

Metasoma petiolate. T1 less than the length of mesosoma. T1 less than half as broad as T2 in dorsal view. T1 and T2 smooth and shiny. The first segment of the metasoma is very long and slender,

Petiole and basal third of the second gastral segment reddish brown, the former black at base and with a sub apical black band, the middle of the later black, its posterior third and the visible part of the remaining abdominal segments yellow. petiole smooth, the rest of the abdomen with the surface finely longitudinally aciculate; gaster almost smooth with minute scattered punctures. petiole and the second gastral segment T2 reddish-brown, the former black at base and with a sub-apical black band, the middle of the later black, its posterior third and the remaining abdominal segments yellow. Yellow marking apex of T2, T3–T6.

Wings (Fig.4g)

Wings deep flavohyaline with a narrow infumation on the apical margin of fore-wing. Wings are deeply flavohyaline. Fore wing with prestigma as long as pterostigma. First discoidal cell longer than sub-median cell. Fore wing longitudinally folded when at rest. Wings yellow hyaline.

Distribution.

India: Maharashtra, Andhra Pradesh, Assam, Arunachal Pradesh, Andaman and Nicobar Islands, Delhi, Chhattisgarh, Gujarat, Goa, Jharkhand, Himachal Pradesh, Kerala, Karnataka, Mizoram, Meghalaya, Manipur, Madhya Pradesh,



Odisha, Nagaland, Puducherry, Tripura, Sikkim, Rajasthan, West Bengal, Telangana, Tamil Nadu, Uttarakhand, Uttar Pradesh.

Elsewhere: China; Cambodia; Bhutan; Hawaii; Laos; Myanmar; Moluccas; Malaysia; Indonesia; Pakistan; New Guinea; Nepal; Thailand; Sri Lanka; Vietnam. (Gawas et al., 2019; Girish Kumar et al., 2019b; Rafi et al., 2017; Sheikh et al., 2017; Pannure et al., 2016; Nidup et al., 2016; Nguyen, 2015b; Pham and Li, 2015; Girish Kumar and Sharma (2014a, 2014b, 2015b); Srinivasan and Girish Kumar, 2013; Gusenleitner (2006, 2011)).

4. Delta conoideum (Gmelin, 1790)

Diagnosis : Female ♀ : Size (H+M+T) 20-25 mm.

Head. (Figs 5a-b)

Body predominantly reddish-brown, Head wider than long in frontal view. Head above the antenna and thorax closely and lightly punctured; Clypeus longer than wide. Truncate at apex and impunctate. Mandibles greater than the height of clypeus and cross at the tip. Antennal toruli closer to eyes than to each other. Last antennal segment not hooked, Clypeus pyriform, its apex truncate. Head yellow except mandibles and antenna reddish, a broad transverse band across the apex between the top of eyes black, black mark extends behind the vertex to occiput;

Mesosoma. (Figs 5c-e)

Globular, as wide as high in lateral view. mesoscutum dark red with black patches, mesoscutum hexagonal in shape, scutellum, metanotum and propodeum dark red in colour, median area of propodeum, Pretegular carina present. Pronotum, scutum, scutellum, metanotum and propodeum with dense punctures, puncture diameters more than the distance between punctures. Tegulae elongate and not exceeding parategulae posteriorly. Tarsal claws bifid. Mid leg with one tibial spur. legs pale reddish; pretegula present.

Metasoma. (Fig. 5f)

Metasoma petiolate. The first segment of the metasoma is very long and slender, and black band at their base, T1 less than the length of mesosoma. T1 and T2 smooth and shiny. second abdominal tergum T2 dark red with base and a short transverse medially interrupted band on its middle above black; T2 is swollen dorsally in one-half and then gradually convex to its apical margin. S2 dark red with a short black band on its middle above; gaster smooth and shining with the surface minutely aciculate. Ovipositor with stinger located on the last abdomen,

Wing (Figs. 5g)

fore-wing basally flavohyaline and apically fuscohyaline, with a slight purplish reflection. Fore wing with prestigma as lengthy as pterostigma. First discoidal cell longer than sub-median cell. Fore wing longitudinally folded when at rest. Wings yellow hyaline.

Distribution.

India: Maharashtra, Goa, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Gujarat, Diu, Chhattisgarh, Kerala, Karnataka, Jharkhand, Meghalaya, Puducherry, Rajasthan, Odisha, Madhya Pradesh, Tripura, Telangana, Tamil N West Bengal, Uttarakhand, Uttar Pradesh. adu, Sikkim, Elsewhere: Arabia; China; Bhutan; Myanmar; Malaysia; Laos; Pakistan; Thailand; Sri Lanka; Nepal; Vietnam. (Rafi et al., 2017; Girish Kumar and Mazumdar, 2015).

