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THE STRUCTURE OF THE OVIPOSITING ORGANS AS A TRIBAL CHARACTER IN THE INDO-AUSTRALIAN SYCOPHAGINE TORYMIDAE (HYMENOPTERA, CHALCIDOIDEA)

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With nine text-figures

Landmarks on the distal segments of the female Chalcidoid gaster are the spiracular peritremata of the eighth urotergite, and the pygostyli of the ninth. The eighth and ninth sterna bear the first and second valvulae, which form the effective ovipositor and its sheath, respectively. The ninth moreover bears the third valvulae, commonly called the valves of the ovipositor.

Most Chalcidoid Hymenoptera of the family Torymidae have a long ovipositor, in some instances several times as long as the body. Comparative study of fig wasps of the subfamily Sycophaginae shows that the great length of the ovipositing organs in different groups, may have been acquired by different means. The characters of these structures of the females appear to be correlated with various characters of the males. The characters of the males are only shortly mentioned in the present paper. Those of the female ovipositing organs are here taken as criteria for a tribal classification of the Sycophaginae.

One nomenclatorial remark precedes the enumeration of the tribes. Saunders (1883a : 11 ff.), on the presumption that the fig wasps should be transferred to "a more congenial sphere, by restoring them, as heretofore, to the vegetable-feeding" Cynipoidea, classified several genera in the subfamilie Sycophagides. *Blastophaga* Gravenhorst, *Agaon* Dalman, *Sycocrypta* Coquerel, *Eupristina* Saunders, *Pleistodontes* Saunders, and *Kradibia* Saunders were assigned to the first division, Prionastomata Saunders (Prionostomata in Saunders, 1883b : v), a synonym of Agaonidae Walker

