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CLARIDGE, M. F.

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TRANSACTIONS OF THE SOCIETY FOR BRITISH ENTOMOLOGY

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PART VII

AN ADVANCE TOWARDS A NATURAL CLASSIFICATION OF EURYTOMID GENERA (HYM., CHALCIDOIDEA), WITH PARTICULAR REFERENCE TO BRITISH FORMS

By M. F. CLARIDGE, M.A., D.Phil.
(Department of Zoology, University College, Cardiff)

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Principles of Natural Classification

The most useful form of biological classification is generally agreed to be that based on the so-called *natural** system. How-

*Since preparing the manuscript for this paper Cain and Harrison (1960, *Proc. zool. Soc. Lond.*, **135**: 1-31) have suggested that the term *natural*, as applied to biological classifications, should be rejected completely since it has been misinterpreted and confused by so many authors. They propose the new term *phenetic* for natural classifications as defined here, *i.e.* those based on overall similarity. However, since it is unlikely that taxonomists will cease using such well entrenched terminology, I incline to the view that it is better to attempt to clarify and stabilize existing terms rather than promote new ones.

ever, there is probably no term used in taxonomy, the meaning of which has been so badly confused. An admirable and full historical discussion has been given recently in a series of papers by Cain (1958, 1959a, b, c), but it is not out of place to discuss the matter briefly here, since it is of great importance in entomological taxonomy.

A natural classification is one which is based on overall resemblance (affinity); that is, on as many characters of all kinds as possible. It cannot be achieved by single-character, or virtually single-character, methods, unless the character can be shown to be correlated with the natural grouping. The taxonomic importance of any single character can only be judged by its co-variation with other characters of the group. A necessary consequence of the natural system is the possibility that any character confined to members of a particular natural group may be absent in one or more of its members and thus could not be used as diagnostic of it (*vide* Cain, 1954). The obvious corollary is that if classificatory groups, particularly genera, are to be natural, it may not be possible, in many cases, to give exclusive definitions of them on the basis of a particular character or character complex: a procedure which is generally considered essential. I have briefly mentioned this problem before in connection with the Eurytomidae (Claridge, 1958a).

Most of the misunderstandings concerning the natural system in recent literature have been concerned with the equation of natural classifications with phylogeny, in the total absence of adequate fossil records. In order to produce a phylogenetic classification, detailed phylogenetic data are required. Such data can only be obtained from fairly complete fossil records, which are very rare and almost unknown in insects. The natural system, based on comparative data of living forms only, may take no account of parallel and detailed convergent evolution and may even tend to obscure such phenomena. Undoubtedly it is probable that in many cases, those species which in a natural classification are said to be closely allied, are truly phylogenetically close. However, we can never be sure, and as more and more groups are hypothetically related the probability of the system representing phylogeny becomes increasingly less. As Cain (1959c), in discussing avian taxonomy, has said ". . . ; the theory [of evolution] is now so strong that it will not matter if we have to say we just don't know the phylogeny of 80% of passerine birds". This applies perhaps with even greater force to almost all insect groups.

An important consequence of the application of a natural generic system in practice will usually be a reduction in the number of genera in a group, since often they have been erected only for couplets of an artificial key. There are many cases of such single character genera in the Chalcidoidea. A good example is *Achrysocephagus* Girault (Encyrtidae) distinguished from

Cheiloneurus Westwood only by its extruded ovipositor (*vide* Claridge, 1958b). Many species with exerted ovipositors show greater affinity with some species of *Cheiloneurus* than with others with extruded ovipositors. The value of such completely artificial genera is very slight. However, since unfortunately it is necessary to place a species generically before it can be described, a taxonomist without the time and material available to revise the group completely may have to erect more such genera.

The great advantage of a natural classification is that it is a reservoir of the maximum amount of information about a group, and thus it allows at least limited generalizations to be made about its components. Also it provides a background against which phylogenetic speculation can be made, but such speculation should not be allowed to affect the system.

Consideration of Eurytomid Genera

In the Eurytomidae, probably since morphological diversity is relatively slight, there have not been so many genera described as in some other Chalcidoid families such as the Encyrtidae. Of workers on Palaearctic forms, Walker (1832, 1846, etc.) recognized only four major genera, though several others were also erected, mostly for tropical and oriental species. Thomson (1875) recognized only the four of Walker and more recently Ferrière (1950) has included eight in four subfamilies from a rather wider geographic area within the Palaearctic. Many more genera were included by Ashmead (1904) in his classification of world Chalcid genera. Of those of Ashmead described for Nearctic species, some have been synonymized by Peck (1951), who recognized only fourteen genera from America north of Mexico. Burks (1958) recognizes a further four from the same area. I have not been able to study sufficient Nearctic material to produce any reliable correlation with Palaearctic forms, but it seems probable that the genera as recognized here include a greater diversity of form. My system is based mainly on European species.

