

***Vectevania vetula* Cockerell, 1922 from the uppermost Eocene of Bembridge Marls, England, and the system of the family Gasteruptiidae s.l.
[Vespida (= Hymenoptera), Evanioidea]**

A.P. Rasnitsyn

***Vectevania vetula* Cockerell, 1922 из верхнего эоцена бембриджских мергелей Англии и система семейства Gasteruptiidae s.l.
[Vespida (= Hymenoptera), Evanioidea]**

А.П. Расницын

Palaeontological Institute, Russian Academy of Sciences, 117997 Moscow, Russia; Natural History Museum, Cromwell Road, London SW7 5BD, UK. E-mail: alex.rasnitsyn@gmail.com

Палеонтологический институт им. А.А. Борисяка Российской академии наук, Москва 117977, Россия; Музей естественной истории, Лондон SW7 5BD, Англия. E-mail: alex.rasnitsyn@gmail.com

Abstract. *Vectevania vetula* Cockerell, 1922 from the uppermost Eocene of Bembridge Marls, Isle of Wight, England, is redescribed and attributed questionably to Aulacinae. System of Evanioidea is revised resulted five families accepted, namely Evaniidae s.l., Praeaulacidae, Anomopterellidae, Andreneliidae, and Gasteruptiidae s.l. The latter family is subdivided into subfamilies Gasteruptiinae (with tribes Gasteruptiini and Hyptiogastrini), Aulacinae, Baissinae, and Kotujellitinae; the former two subfamilies are strictly Cainozoic, the latter two are strictly Cretaceous. Hyptiogastritinae Engel, 2006 is a junior synonym by Kotujellitinae Rasnitsyn, 1975 (**syn. n.**).

Key words. Fossil insects, parasitic wasps, Evanioidea, Bembridge Marls, Isle of Wight, Eocene.

Резюме. *Vectevania vetula* Cockerell, 1922 из самого верхнего эоцена бембриджских мергелей острова Уайт (Англия) переописана и предположительно отнесена к подсемейству Aulacinae. Система эваниоидов ревизована, в его составе принято 5 семейств Evaniidae s.l., Praeaulacidae, Anomopterellidae, Andreneliidae и Gasteruptiidae s.l. Последнее семейство разделено на подсемейства Gasteruptiinae (с трибами Gasteruptiini и Hyptiogastrini), Aulacinae, Baissinae и Kotujellitinae; первые два подсемейства целиком кайнозойские, последние два – меловые. Hyptiogastritinae Engel, 2006 является младшим синонимом Kotujellitinae Rasnitsyn, 1975 (**syn. n.**).

Ключевые слова. Ископаемые насекомые, наездники, Evanioidea, Бембриджский мергель, остров Вайт, эоцен.

Introduction

Vectevania vetula Cockerell, 1922 has been very briefly described based on the unique holotype collected in the Bembridge Marls (Isle of Wight, England, now considered to be the latest Eocene in age: Hooker *et al.*, 2009). Cockerell (1922) has ascribed this fossil to the family Evaniidae which that time

was an equivalent of the current superfamily Evanioidea, and compared it with *Hyptiogaster* Kieffer, 1903 which is now attributed to the family Gasteruptiidae s. str. and subfamily Hyptiogastrinae (Jennings, Austin, 2000). Objectives of the present publication are to re-describe *V. vetula* and to check if its original allocation is correct.

Material and methods

The unique holotype (obverse part only) "In.20535" is kept at the Natural History Museum, London (BMNH). It was collected before 1883 by A'Court Smith in the Insect Limestone, Bembridge Marls, at the Gurnet Bay (now spelled Gurnard Bay), Isle of Wight, South England. The deposits are now considered as the uppermost Eocene (Hooker *et al.*, 2009). As usual in the Bembridge Marls, the fossil (Fig. 1) is perfectly three-dimensional, with body cavity empty, and split within body more or less along the wing plane. Counterpart is lost, and the only part at hand shows the internal ventral surface of the insect seen from above. The head cavity is only slightly open dorsally showing no details. Antennae, legs and metasomal apex are not preserved in addition to practically all dorsal surface, except for the first metasomal acrosegment seen from above and sidewise, and small subterminal tergal surface of metasoma. This restricts available taxonomically meaningful structures mainly to wing venation. The specimen was examined using LOMO MPS-2 and Leica MZ 9.5 microscopes. The photograph was prepared using Nikon Coolpix4500 camera automontaged under Helicon Focus software. Line drawing is prepared using CorelDRAW 11 software.