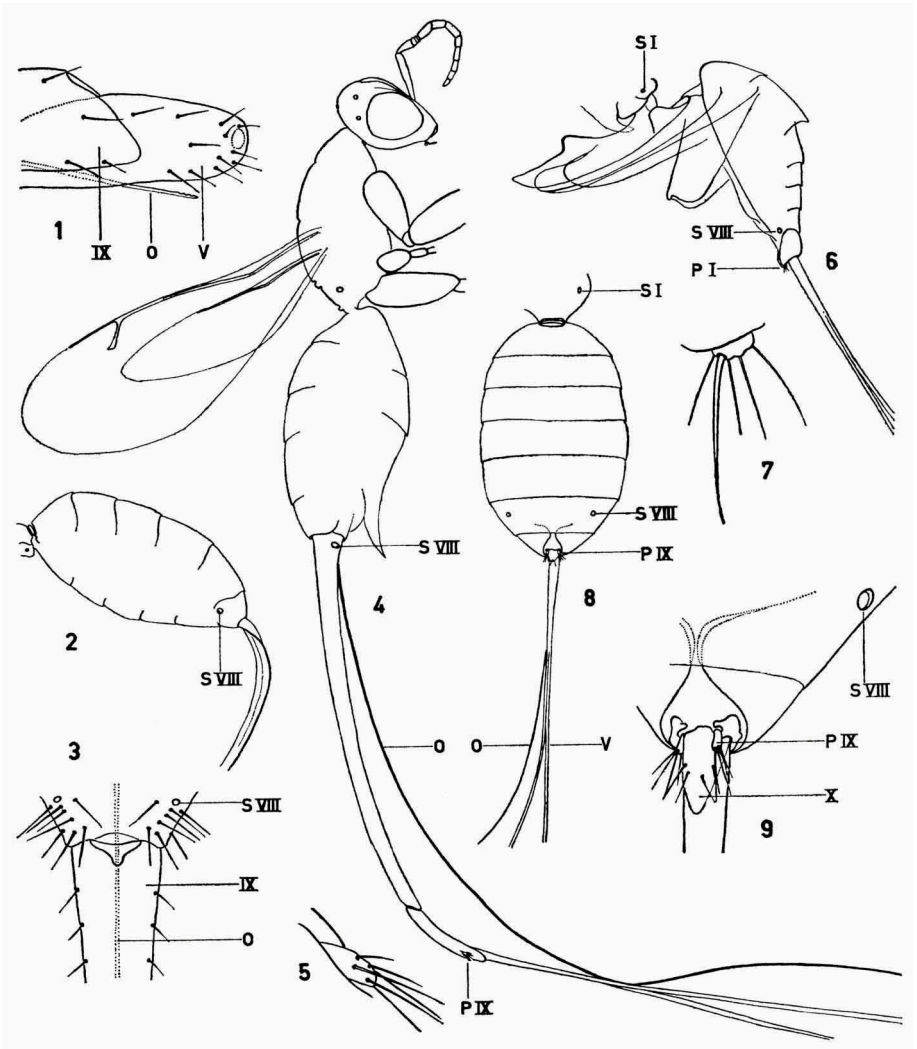

Fig. 1-9. Female Sycophaginae, semidiagrammatical. 1, *Sycoryctes* sp., apex of ninth urotergite, valva, and ovipositor, lateral aspect; 2, *Sycoryctes patellaris* Mayr, gaster, lateral aspect; 3, *Arachonia* sp., eighth, and base of ninth urotergites, dorsal aspect (flattened); 4-5, *Philotrypesis similis* Baker: 4, lateral aspect, 5, pygostyle, dorsal aspect; 6-7, *Apocrypta larvalis* (Baker), lateral aspect: 6, gaster, 7, pygostyle; 8-9, *Eukoebelea nota* (Baker): 8, gaster, dorsal aspect, 9, apex of gaster, dorsal aspect (slightly oblique). o, ovipositor; p IX, pygostyle of ninth urotergite; s I, propodeal spiracle; s VIII, spiracle of eighth urotergite; v, valva; IX, X, ninth and tenth urotergites. Fig. 1, 9 × 100; 2, 4, 6, 8, × 25; 3, × 40; 5, 7, × 250.

(1846: 23); *Sycophaga* Westwood and *Apocrypta* Coquerel to the second, Aploastomata Saunders (Haplostomata), a synonym of Sycophagoidae Walker (1875: 16). Apart from these "fig insects proper", Saunders distinguished the "presumably parasitic types" as Sycocolacides Saunders. This, as was correctly suggested by Patton (1884: xvi), is another synonym of Sycophagoidae Walker if the genus *Sycophaga* Westwood is included, or a synonym of Idarninae Ashmead (1899: 235).

Joseph's (1964) division of the Sycophaginae (cf. Wiebes, 1961; 1964: 84-85) into tribes, left many genera unclassified. Most of these may be accommodated in one of the following groups.

The figured specimens were taken from the following samples: *Sycoryctes patellaris* Mayr, ex *Ficus glomerata* Roxb. [= *F. racemosa* L.], Bogor, Java, leg. H. Solms (coll. Mus. Vienna; slide II. ii); *Arachonia* sp. and *Sycoryctes* sp., ex *Ficus stupenda* Miq., Sungei Liwagu, N. Borneo, leg. E. J. H. Corner (Mus. Leiden, nos. 717 and 720); *Apocrypta larvalis* (Baker), *Eukoebelea nota* (Baker), and *Philotrypesis similis* Baker, ex *Ficus nota* (Blanco) Merrill, Los Baños, Luzon, Philippines, leg. J. T. Wiebes (Mus. Leiden, nos. 779, 780, 781).

(1) Sycophagini (Sycophagoidae) Walker, 1875: 16. Gaster depressed, with normal sternites; at the distal end the (divided) ninth urotergite and the pygostyles are visible, preceded by the eighth (with spiracles). The long ovipositing organs are formed by the valvulae only (fig. 8, 9). The parapsidal furrows of the mesonotum are complete. The males are dorsoventrally depressed, ribbon-shaped; they show the peculiar division of the head described by Grandi (1916: 227-228, fig. xxxii, 1), and bear long filaments on the spiracular peritremata of the eighth urotergite.

Type-genus, *Sycophaga* Westwood (extra-limital). Additional genera, *Eukoebelea* Ashmead, *Parakoebelea* Joseph, (*Idarnes* Walker, see below). Synonyms, Idarninae Ashmead, Sycocolacides Saunders.

(2) **Apocryptini** new tribe. The gaster ends with the ninth urotergite (with pygostyles), and the ovipositing organs are formed by the valvulae only; the gastral sternites are extended ventrad, they are ploughshare-shaped in lateral aspect (fig. 6, 7). The parapsidal furrows are complete. The males are very slender; the spiracular peritremata of the eighth urotergite are large, but not prominent.

Type-genus, *Apocrypta* Coquerel.