With the key given below it should be possible to identify any known European species to a genus, though it is hoped that it may also serve as a basis for eastern Palaearctic and Nearctic forms. The characters of the occiput have not been used extensively before. Though not completely diagnostic for the genera as recognized here, they make possible the construction of such a key and fail only for odd species groups, particularly of *Eurytoma*. The arrangement of the key is entirely artificial and intended as an aid to identification only.

The figures of antennae were prepared from slide-mounts in canada balsam. However, such mounts should not be necessary for generic identification.

Terminology

Richards (1956) has been followed for the terminology of most morphological features, but unless otherwise stated the term thorax is taken to include the propodeum.

The terminology of the antennal segments poses a number of problems which have been discussed elsewhere (Claridge, 1959b). The term flagellum is here used for that part of the antenna distal to the anellus: that is it does not include the latter. Though contrary to most general entomological usage, such a terminology is very valuable for those groups of Chalcidoidea in which there is no clear distinction between a funicle and club.

In discussing characters of the occiput I have previously (1958a) used the terms hypostomal carina and hypostomal lamella for the distinctive structures of some *Eurytoma* species (figs. 1 and 2). Prof. O. W. Richards has pointed out to me (personal communication) that the carina is unlikely to represent the boundary of the true hypostoma and that the terms post genal carina and lamella would probably be preferable. These terms seem to represent a better interpretation of the structures and will be used here.

Key to genera of Northern Palaearctic Eurytomidae

1. Antennae (figs. 24 and 25) with anelli indistinct and not clearly differentiated from flagellar segments
Archirileya Silvestri.
Antennae (figs. 12-18, 26-28) with one distinct anellus, clearly differentiated from flagellar segments 2.
2. Occipital carina strongly developed **and** post genal lamella present (figs. 1 and 2); occiput highly polished, unlike rugose face *Eurytoma* Illiger (*partim*).
Occipital carina variably developed; post genal lamella never present; occiput usually sculptured similarly to face, but polished in *Ahtola* and some *Eudecatoma* 3.
3. Female gaster with petiole elongate, at least one and a half times as long as wide, from above; remainder of gaster flattened laterally and distinctly globular (figs. 9 and 10). Forewings with more or less developed, pigmented submarginal band below marginal vein (figs. 21-23). Male antenna (fig. 16) little specialised, resembling that of female, but with only 4 free basal flagellar segments
Eudecatoma Ashmead
Female gaster with petiole shorter, rarely longer than wide. Forewings without distinctly pigmented submarginal band. Male antenna (figs. 13, 18, 26, 28) with flagellar segments longer and bearing variably arranged long hairs 4.

4. Occipital carina strongly developed; occiput polished; post genal lamella **not** present (fig. 4). Post marginal vein well developed, almost as long as marginal; longer than stigmal vein (fig. 20) *Ahtola* gen. nov.
Occipital carina weakly developed or absent (figs. 3 and 5); occiput not clearly differentiated from face in sculpture. Post marginal vein less well developed and shorter 5.
5. 5th segment of female gaster longest, about twice as long as 4th in dorsal view (figs. 7 and 8) ... *Eurytoma* Illiger (*partim*).
5th segment of female gaster not longest; segments either subequal (fig. 11) or another segment longest 6.
6. Marginal vein short, about as long as or slightly longer than stigmal vein. Small, short species with gaster shorter than head and thorax together. Male antenna with only four clearly separate basal flagellar segments (fig. 18) 7.
Marginal vein longer; usually more than twice as long as stigmal vein. Mostly elongate species. Male flagellum of seven distinctly separate segments (figs. 26, 28); terminating in a short spine, sometimes very short ... *Tetramesa* Walker.
7. Female basal flagellar segments clearly narrower than succeeding segments (fig. 14). Sculpture of head and thorax regularly alutaceous, rarely with slight traces of shallow umbilicate punctures *Systole* Walker.
Female basal flagellar segment little narrower than succeeding segments (fig. 17). Sculpture of head and thorax irregularly rugose, with scattered shallow umbilicate punctures *Bruchophagus* Ashmead.

Classification

The suprageneric classification within the family Eurytomidae has received little attention, probably because of the extreme morphological homogeneity of the group. Ashmead (1904), in revising the world genera, recognised five tribes, *viz.*—Aximini, Isosomini, Eurytomini, Rileyini, and Decatomini. These tribes have all been raised to subfamilies by various more recent authors. Ferrière (1950) grouped the Palaearctic genera into four subfamilies, *viz.*—Rileyinae, Harmolitinae (= Isosomini Ashmead), Decatominae, and Eurytominae. The only one of Ashmead's tribes not included was the Aximini which includes aberrant forms mostly confined to central America.