5. Delta euseriens (Fabricius, 1787)

Diagnosis: Female ♀ : Size (H+M+T) 20-23mm

Head (Figs. 6a-b)

Head yellow to brownish yellow with following black markings: a broad band on upper half of frons extending behind vertex to outer side of temple and to occiput, a black band on frons and vertex; antennae light reddish; mandible yellow



except at margins yellowish brown; Clypeus smooth, yellow ; frons and ocular sinus closely and strongly punctured; clypeus wide as long.

Mesosoma (Figs.6c-e)

pronotum almost entirely yellow , mesoscutum yellow,dark brown with black patches, two triangular patches at the anterior margin of mesoscutum, and two long black patches at lateral both margin.. scutellum yellow brown; metanotum yellow, propodeum light red except at basolateral apex near to lateral corner with yellow markings; legs light reddish with highly variable yellow markings; pronotum strongly and closely punctured except anterior face almost smooth; mesoscutum, scutellum and metanotum strongly and closely punctured; mesepisternum densely punctate; metapleuron almost smooth; propodeal dorsum strongly punctured except at dorsolateral angle with scattered punctures; ventral area of propodeum strongly punctured except the inner concavity with scattered punctures; lateral areas of propodeum almost smooth; propodeal dorsum strongly punctured except at dorsolateral angle with scattered punctures; pronotum with distinct pretegular carina; parategula present.

Metasoma (Fig.6f)

Metasoma petiolate, petiole light reddish except at base black, at sub-apically a black band and then a yellow band; T2 basally light reddish then a black band and remaining apical half yellow; S2 light red with a yellow and black band; all remaining visible part of gastral segments yellow, with their bases (when drawn out) black. petiole and gaster almost smooth.petiole and gaster almost smooth; T2 without lamellae separated by apical thickening.The first segment of the metasoma T1 is very long and slender.

Wings (Fig.6g)

Wings flavohyaline with a narrow sub-apical dark infumation on fore-wing. fore-wing with prestigma and pterostigma; Fore wing with prestigma as lengthy as pterostigma. First discoidal cell longer than sub-median cell.Fore wing longitudinally folded when at rest.

Distribution.

India: Maharashtra, Nagaland (new record), Assam, Arunachal Pradesh, Andhra Pradesh, Delhi, Chhattisgarh, Jharkhand, Kerala, Karnataka, Himachal Pradesh, Gujarat, Rajasthan, Meghalaya, Manipur, Madhya Pradesh, Odisha, West Bengal, Telangana, Tamil Nadu, Uttar Pradesh, Uttarakhand.

Elsewhere: Arabia; China; Laos; Israel; Iraq; Indonesia; Iran; Myanmar; Mauritius; Bhutan; New Caledonia; Oman; Sri Lanka; Saudi Arabia; Thailand; United Arab Emirates; Vietnam.

Summary

The present paper includes the systematic account of the genus *Delta* from Buldhana district Maharashtra, India. It consists of 5 species belonging to genus *Delta* and subfamily Eumeninae. This 5 species are newly recorded here from Buldhana district Maharashtra, India.

REFERENCES

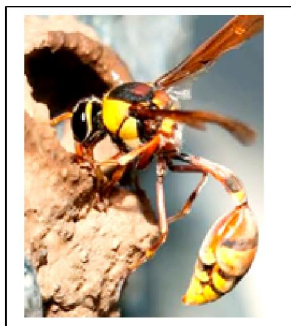
- [1]. Bingham, C.T. (1897). The Fauna of British India, including Ceylon and Burma, Hymenoptera, I - Wasps and Bees. Taylor and Francis, London, 579+i-xxix.
- [2]. Brothers D. J. & Finnamore A. T. (1993). Chapter 8. Superfamily Vespoidea. Pp. 161-278. In : Goulet, H. & Huber, J. T. (eds.) : Hymenoptera of the world. Centre for Land and Biological Resources Research, Ottawa, Ontario, 668 pp.
- [3]. Chhotani, O.B. & K.K. Ray (1975). Fauna of Rajasthan, India (Hymenoptera). Records of Zoological Survey of India, 71 : 13-49.
- [4]. Das, B.P. and Gupta, V.K. (1983). A Catalogue of the families Stenogastridae and Vespidae from the Indian sub-region. (Hymenoptera : Vespoidea). Oriental Ins., 17 : 395-464.