(3) **Sycoryctini** new tribe. The apparent gaster ends with the eighth urotergite (with spiracles), the ninth is tubularly lengthened covering the valvulae almost to the tips (fig. 1-3). The pygostyles may be present close to the tip of the ninth urotergite, or absent. The parapsidal furrows are

incomplete [1]) or obsolete. The males are less depressed than in the nominate tribe; the head is not divided into two parts, and the spiracular peritremata of the eighth urotergite are not prominent, nor very large.

Type-genus, *Sycoryctes* Mayr. Additional genera, *Arachonia* Joseph, *Sycoscapter* Saunders, *Sycoscapteridea* Ashmead. *Sycoscaptella* Westwood and *Sycoscapterella* Ashmead probably belong in this tribe.

(4) **Philotrypini** new tribe. The last two segments of the gaster are tubularly lengthened; the apparent ovipositor is formed by the eighth urotergite (with spiracles), the ninth (with pygostyles), and the valvulae (fig. 4, 5). The parapsidal furrows are complete. The males are more robust than in the tribes mentioned above; the abdominal spiracles are small. Most males are subapterous, some species are homeomorph (alate).

Type-genus, *Philotrypesis* Förster.

(5) Otitesellini Joseph, 1964: 65. Description from Joseph: females with short, inserted ovipositor; postmarginal vein long [but it is short in *Grandiana* Wiebes]. Male with over-sized head, mandibles, antennal scape and toruli, and large thorax; the fore wings only are present, and are usually represented by filamentous rudiments. For more detailed descriptions, and figures, see Grandi (1922).

Type-genus, *Otitesella* Westwood. Additional genera, *Eujacobsonia* Grandi, *Grandiana* Wiebes, *Lipothymus* Grandi, *Micrognathophora* Grandi, *Terastiozoon* Grandi (? = *Walkerella* Westwood), *Sycobiella* Westwood.

(6) Sycophilini Joseph, 1964: 65. Description from Joseph: females with very short ovipositor, which hardly projects beyond the tip of the gaster; postmarginal vein short or very short; abdomen subdepressed. Males apterous or alate or both. Figures, see Grandi (1923. *Neosycophila*). As mentioned earlier (Wiebes, 1964: 85), I am not sure whether this group should be retained in the subfamily.

Some genera formerly placed in the "Idarninae" (in the relationship of *Sycophila* etc.), appear to be better accommodated in the Pteromalidae, tribe Brachyscelidiphagini (see Gahan & Ferrière, 1947). The contents of the Sycophilini listed here are as given by Joseph (1964). This assemblage of genera is in urgent need of revision.

Type-genus, *Sycophila* Walker. Additional genera, *Neosycophila* Grandi, *Sycobia* Walker, *Sycobiomorpha* Joseph, *Sycophilodes* Joseph.

(7) Incertae sedis. Some genera could not be classified. One of these, *Diaziella* Grandi, was sufficiently described; it appears to be aberrant. *Diaziella* may need another tribe, the description of which I postpone until

1) They are complete in the American genus *Critogaster* Mayr, which seems to belong to the same tribe, Sycoryctini.

the African and American Sycophaginae are studied. Another genus, *Polanisa* Walker, based on *Polanisa lutea* Walker (the type of which is probably lost), is of dubious standing.

Three, viz. *Sycoscaptella* Westwood, *Sycoscapterella* Ashmead, and *Walkerella* Westwood, are known in one sex only, but they can probably be assigned to their proper tribes after a revision of the type material of their type species. The same applies to *Micranisa* Walker, and to the genera named by Girault, and described in his usual sketchy way, viz. *Goniogastrella* (judging from the name, it may belong to the Apocryptini), *Idarnoides, Idarnomorpha* (both Sycophagini?), *Philotrypesella* and *Philotrypesopsis* (both Philotrypini?), *Epicolystichus* and *Paracolystichus. Platyneura* Motschulsky, finally, is unrecognizable from the description.