Though I only recognize eight Palaearctic genera I retain the same subfamily grouping as that of Ferrière, since there does seem to be a wider gulf between the genera so separated than between those included in the Eurytominae. My classification is thus as follows:—

Rileyinae

Archirileya Silvestri

Eurytominae*Eurytoma* Illiger*Ahtola* gen. nov.*Systole* Walker*Bruchophagus* Ashmead**Harmolitinae***Tetramesa* Walker*Ailomorphus* Walker—probably restricted to the extreme south-eastern Palaearctic and the Oriental regions.**Eudecatominae** (=Decatominae Ferrière)*Eudecatoma* Ashmead**Rileyinae**

The Rileyinae seem to be characterized reliably by the presence of two or three antennal anelli, which are not clearly distinguishable from the basal flagellar segments (figs. 24 and 25), and a general facies quite unlike the other subfamilies, lacking the typical umbilicate punctation. The single Palaearctic genus *Archirileya* Silv. of southern and central Europe is represented by two described species. So far as known they are predators of the eggs of various Orthoptera, like the allied *Macrorileya oecanthi* (Ashm.) of North America. The known species of *Rileya* Ashm. are parasites in various Cecidomyiid galls.

Archirileya Silvestri1920, *Archirileya* Silvestri, *Boll. Lab. Zool. Portici*, **14**: 223-225.1951, *Anarchirileya* Boucek, *Acta Mus. nat. Prag.*, **27**: 54-56.1957, *Sidonia* Erdös, *Ann. hist. nat. Mus. hung.*, **8**: 350-351.

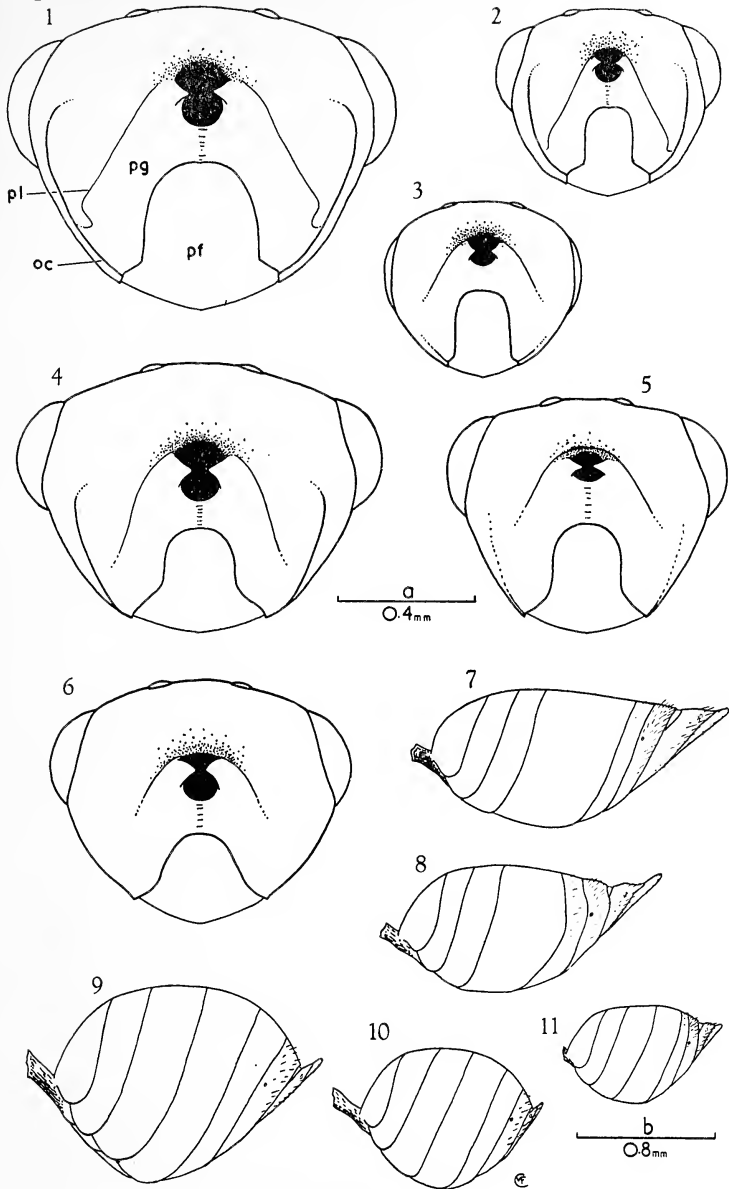
The genus is characterized by its elongate body form in which it resembles *Macrorileya* Ashm. *Rileya* differs in its shorter body form and apparent fusion of the post spiracular sclerite to the mesepisternum.

Boucek (1958) has synonymized *Sidonia podagrica* Erdös with *A. inopinata* Silv. and has included his own genus and species *Anarchirileya femorata* in the genus *Archirileya*.

Neither *A. inopinata* nor *A. femorata* have been recorded from northern Europe or Britain.

Eurytominae

This is the largest and most difficult to define of the subfamilies recognized here. There is an extremely wide range of habits, from endophagous and ectophagous parasitism (most *Eurytoma* species) to complete phytophagy (*Bruchophagus*, *Systole* and some *Eurytoma* species).