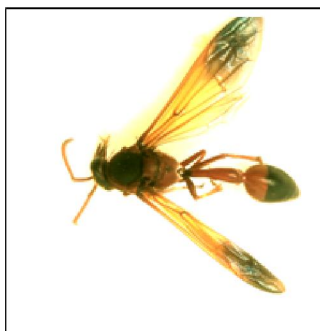
- [5]. Das, B.P. and Gupta, V.K. (1989). The Social wasps of India and adjacent countries (Hymenoptera : Vespidae). *Oriental Ins. Monogr.*, 11 : 1-292.
- [6]. Ebrahimi, E. and J.M. Carpenter (2008). Catalog of the vespidae fauna of Iran (Hymenoptera, Vespidae). *Zootaxa*, 1785 : 1-42.
- [7]. Girish Kumar, P. and Srinivasan, G. (2009). New records of *Vespa soror* du Buysson (Hymenoptera : Vespidae) from India. *Records of Zoological Survey of India*, 109(4) : 111-112.150
- [8]. Girish Kumar, P. and Srinivasan, G. (2010). Taxonomic studies of Hornet Wasps (Hymenoptera : Vespidae) *Vespa* Linnaeus of India. *Records of Zoological Survey of India*, 110(2) : 57-80.
- [9]. Gupta, S.K. (1997). Hymenoptera : Aculeata. *Zoological Survey of India, Fauna of Meghalaya, State Fauna Series*, 6 : 421-440.
- [10]. Gupta, S.K. (2003). Hymenoptera : Aculeata. *Zoological Survey of India, Some Selected Fauna of Asola-Bhatti Wildlife Sanctuary, Conservation Area Series*, 16 : 27-30.
- [11]. Gupta, S.K. (2007). Insecta : Hymenoptera : Aculeata. *Zoological Survey of India, Faunal Diversity Western Doon Shiwaliks, Special Publications*, 35-39pp.
- [12]. Gusenleitner, J. (1996). *Über Eumenidae der orientalischen Region* (Hymenoptera, Vespoidea). *Linzer biologischen Beiträge*, 28(1) : 39-56.
- [13]. Gusenleitner, J. (2001). *Beitrag zur Kenntnis von Faltenwespen der orientalischen Region* (Hymenoptera, Vespidae, Eumenidae). *Linzer biologischen Beiträge*, 33(2) : 655-662.
- [14]. Gusenleitner, J. (2006). *Über Aufsammlungen von Faltenwespen in Indien* (Hymenoptera, Vespidae). *Linzer biologischen Beiträge*, 38(1) : 677-695.
- [15]. Gusenleitner, J. (2007). *Bemerkenswerte Faltenwespen- Funde aus der orientalischen Region Teil 3* (Hymenoptera : Vespidae, Polistinae, Eumeninae). *Linzer biologischen. Beiträge*, 39(1) : 97-104.
- [16]. Jonathan, J.K., S.R. Roy and B.G. Kundu. (1999). Insecta : Hymenoptera : Vespidae. *Zoological Survey of India, Fauna of West Bengal, State Fauna Series*, 3(8) : 149-182.
- [17]. Jonathan, J.K., S.R. Roy and B.G. Kundu. (2000). Insecta : Hymenoptera : Vespidae. *Zoological Survey of India, Fauna of Meghalaya, State Fauna Series*, 4(7) : 117-160.
- [18]. Kim, J.K. & S. Yamane (2001). A revision of *Eumenes* Latrielle (Hymenoptera : Vespidae) from the Far East Asia, with descriptions of one new species and one new subspecies. *Entomological Science*, 4(2) : 139-155.
- [19]. Krombein, K.V. (1991). *Bio systematic Studies of Ceylonese Wasps*, xix : *Natural History Notes in Several families* (Hymenoptera : Eumenidae, Vespidae, Pompilidae, and Crabronidae). *Smithsonian Contributions to Zoology*, 283 : 1-41.
- [20]. Kundu, B.G., P. Girishkumar, S.I. Kazmi and S. Roychowdhury. (2010). Insecta : Hymenoptera : Aculeata (Vespidae and Apidae). *Zoological Survey of India, Fauna of Uttarakhand, State Fauna Series*, 18(2) : 725-748.
- [21]. 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.
- [22]. Lambert, K., T.C. Narendran, & P.G. Kumar (2007). A new record of *Ancistrocerus tinctipennis* (Walker) (Hymenoptera : Vespidae) from India. *Journal of Entomological Research*, 31(2) : 169-171.
- [23]. Ray, K.K. (2000). Insecta : Hymenoptera : Apoidea and Vespoidea. *Zoological Survey of India, Fauna of Tripura, State Fauna Series*, 7(3) : 335-346.
- [24]. Ray, K.K. (2003). Insecta : Hymenoptera : Aculeata. *Zoological Survey of India, Fauna of Sikkim, State Fauna Series*, 9(4) : 507-517.
- [25]. Roy, S.B. & B.G. Kundu (1985). *Fauna of Namdhapa, Arunachal Pradesh, India* (Insecta : Hymenoptera). *Records of Zoological Survey of India*, 82(1-4) : 221-229.
- [26]. Srinivasan, G. & P.G. Kumar (2010). New records of potter wasps (Hymenoptera : Vespidae : Eumeninae) from Arunachal Pradesh, India : five genera and ten species. *Journal of Threatened Taxa*, 2(12) : 1313-1322.