Eukoebelea, Idarnes and Sycophaga

The presence of *Idarnes* Walker (type, *I. carme* Walker from the West Indies) in the Indo-Australian region is doubtful. Joseph (1957: 103) synonymized *Sycophagella agraensis* Joseph (1953: 54) with *Tetragonaspis testacea* Mayr (1885: 157), and listed the species as *Idarnes testacea* (Mayr). In comparing *Sycophagella* with *Sycophaga* (*S. brevitarsus* Grandi, 1916: 236; = *Eukoebelea brevitarsus* (Grandi) Joseph, 1957: 103), Joseph (1953: 61) stated: "... there are fundamental differences between the two genera viz. in *Sycophagella agraensis* Joseph the twelve-segmented antenna with a single ring-joint and the unisegmented maxillary and labial palpi alone are sufficient to distinguish the two into separate genera". I may present the following comments. (1) The numbers given by Joseph (1953) for *Sycophagella agraensis* do not agree with those found in material of *T. testacea* from Mayr's collection (Mayr, in the original description, did not specify these characters for *T. testacea,* and they do not fit in his description of the genus): in *T. testacea* the antennal segments number 13, the annuli 2, the maxillary and labial palpi are 1- and 2-segmented respectively; (2) the unisegmented maxillary and labial palpi of *Eukoebelea cunia* Joseph (1957: 102) show that this character cannot be considered differential between *Idarnes* (sensu Joseph) and *Eukoebelea*; (3) antennae with two annuli are found in *Eukoebelea camerunensis* Mayr and *E. gigas*[2]) Mayr (1906: 165) etc., and this appears indeed to be the normal number in *Eukoebelea*; (4) in my opinion, *Tetragonaspis testacea* can remain in the genus *Eukoebelea* Ashmead, where Mayr (1906: 165) and Grandi (1928: 80) placed it. A discussion of the differential characters of *Eukoebelea*

2) This species may belong to *Parakoebelea* Joseph.

testacea and *E. brevitarsus,* additional to that by Joseph (1953), falls out of the scope of this paper.

Idarnes subaenea (Girault) Girault (1917: 37) must remain incertae sedis, until the type material has been restudied.

All Indo-Malayan species, previously assigned to *Sycophaga* Westwood, appear to belong to *Eukoebelea* Ashmead (see Grandi, 1923: 113, nota). *Sycophaga* seems to be exclusively African in its distribution.

List of the Indo-Australian genera of the Sycophaginae
(synonyms in italics)

Agaonella Baker, 1913, Philipp. J. Sci. **8**: 72; type *A. larvalis* Baker = *Apocrypta larvalis* (Baker) Williams (1928, Bull. Exp. Sta. H.S.P.A. **19**: 13).

Agrianisa Walker, 1875, Entomologist **8**: 16; type *A. myrmecoides* Walker = *Sycobia bethyloides* Walker, sec. Patton (1884, Proc. ent. Soc. Lond. **1884**: xvi).

Apocrypta Coquerel, 1855, Rev. Mag. Zool. (2) **7**: 367; type *A. perplexa* Coquerel. Apocryptini.

Arachonia Joseph, 1957, Ann. Soc. ent. France **125**: 107; type *A. plumosa* Joseph. Sycoryctini.

Diaziella Grandi, 1928, Boll. Lab. Ent. Bologna **1**: 80; type *D. bicolor* Grandi. As yet unclassified.

Epicolystichus Girault, 1915, Mem. Queensland Mus. **4**: 285; type *E. aereicorpus* Girault. Incertae sedis.

Eujacobsonia Grandi, 1923, Ann. Mus. Stor. nat. Genova **51**: 105; type *E. mirabilis* Grandi. Otitesellini.

Eukoebelea Ashmead, 1904, Proc. ent. Soc. Washington **6**: 126; type *Koebelea australiensis* Ashmead. Sycophagini

Goniogaster Mayr, 1885, Verh. zool.-bot. Ges. Wien **35**: 240; type *G. varicolor* Mayr. *Goniogaster* is a synonym of *Apocrypta* Coquerel, sec. Grandi (1924, Boll. Lab. Zool. Portici **17**: 113, nota).

Goniogastrella Girault, 1915, Mem. Queensland Mus. **4**: 282; type *G. caudatus* Girault. Incertae sedis.

Grandiana Wiebes, 1961, Nova Guinea, Zool. **14**: 245; type *G. wassae* Wiebes. Otitesellini.

Idarnella Westwood, 1883, Trans. ent. Soc. Lond. **1883**: 37; type *Idarnes transiens* Walker = *Philotrypesis transiens* (Walker) Grandi (1921, Boll. Lab. Zool. Portici **15**: 92).