Figs. 1-6.—Female occiput in posterior view of: 1, *Eurytoma tibialis* Boh.; 2, *E. rufipes* Walk.; 3, *Bruchophagus platypterus* (Walk.); 4, *Ahtola atra* (Walk.); 5, *Eurytoma cynipsea* Boh.; and 6, *Tetramesa calamagrostidis* (v. Schlecht.) (to scale a). oc—occipital carina; pf—proboscis fossa; pg—post gena; pl—post genal lamella.

Figs. 7-11.—Lateral view of female gaster of: 7, *Eurytoma saliciperdae* Mayr; 8, *E. cynipsea* Boh.; 9, *Eudecatoma submutica* (Thoms.); 10, *E. mellea* (Curtis); and 11, *Bruchophagus platypterus* (Walk.) (to scale b).

The status of *Nikanoria* Nikol'skaya (= *Biro-Lajosia* Erdős, *vide* Boucek, 1958) is uncertain. I have not been able to examine either of the included species from central Europe and the U.S.S.R., but it is probable that it is best considered as a part of *Eurytoma* Ill., as suggested by Boucek (*loc. cit.*).

Eurytoma Illiger

1807, *Eurytoma* Illiger, *Mag. Insektenk.*, **6**: 192.

1807, *Eurytoma* Illiger, in Rossi, *Fauna Etrusca*, 2nd ed., **2**: 128.

1811, *Decatoma* Spinola, *Ann. Mus. Hist. Nat.*, **17**: 138-152.

Type species—*Chalcis abrotani* Panzer—designated by Westwood (1839).

Eurytoma is the oldest described genus in the family and a large number of species have been described, including a number from all the major geographic regions. The generic limits are very difficult and I have found it impossible to give completely diagnostic key characters without recognizing artificial assemblages of species. In most of the species groups the occiput is strongly margined and polished with the post genal lamella well developed (figs. 1 and 2). This complex of characters provides the best means of identifying the genus. However, it is not present in the *cynipsea* Boh. group (fig. 5), *saliciperdae* Mayr group, and a few odd species such as *E. setigera* Mayr. The lengthened fifth tergite of the gaster distinguishes these groups from species of *Bruchophagus* and *Systole*. It would be possible to restrict the genus to those species with the occipital characters, but the species groups so included have no more relationship with each other than with the excluded groups. Thus an extremely artificial system would result.

I have not examined specimens of *Ipideurytoma* Boucek & Novitsky (1954), but it seems probable that it is best considered as a very distinct species group of *Eurytoma*, characterized by the very curious flattened head. The single European species, *I. spessivtsevi* Bk. & Nov., has not been recorded from Britain.

Ahtola gen. nov.

Type species—*Isosoma atrum* Walker (1832).

The species of *Ahtola* may be separated from *Eurytoma* by the following combination of characters:—

Occiput (fig. 4) strongly margined; polished; sculptured differentially to face; post genal carina clearly differentiated, but not formed into a lamella. Forewings (fig. 20) with post marginal vein well developed, as long as or longer than marginal vein;

thickly haired with small submarginal speculum. Gaster (fig. 19) clearly petiolated; tergites subequal, fifth not or little longer than fourth.

Ahtola resembles superficially some species of *Tetramesa*, but is separable by means of the occipital characters. The latter together with the structure of the male antenna (fig. 13) place the genus in the Eurytominae.

Isosoma atrum together with *Eurytoma globiceps* Boucek (1954) and *E. cylindrica* Thomson (1875) represents a distinct natural group which I believe warrants generic status. I had supposed that *Eurytomocharis* Ashmead might be congeneric with *atrum*. However, Dr. B. D. Burks, Washington, informed me (*in litt.*) that in his opinion it was not congeneric with the type species of *Eurytomocharis*, *E. minuta* Ashm., and that it probably represented an undescribed genus. Thus, at present it seems best to give a new generic name even though it may have to be synonymized later.

Ahtola atra (Walker) **comb. nov.**

1832, *Isosoma atrum* Walker, *Ent. Mag.*, 1: 14.

The following is a redescription based on modern material:—

Female. Predominantly black species. Tarsi and extreme apex of femora and base of tibiae rufo-fuscous; venation fuscous; disc of wing variably infumate, particularly in large specimens. Maximum length about 4.2 mm.

Head, in frontal view, distinctly transverse, width to height as about 11: 8 (*cf.* fig. 4); cheeks evenly narrowed to mouth; antennae inserted at or slightly above lower level of eyes; antennal scrobes strongly margined; surface sculpture consisting of distinct umbilicate punctation, with short white hairs arising from each puncture. Head, from above, distinctly transverse, varying from about twice as wide as long to distinctly less; rather gibbous between eyes; POL: OOL, measured from edges of ocelli, as slightly more than 4:3. Malar space to height of eye as about 3:4. Antennae (fig. 12) with scape simple, reaching to about level of ocelli; pedicel short globular; anellus distinctly transverse: seven clearly distinct flagellar segments, sixth and seventh closely associated; proportions of flagellar segments rather variable; rhinaria well developed, tending to form two rows on each segment.