PLATE 1-Subfamily Eumeninae



1. *Delta campaniforme*
(Fabricius, 1775) ♀



2. *Delta dimidiatipenne*,
(Saussure, 1852) ♀



3. *Delta pyriforme*
(Fabricius, 1775) ♀



4. *Delta conoideum*
(Gmelin, 1790) ♀



5. *Delta euseriens*
(Fabricius, 1787) ♀

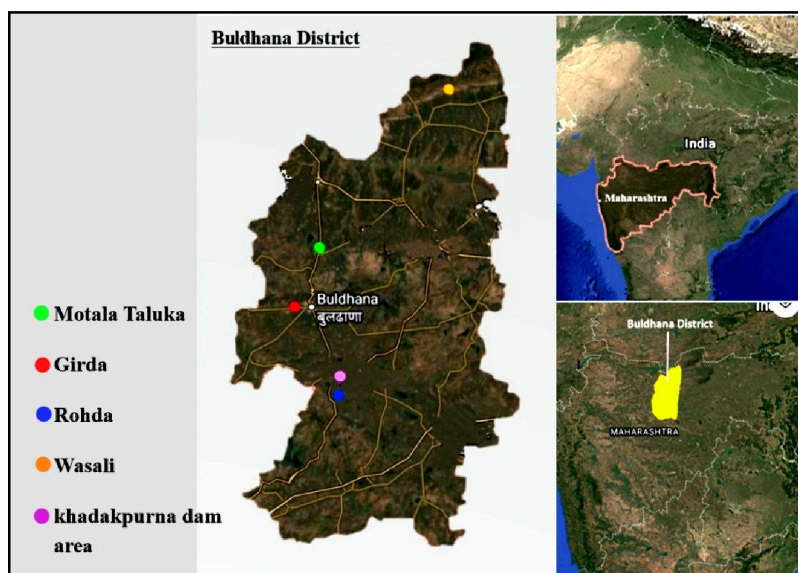


Fig. 1 Map indicating study sites(five ecological belts) in Buldhana district



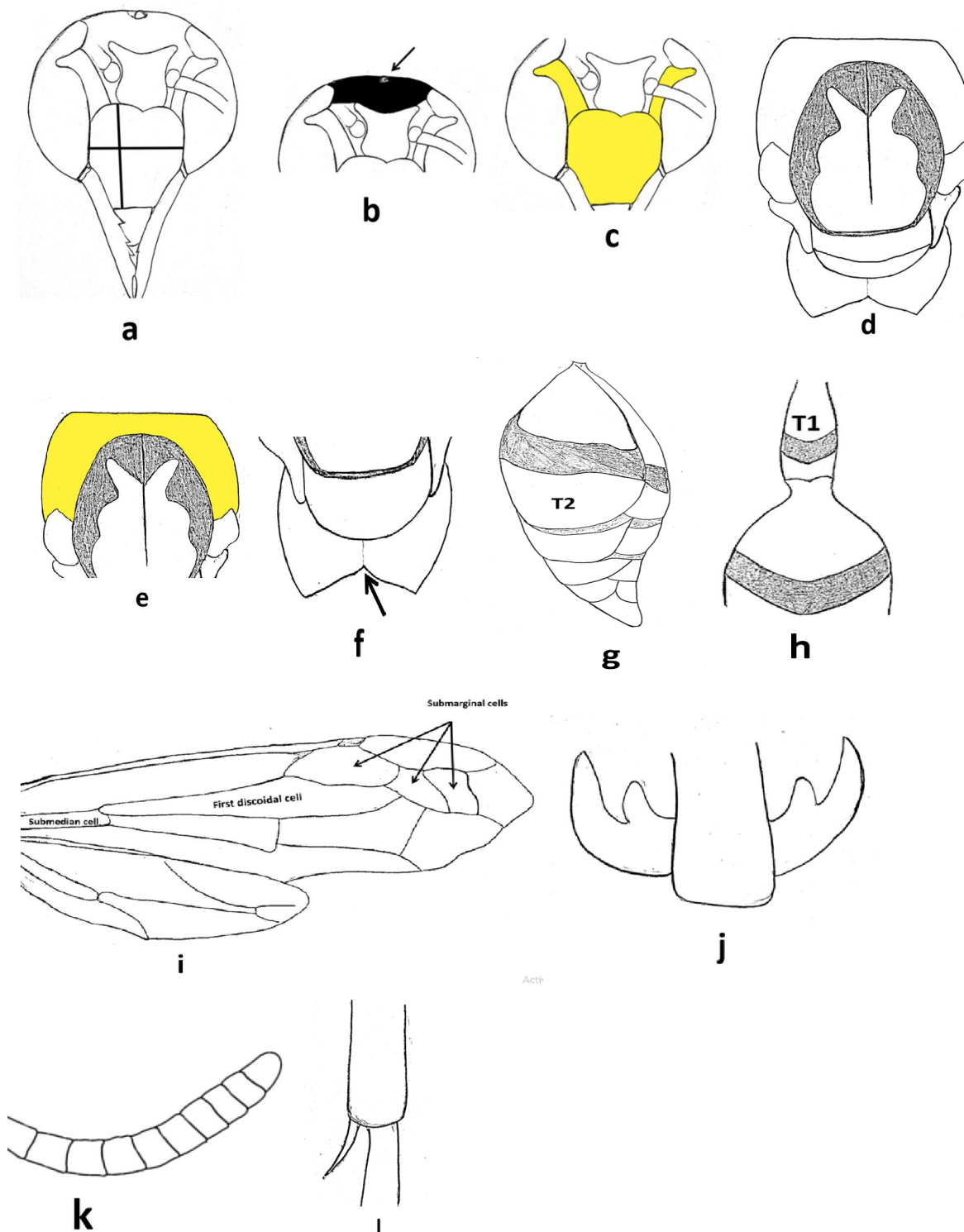


FIGURE 2. *Delta campaniforme* ♀. a. Head (Frontal view.) b. Head (broad transverse black band). c. Clypeus. d. f. Mesosoma. g. Metasoma. h. Petiole (T1). i. Wing. j. Bifid claws. k. Left antenna. l. Tibial spur.