Idarnes Walker, 1843, Ann. Mag. nat. Hist. **12**: 47; type *I. carme* Walker (from the West Indies). As argumented above, the genus is of doubtful occurrence in the region. *Idarnes australis* Froggatt (1901, Agric. Gaz. N. S. Wales **11**: 6) = *Sycoryctes australis* (Froggatt) Mayr (1906, Wien. ent. Ztg. **25**: 170); *Idarnes orientalis* Walker (1875, Entomologist **8**: 17) = *Idarnes stabilis* Walker, sec. Patton (1884, Proc. ent. Soc. Lond. **1884**: xvii); *Idarnes stabilis* Walker (1871, Notes on Chalcidiae **4**: 62) = *Sycoscapter stabilis* (Walker) Grandi (1928, Bull. Soc. zool. France **53**: 81); *Idarnes testacea* (Mayr) Joseph (1957, Ann. Soc. ent. France **125**: 103) = *Eukoebelea testacea* (Mayr) Mayr (1906, Wien. ent. Ztg. **25**: 165). Sycophagini.

Idarnodes Westwood, 1883, Trans. ent. Soc. Lond. **1883**: viii (errata); type *Cynips caricae* L. (present designation) = *Philotrypesis caricae* (L.).

Idarnoides Girault, 1913, Trans. R. Soc. S. Australia **37**: 100; type *I. channingi* Girault. Incertae sedis.

Idarnomorpha Girault, 1915, Mem. Queensland Mus. **4**: 281; type *I. subaenea* Girault = *Idarnes subaenea* (Girault) Girault (1917, Insec. inscit. Menstr. **5**: 37). Incertae sedis.

Indothymus Joseph, 1953, Agra Univ. J. Res. **2**: 73; type *I. infectorius* Joseph = *Sycoscapter infectorius* (Joseph) Joseph (1957, Ann. Soc. ent. France **125**: 107).

Isanisa Walker, 1875, Entomologist **8**: 15; type *I. decatomoides* Walker = *Sycophila decatomoides* Walker, sec. Patton (1884, Proc. ent. Soc. Lond. **1884**: xvi).

Koebelea Ashmead, 1904, Mem. Carnegie Mus. **1**: 238; type *K. australiensis* Ashmead = *Eukoebelea australiensis* (Ashmead) Ashmead (1904, Proc. ent. Soc. Washington **6**: 126). As to *Koebelea* Girault, see Gahan & Fagan (1923, Bull. U.S.N.M. **124**: 77); it is the same as *Eukoebelea.*

Lipothymus Grandi, 1921, Ann. Mus. Stor. nat. Genova (3) **9**: 307; type *L. sumatranus* Grandi. Otitesellini.

Micranisa Walker, 1875, Entomologist **8**: 18; type *Idarnes pteromaloides* Walker, sec. Patton (1884, Proc. ent. Soc. Lond. **1884**: xvii). Incertae sedis.

Micrognathophora Grandi, 1921, Ann. Mus. Stor. nat. Genova (3) **9**: 314; type *M. leptoptera* Grandi. Otitesellini.

Neosycoecus Joseph, 1953, Agra Univ. J. Res. **2**: 62; type *N. indicus* Joseph = *Sycoscapteridea indica* (Joseph) Joseph (1957, Ann. Soc. ent. France **125**: 115).

Neosycophila Grandi, 1923, Ann. Mus. Stor. nat. Genova **51**: 6; type *Eufroggattia omeomorpha* Grandi. Sycophilini.

Otitesella Westwood, 1883, Trans. ent. Soc. Lond. **1883**: 39; type *O. digitata* Westwood. Otitesellini.

Paracolystichus Girault, 1915, Mem. Queensland Mus. **4**: 284; type *P. compressiventris* Girault. Incertae sedis.

Parakoebelea Joseph, 1957, Ann. Soc. ent. France **125**: 97; type *P. stratheni* Joseph. Sycophagini.

Philotrypesella Girault, 1919, Hymenoptera Chalcidoidea Australiensis: 2; type *P. huberi* Girault. Incertae sedis.

Philotrypesis Förster, 1878, Verh. naturh. Ver. preuss. Rheinl. **35**: 59; type *P. longicauda* Förster = *Philotrypesis caricae* (L.); see China (1962, Bull. zool. Nomencl. **19**: 160-163) and Opinion 694 (1964, Bull. zool. Nomencl. **21**: 31-32). Philotrypini.

Philotrypesopsis Girault, 1919, Hymenoptera Chalcidoidea Australiensis: 2; type *P. hallani* Girault. Incertae sedis.

Platyneura Motschulsky, 1863, Bull. Soc. Natural. Moscou **36** (2): 49; type *P. testacea* Motschulsky. Incertae sedis.