Thorax variable, from about twice as long as wide to distinctly less—length to width as about 8:5; pronotum similarly variable, from about twice as wide as long to distinctly less—width to length as about 15:9; surface sculpture heavily alutaceous with densely distributed umbilicate punctures; mesepisternum sloping evenly to mid coxa. Propodeum heavily and variably rugulose, usually with distinct median furrow; often

with tendency to develop a dorsal face; angle of slope shallower in narrow specimens. Forewings (fig. 20) densely clothed with short hairs; stigmal vein slightly shorter than marginal vein and making an angle of about 30° with post marginal vein; post marginal vein, though fading apically, about as long as or slightly shorter than marginal vein; submarginal vein broken into a long basal and a short apical section.

Gaster varying from about as long as thorax, in large specimens (fig. 19) to clearly longer, usually in smaller narrower specimens; petiole variable, at least half as long as wide in dorsal view; basal segments, after petiole, subequal; tergites highly polished; short hairs and faint alutaceous sculpture developed dorsally on 5th to 8th tergites.

Male. Resembles female closely. Antennae (fig. 13) longer; scape distinctly swollen medially; seven clearly separate flagellar segments, flattened laterally and bearing dense long hairs with tendency to be arranged in whorls. Abdominal petiole elongate, about one and a half times as long as wide.

A. atra is subject to variation in body width like many other species whose larvae inhabit stems. It is a distinct species, but may really consist of a number of very closely allied forms which it has not yet been possible to separate on adult morphology. Detailed breeding experiments are required to elucidate the problem. The generic characters given in the key, together with its size, should immediately separate the morphospecies from all other British Eurytomids.

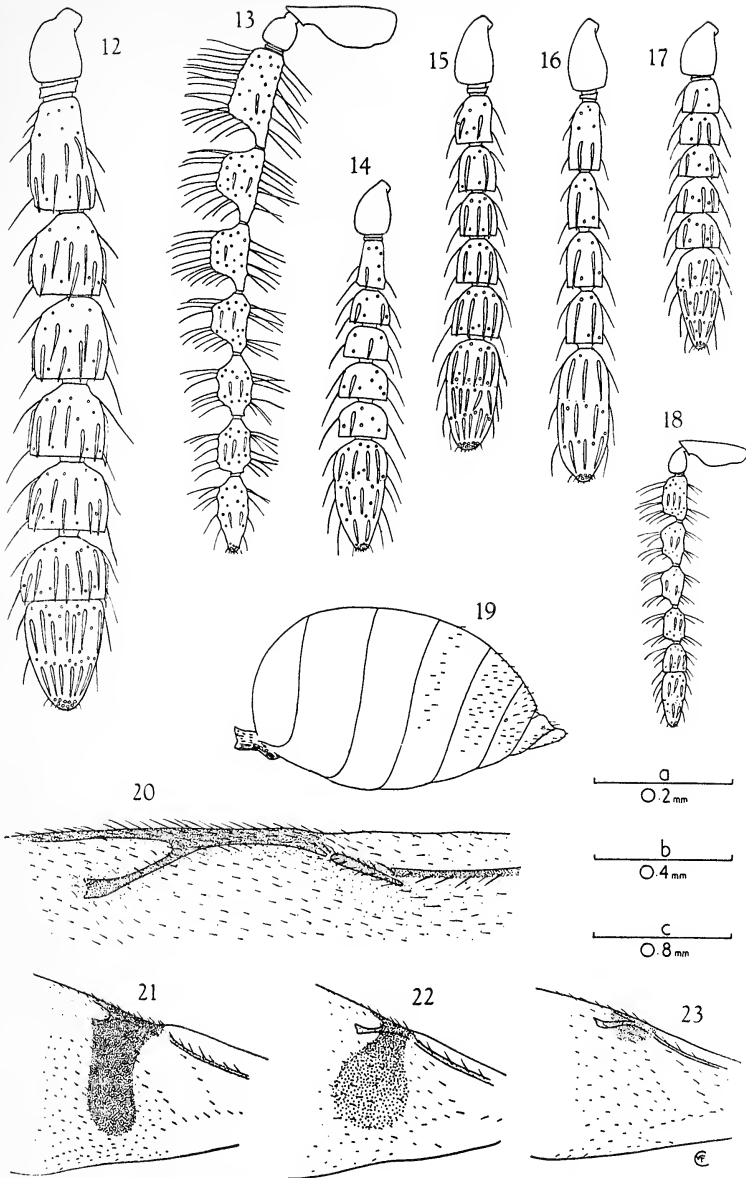
In the British Museum (Nat. Hist.) type collection there is a single Walker specimen (B.M. Type Hym. 5.569) bearing a green type label. This specimen, a female, fits well the original description and is here designated as lectotype.

Biology

A. atra may be bred from stems of *Alopecurus* species together with *Eurytoma tapio* Claridge (1959b). During the winter I have removed large numbers of last instar larvae from the stems where they appeared to have been feeding phytophagously. However, the exact host relationships are uncertain. I have also reared a series of specimens from a collection of stems, thought to be of *Anthoxanthum odoratum* L., but this record requires confirmation and the specimens were not used in making the above redescription.