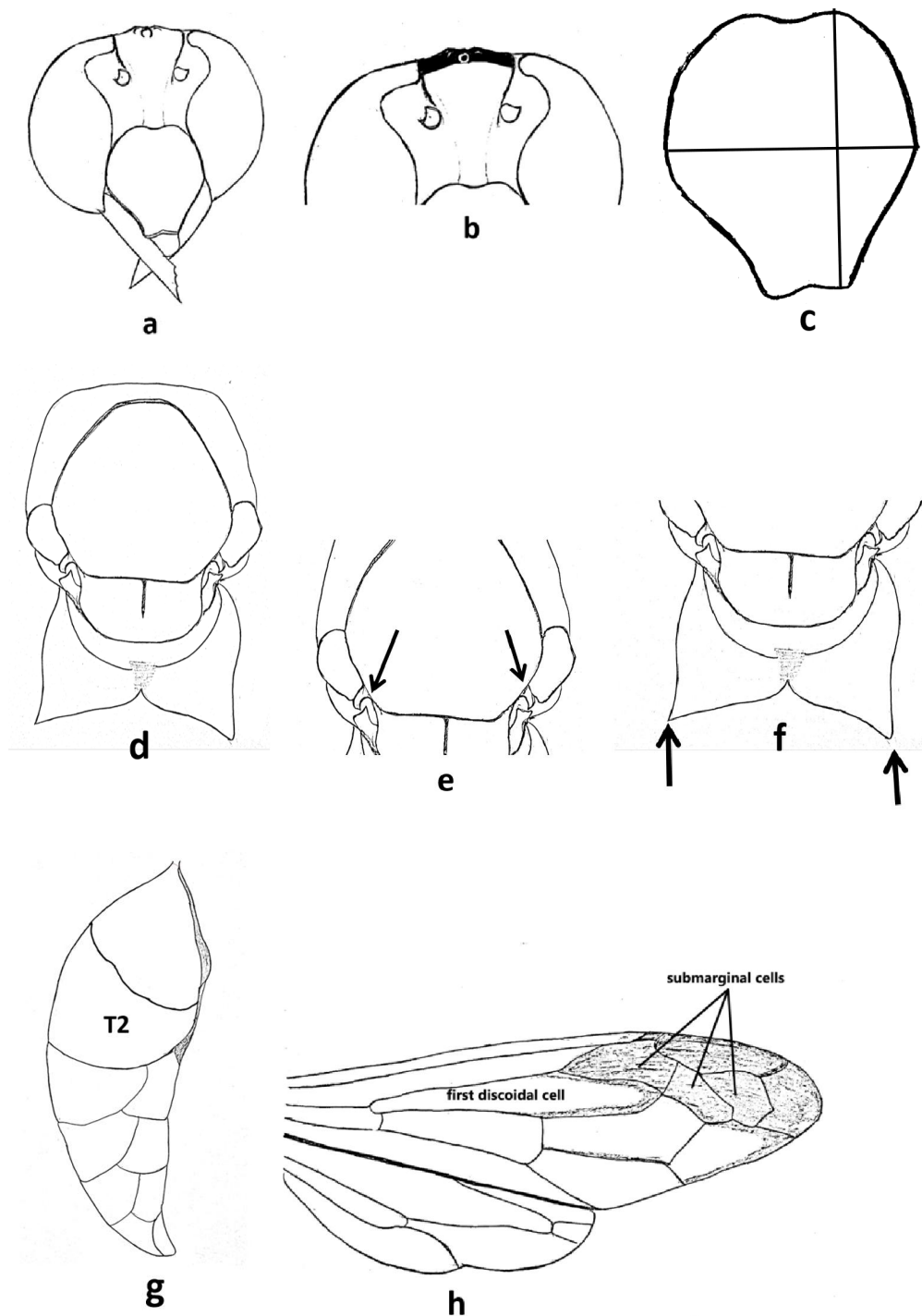


FIGURE 3 . *Delta dimidiatipenne* ♀. a. Head (Frontal view.). b. Head (broad transverse black band). c. Clypeus .d- f..Mesosoma.g..Metasoma.h. Wing.