Polanisa Walker, 1875, Entomologist **8**: 17; type *P. lutea* Walker = *Idarnella transiens* (Walker), sec. Patton (1884, Proc. ent. Soc. Lond. **1884**: xvi): if this is correct, *Polanisa* is a synonym of *Philotrypesis* (see Hoffmeyer, 1930, Ent. Medd. 17: 234; 1933, Ent. Medd. 18: 248-249), but according to China (1962, Bull. zool. Nomencl. **19**: 162) it should, for the time being, remain a nomen dubium.

Pseudisa Walker, 1875, Entomologist **8**: 15; type *Pseudia* (!) *smicroides* Walker = *Sycophila megastigmoides* Walker, sec. Patton (1884, Proc. ent. Soc. Lond. **1884**: xvi).

Sycobia Walker, 1871, Notes on Chalcidiae **4**: 60; type *S. bethyloides* Walker. Sycophilini.

Sycobiella Westwood, 1883, Trans. ent. Soc. Lond. **1883**: 33; type *S. saundersii* Westwood. Otitesellini.

Sycobiomorpha Joseph, 1959, J. Karnatak Univ. **4**: 93; type *S. bimasculinum* Joseph. Sycophilini.

Sycophaga Westwood, 1840, Trans. ent. Soc. Lond. **2** (1840) (4): 214; type *S. crassipes* Westwood (from Egypt) = *Sycophaga sycomori* (L.), sec. Mayer (1882, Mitt. zool. Sta. Neapel **3**: 582). *Sycophaga* seems to be exclusively African in distribution. Sycophagini.

Sycophagella Joseph, 1953, Agra Univ. J. Res. **2**: 53; type *S. agraensis* Joseph = *Idarnes testacea* (Mayr), sec. Joseph (1957, Ann. Soc. ent France **125**: 103), but I would rather place it with *Eukoebelea*. See discussion above.

Sycophila Walker, 1871, Notes on Chalcidiae **4**: 63; type *S. decatomoides* Walker. Sycophilini.

Sycophilodes Joseph, 1959, J. Karnatak Univ. **4**: 92; type *S. moniliformis* Joseph. Sycophilini.

Sycoryctes Mayr, 1885, Verh. zool.-bot. Ges. Wien **35**: 211; type *S. patellaris* Mayr. Sycoryctini.

Sycoscaptella Westwood, 1883, Trans. ent. Soc. Lond. **1883**: 36; type *S. affinis* Westwood (according to Grandi (1921, Boll. Lab. Zool. Portici **15**: 95) it is nòt *Philotrypesis*). It may belong to the Sycoryctini.

Sycoscapter Saunders in Westwood, 1883, Trans. ent. Soc. Lond. **1883**: 34; type *S. insignis* Saunders. Sycoryctini.

Sycoscapterella Ashmead, 1904, Mem. Carnegie Mus. **1**: 239; type *Sycoscapter* (recte *Sycoscaptella*) *anguliceps* Westwood (according to Grandi (1921, Boll. Lab. Zool. Portici **15**: 102) it is nòt *Philotrypesis*). It may belong to the Sycoryctini.

Sycoscapteridea Ashmead, 1904, Mem. Carnegie Mus. **1**: 239; type *Sycoscapter monilifer* Westwood. Sycoryctini.

Terastiozoon Grandi, 1921, Ann. Mus. Stor. nat. Genova (3) **9**: 312; type *T. jacobsoni* Grandi. Otitesellini.

Tetragonaspis Mayr, 1885, Verh. zool.-bot. Ges. Wien **35**: 205; type *T. gracilicornis* Mayr = *Idarnes gracilicorne* (Mayr) Ashmead (1904, Mem. Carnegie Mus. **1**: 391). Only one species, *T. testacea* Mayr, is Indo-Malayan; see discussion above.

Tetranemopteryx Ashmead, 1904, Mem. Carnegie Mus. **1**: 239; type *Sycoscapter* (recte *Sycoscaptella*) *quadrisetosa* Westwood = *Philotrypesis quadrisetosa* (Westwood) Grandi (1921, Boll. Lab. Zool. Portici **15**: 96).

Walkerella Westwood, 1883, Trans. ent. Soc. Lond. **1883**: 32; type *W. temeraria* Westwood. Otitesellini; may be the same as *Terastiozoon*.

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