Material Studied

ENGLAND. Berkshire, Cothill, Nat. Grid Ref. SU4699: 1 ♀, 26.v.1957. Buckinghamshire, Oakley Wood, Nat. Grid Ref. SP6111: 12 ♀♀, 2 ♂♂, emerged 29.iv.-2.v.1958 from larvae in stems of *Alopecurus pratensis* L.; 1 ♀, 26.vi.1957. Oxfordshire, Otmoor, Nat. Grid Ref. SP5514-5614: 4 ♀♀, 2 ♂♂, em. 1-2.v.1958, larvae in stems *A. pratensis*; 1 ♀, 3 ♂♂, 20.v.1958; 1 ♀, 1 ♂, 21.v.1957; 2 ♀♀, 1 ♂, 4.vi.1958; 1 ♂, 14.vi.1958 (all coll. M. F. Claridge).



Figs. 12-19.—Left antenna in lateral view of: 12, *Ahtola atra* (Walk.), female; 13, *A. atra*, male; 14, *Systole albipennis* Walk., female; 15, *Eudecatoma mellea* (Curtis), female; 16, *E. mellea*, male; 17, *Bruchophagus platypterus* (Walk.), female; 18, *B. platypterus*, male (figs. 12, 14-17 to scale a; figs. 13, 18 to scale b).

Fig. 19.—Lateral view of female gaster of *Ahtola atra* (scale c).

Figs. 20-23.—Part of leading edge of forewing of: 20, *Ahtola atra*; 21, *Eudecatoma submutica* (Thoms.); 22, *E. flavicollis* (Walk.); and 23, *E. concinna* (Boh.) (figs. 20, 22 and 23 to scale b; fig. 21 to scale c).

Ahtola cylindrica (Thomson) **comb. nov.**

1875, *Eurytoma cylindrica* Thomson, *Hym. Scand.*, **4**: 52.

I have only been able to examine a single specimen, the type, of this species, and thus cannot evaluate it adequately. It seems to differ from *A. atra* in its smaller size and extremely narrow body. It is possible that it is a very small specimen of *A. atra* though I am inclined to think that it represents a good species.

I have seen the five specimens from the Thomson collection which stand as *Eurytoma cylindrica*. One of these has been provisionally selected as lectotype by Dr. A. Jansson. I agree with his designation and here validate it. The specimen has been remounted and is staged on a pin which also carries a male *Tetramesa* species and a printed label "Wit". The other specimens are not conspecific.

Ahtola globiceps (Boucek) **comb. nov.**

1954, *Eurytoma globiceps* Boucek, *Acta Mus. nat. Prag.*, **29**: 72-74.

Dr. Z. Boucek has kindly sent me two specimens of his species *Eurytoma globiceps*. It is closely allied to *A. atra*, but differs in its smaller size, more gibbous head and longer abdominal petiole. Its biology is unknown, but Boucek (*loc. cit.*) believes that it is probably associated with grasses.

Bruchophagus Ashmead

1888, *Bruchophagus* Ashmead, *Ent. Amer.*, **4**: 42.

1950, *Bruchophagus* Ferrière (*partim*), *Mitt. Schweiz. ent. Ges.*, **23**: 379.

Type species—*Bruchophagus borealis* Ashm.—designated by Ashmead (1894).

The group of species represented in the Palaearctic region by *Eurytoma platyptera* (Walk.) and closely allied forms, is here separated from *Eurytoma* and recognized as the genus *Bruchophagus*. It differs from *Eurytoma* in its shorter gaster without an elongated fifth segment (fig. 11), and in the lack of the occipital carina and post genal lamella (fig. 3). The only western Palaearctic species that have been studied intensively are undoubtedly phytophagous in the fruits of various Papilionaceae—*B. platypterus* (Walk.) (= *gibbus* Boh.) in *Trifolium* species (Claridge, 1959c), and *B. ononis* (Mayr) in *Ononis* species (Crèvecoeur, 1951). In this habit they resemble the known Nearctic species (*vide* Burks, 1957). Nikol'skaya (1952a, b, and 1955) has described several phytophagous species from the U.S.S.R. including one, *B. mutabilis*, from Primrose seeds, *Primula*

species. Burks (*loc. cit.*) has included a new species bred from seeds of an *Aloe* species (Liliaceae), imported from South Africa. It seems likely that all the species attributable to *Bruchophagus* as recognized here are similarly phytophagous. Species differentiation within the genus is very difficult and it is probable that careful breeding experiments will show there to be more species involved than the adult morphology suggests.