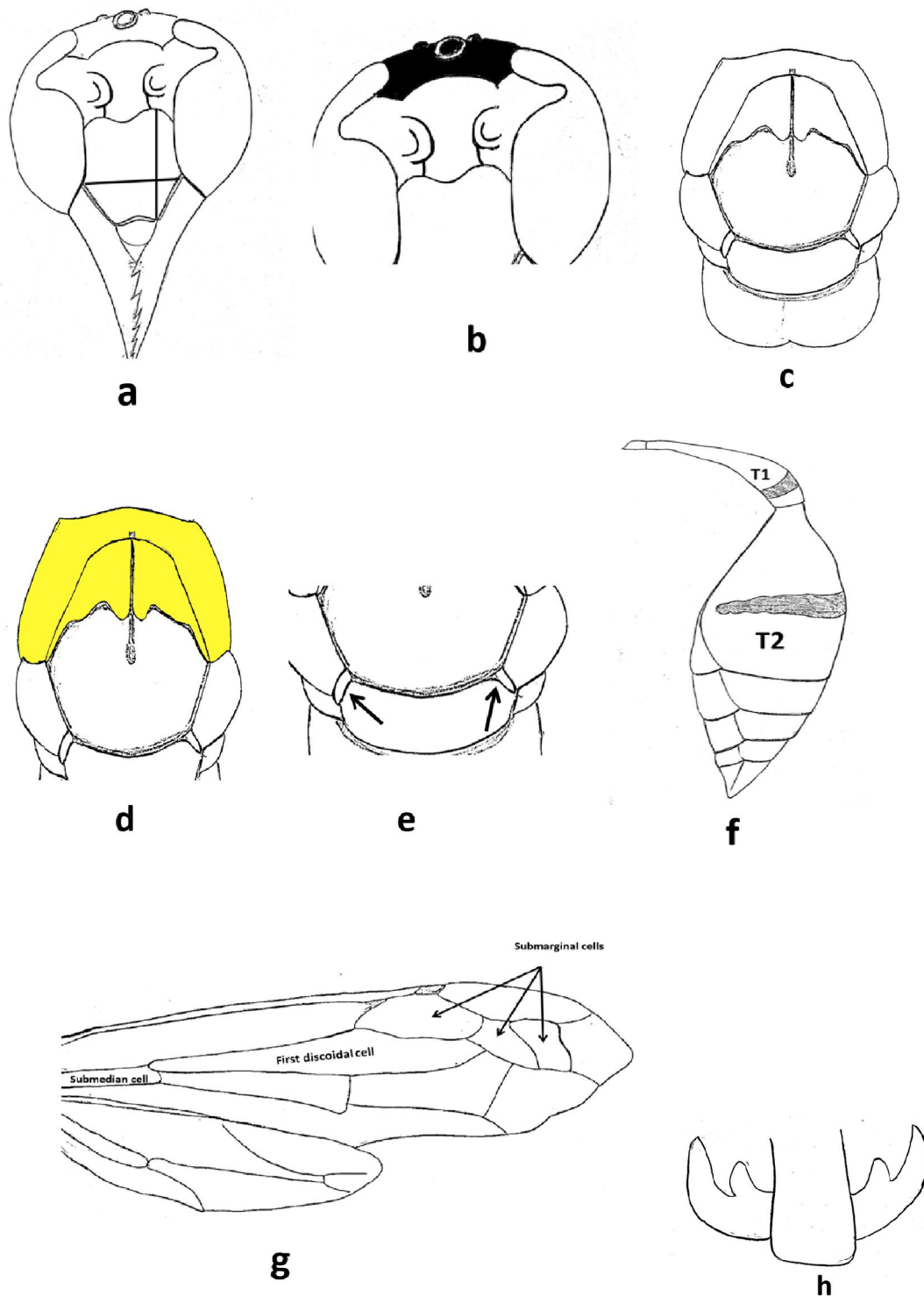


FIGURE 4. *Delta pyriforme* ♀. a. Head (Frontal view.) b. Head (broad transverse black band). c. Mesosoma. d. Pronotum entirely and mesoscutum anteriorly yellow. e. Parategula. f. Metasoma. g. Wing. h. Bifid claws



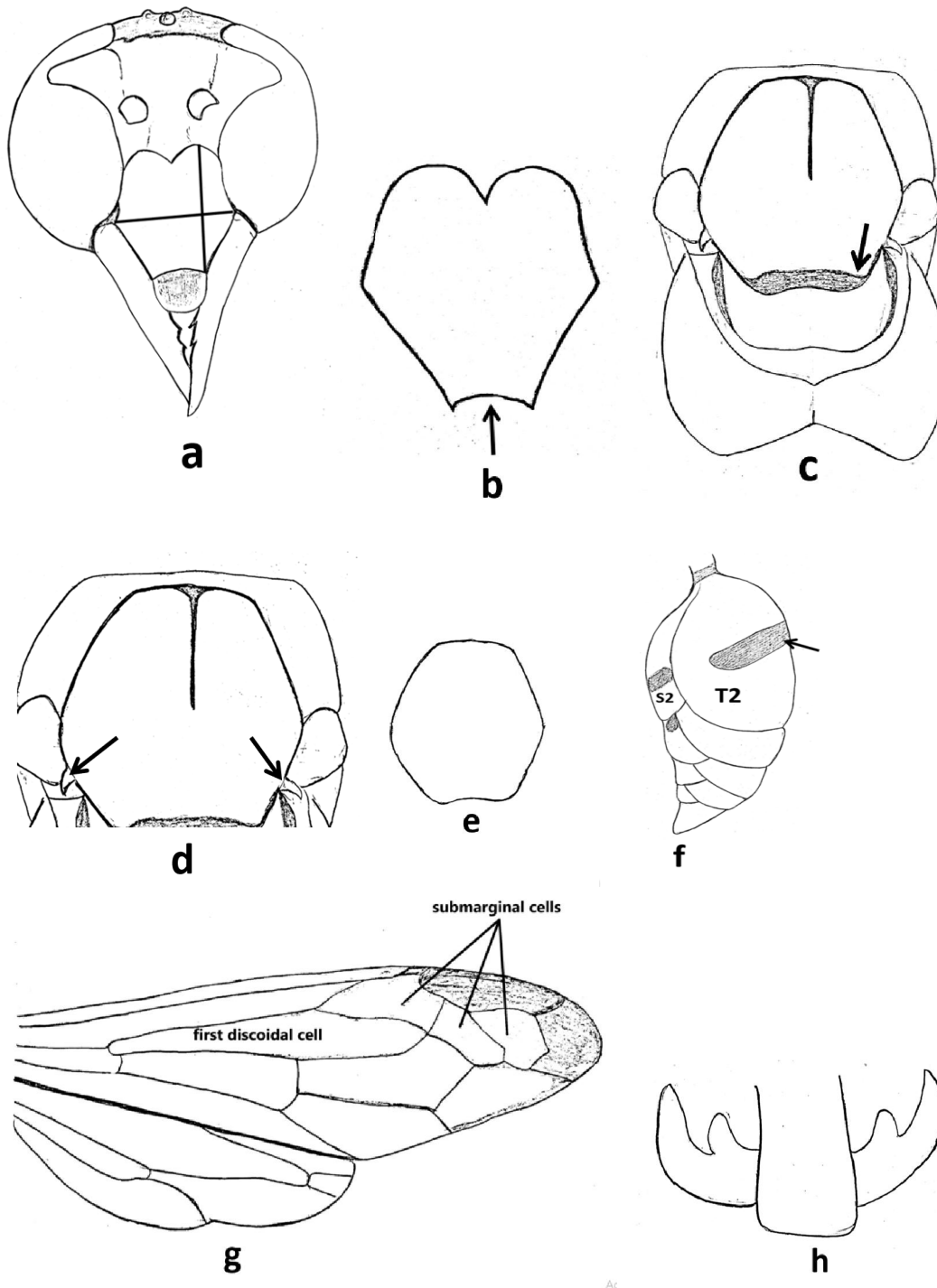


FIGURE 5. *Delta conoideum*. ♀. a. Head (Frontal view.) b. Clypeus, c-d. Mesosoma. e. mesoscutum. f. Metasoma. g. Wing. h. Bifid claws