Ferrière (1950) introduced the genus *Bruchophagus* to the Palaearctic literature, but defined it almost completely on the single character of a four segmented male funicle. As I have pointed out previously (1959b), such a character may be difficult to appreciate and, more important, usually breaks down within any natural genus, at least in the Eurytomidae. Ferrière included such diverse species as *Eurytoma cynipsea* Boh. and *E. setigera* Mayr, together with those species here included. Boucek (1951) and I (1958a) have criticized the genus as recognized by Ferrière. I believe that it can be recognized as a natural unit only when some of the species which resemble the *platypterus* group in the possession of a four segmented male funicle alone, are excluded. This view is enhanced by the biological information.

Systole Walker

1832, *Systole* Walker, *Ent. Mag.*, **1**: 22.

1959, *Systole* Walker, Claridge, *Ent. mon. Mag.*, **95**: 39.

Type species—*Systole albipennis* Walk.—only originally included species.

I have previously (1959c) discussed the genus and given characters by which it is distinguished from *Eurytoma*.

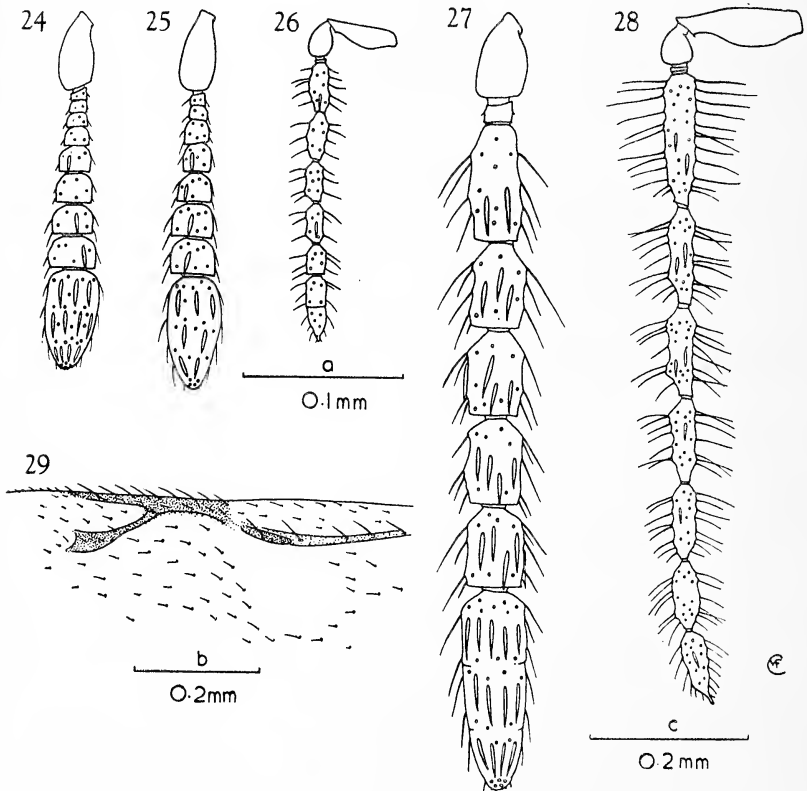
The species of *Systole*, like those of *Bruchophagus*, form a small and very compact group, all the known species of which are phytophagous exclusively in the seeds of Umbelliferae. The genus is recognized on rather slight characters, but again like *Bruchophagus*, the biological generalizations which can be made about it justify its recognition.

Harmolitinae

In the northern Palaearctic region I recognize only one genus in this subfamily, *viz.*, *Tetramesa* Walker. It may be divided into a number of species groups which grade into each other and which I do not consider to warrant generic rank. The larvae of all known species are phytophagous in grasses.

Ailomorphus rhopaloides Walk. (1871), described from Hong Kong, is closely allied to *Tetramesa*. It differs in having the gaster more laterally compressed with the fifth tergite distinctly the longest. Of species known to me, it resembles most closely

T. romana (Walk.) of southern Europe. *A. rhopaloides*, together with an undescribed species represented in the British Museum (Nat. Hist.), is probably best kept separate from *Tetramesa* at least until the south-eastern Palaearctic and Oriental forms are better known. It is interesting that *A. rhopaloides* has been recorded as phytophagous in Bamboo, *Phyllostachys* species (Gahan, 1924).



Figs. 24-28.—Left antenna in lateral view of: 24, *Archirileyia inopinata* Silv., female; 25, *A. inopinata*, male; 26, *Tetramesa brevicornis* (Walk.), male; 27, *T. hyalipennis* (Walk.), female; 28, *T. hyalipennis*, male (figs. 24, 25, 27 to scale a; figs. 26, 28 to scale c).

Fig. 29.—Part of leading edge of forewing of *Systole tuonela* Clar. (to scale b).

Tetramesa Walker

- 1832, *Isosoma*, Walker, *Ent. Mag.*, **1**: 14 (preoccupied).
 1848, *Tetramesa* Walker, *List spec. Hym. coll. Brit. Mus.*, **2**,
 Chalcidites, appendix: 154, London.
 1863, *Harmolita* Motschulsky, *Bull. Soc. Nat. Moscow*, **36** (3): 58.
 1871, *Philachyra* Walker, *Notes on Chalcidiae*, **1**: 7-8, London.
 1920, *Isthmosoma* Hedicke, *Archiv. Naturgesch.*, **86** (11): 165.
 1958, *Tetramesa* Walker, Claridge, *Ent. mon. Mag.*, **94**: 84.