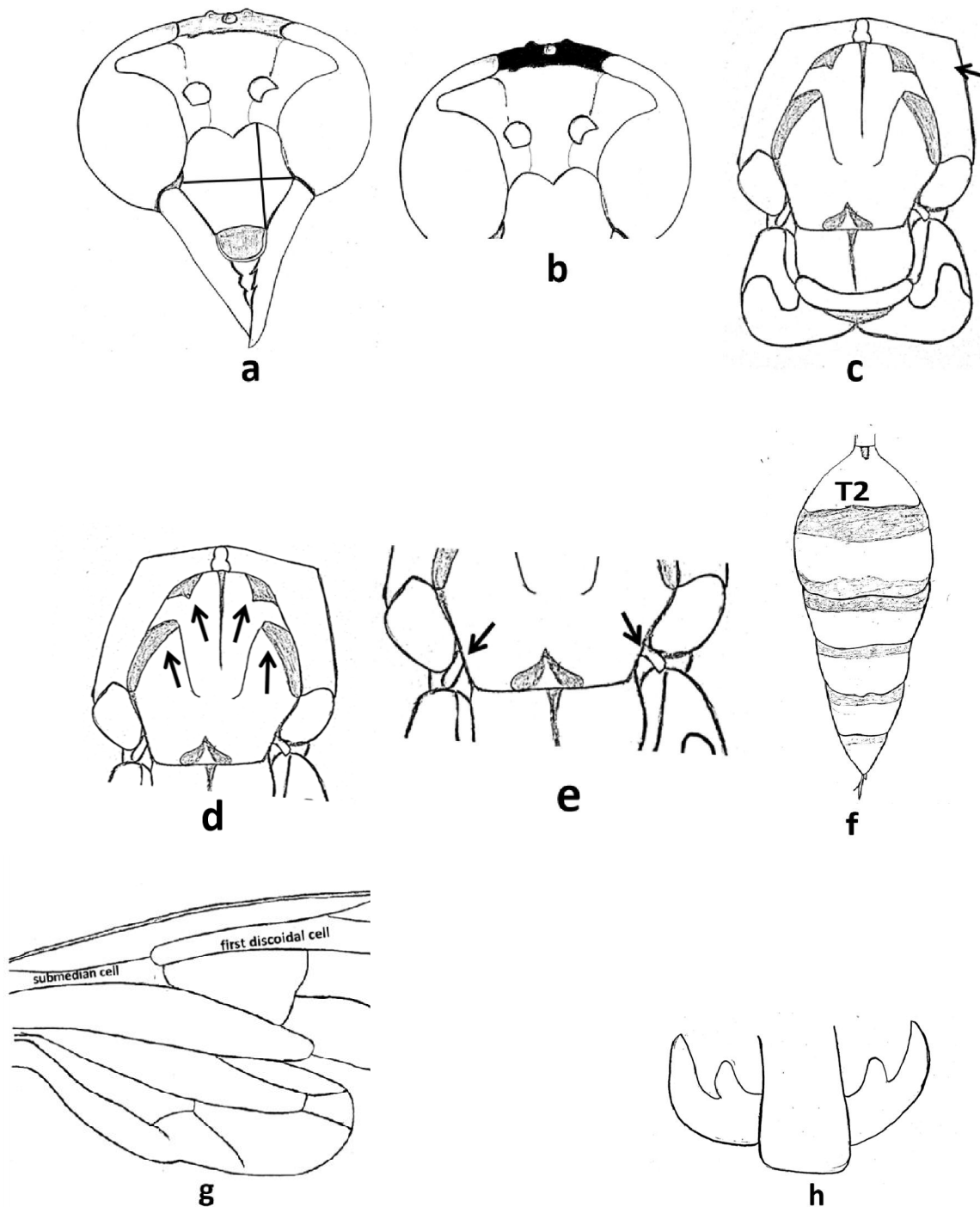


FIGURE 6. *Delta euseriens*. ♀ .a. Head (Frontal view.)b..Head (broad transverse black band).c- e.Mesosoma.e.Parategula. f.Metasoma. g.Wing .h. Bifid claws