Type species—*Tetramesa iarbás* Walker (= *T. crassicornis* (Walk.) (*vide* Claridge, 1958a))—only originally included species.

I have previously (*loc. cit.*) given a description of the genus and no further information need be added here. A complete diagnosis will be given in a revision of the European species now in preparation.

Eudecatominae

The Eudecatominae is the Decatominae of Ferrière. I have previously discussed the genus *Decatoma* Spinola (*nec auctt.*) and concluded that it should be taken as a synonym of *Eurytoma* (Claridge, 1959a). Thus the group name based on it cannot be used to refer to a group not including it. Since the only genus attributable to the subfamily is *Eudecatoma* Ashm., I suggest the name Eudecatominae.

Eudecatoma Ashmead

- 1888, *Eudecatoma* Ashmead, *Ent. Amer.*, **4**: 42.

Type species—*Decatoma batatoides* Ashm.—only species included by Ashmead (1894).

The genus is characterized as follows:—

Often extensively pale marked species; exact marking variable. Female flagellum (fig. 15) with five clearly separate basal segments. Male flagellum (fig. 16) resembles that of female but with only four distinctly separate basal segments. Occiput variable—clearly margined and polished in some larger species (*cf. E. biguttata* (Swed.))—not margined and sculptured more or less as face in most smaller species (*cf. E. mellea* (Curtis)). Forewings with distinct pigmented submarginal band, often extensive (figs. 21 and 22), but sometimes small (fig. 23). Gaster (figs. 9 and 10) distinctly petiolated and laterally flattened; in female, rather circular in outline, with ovipositor clearly directed dorsally when not in use.

The species of *Eudecatoma* form a clearly distinct natural group. I have previously (1959a) discussed the British species.

Evidence suggests that at least some of the species are endoparasitic, a habit rare in the family.

Phylogenetic Speculation

Several authors have speculated on the phylogenetic relationships of the Eurytomidae and of the genera within the family (*vide* Bugbee, 1936; and Nikol'skaya, 1956). Particular attention has been paid to the importance of the phytophagous habit in the evolution of the group. Bugbee concluded that "Whether the primitive Eurytomid stock was parasitic, phytophagous or both is uncertain, but the evidence favours a plant feeding origin". Nikol'skaya on the other hand favours a parasitic ancestry.

Bugbee, after giving a very useful summary of the comparative anatomy of the Nearctic genera, went on to suggest that certain features were phylogenetically primitive and others more recent from the results of his preceding comparative account alone. With regard to the structure of the antennae for example, he uses six definite, but unjustifiable, a *priori* criteria for determining phylogenetic relationships. These include:—

- “ . . . 2. The more alike the male and female antennae, the more primitive are the insects.
3. Reductions in the number of segments is a sign of recent development. . . . ”

Such criteria are entirely subjective and without fossil evidence mean nothing. Bugbee's conclusions on such grounds are that the Harmolitinae include structurally the most primitive forms. This may be so, but all known species are specialized plant feeders associated with Gramineae. Probably they represent a branch or branches derived from the ancestral Eurytomids which early took up the phytophagous habit and radiated following their host plants. Modern species seem to be restricted mainly to the grasslands of the Holarctic region.

The genera of Eurytominae exhibit the widest range of habit, structure and geographical range known within the family. It seems most likely that the subfamily includes forms nearer to the ancestral Eurytomid than do the others. Within it a number of forms have independently taken up the phytophagous habit. Some such as *Systole* and *Bruchophagus* species specialized as seed-eaters. Many species of *Eurytoma* are only parasitic for a short period and complete their development phytophagously, e.g. *E. flavimana* Boh., a parasite of *Tetramesa linearis* (Walk.), a gall-former in stems of *Agropyron* species. Larvae of the allied *E. suecica* von Rosen are completely phytophagous in stems of Wheat, *Triticum* species (v. Rosen, 1956). Such a habit probably evolved from a condition such as that found to-day in *E. flavimana*. Thus there is little doubt that the phytophagous habit has arisen many times within the subfamily.

The Eudecatominae and Rileyinae show a number of possibly specialized features and probably represent rather early divergents from the ancestral stock. It seems most likely that the ancestral Eurytomids were parasitic forms, probably associated with insect galls. The modern forms then specialized in various directions, thus retaining only some of the ancestral characters. Without the help of a good fossil record such characters cannot be differentiated from the specialized and more recent features. However, since the phytophagous habit can be shown almost certainly to have arisen several times within the Eurytominae, there is no reason why it should not have done so in the Harmolitinae. In fact, any of the subfamilies or genera could be polyphyletic in origin and any supposed phylogeny can be read in either direction. We simply have to admit that in the final analysis we just do not know.

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