Taxonomic part

Superfamily Evanioidea Latreille, 1802

Family Gasteruptiidae Ashmead, 1900

Subfamily Aulacinae Hedicke, 1939

Genus *Vectevania* Cockerell, 1922

Vectevania Cockerell, 1922: 33.

Type species: *V. vetula* Cockerell, 1922 (by monotypy).

Diagnosis. Propleuron short. Forewing not folded longitudinally as preserved, with cell *1m-cu* reversely triangular (*RS+M* meeting basal vein at its lower corner, *1m-cu* short but distinct), *2r-m* spectral, *3r-m* apparently lost but leaving signs of its former position in slight angulation of *RS* and *M*, *2m-cu* tubular. Hind wing with *C* tubular. Metasomal sterna flat indicating depressed metasoma, apparent metasomal segment 1 triangular and with sides slightly convex (fore part not forming petiole). No trace of possible fusion of two primary sterna discernible.

Vectevania vetula Cockerell, 1922

(Figs 1, 2)

Vectevania vetula Cockerell, 1922: 34.

Type material. Holotype: In.20535 (BMNH).

Description. Head apparently large, transverse. Pronotum as preserved arching, not armed. Propleuron short, at most slightly extending beyond fore pronotal contour. Mesospectus with internal surface smooth with few and ordinary features (discrimen, pleural sutures, and bend delimiting anterior (coxae-faced) surface). Forewing with pterostigma large semicircular. Basal vein composed almost entirely of long *1RS* slightly arching in lower half, *1M* rudimentary, aligned with *1RS+M* thus making *1mcu* cell reversal triangular (with narrow end directed basad); *2RS+M* short (about as long as *1m-cu*), with *RS* and *M* diverging almost symmetrically at its distal end. Cross-vein *2r-rs* about 0.7 times as long as pterostigma width, meeting pterostigma at its midlength, slightly inclined postero-distally, meeting *RS* at about its length basad of *2r-m*; *2r-m* spectral, meeting *M* slightly basad of *2m-cu*. Cell *2rm* subtriangular, almost twice as long as high. Cell *3rm*, as defined by angulations of *RS* and *M* at junctions with former *3r-m*, subquadrate. *M* getting thinner beyond former *3r-m* but apparently persist tubular and coloured. Cell *2mcu* receiving *1-Cu* at its midheight basally, *2m-cu* about half as long as *2mcu* cell maximum height. Crossvein *cu-a* mirroring *1-RS* in meeting of *Cu* close to *M+Cu* fork and being inclined posterodistally at similar angle. Anal vein thick, slightly sinuate. Hind wing with *C* and *R* tubular and the rest veins spectral and usual form. Metasoma elongate, tear-shaped, with sterna flat, six in number, implying either female sex with no sternal fusion, or male sex with tracelessly fused sterna 1 and 2. Metasomal first acrotergite small and not much modified in side view, first apparent

sternum beyond acrosternite of subequal length and width, longer than two following sterna combined; following sterna short but irregular length, possibly being telescoped irregularly. No distinct surface sculpture nor colouration of ventral body integuments preserved. Forewing length about 4.7 mm, body length might be 5.0–6.0 mm (body parts are too incomplete to be worth measuring).

Discussion

Identification of the taxonomic position of *Vectevania* depends on the system of Evanioidea which is a rather clear-cut group (defined by a unique synapomorphy: the high attachment of metasoma on the propodeum) and the highly debatable internal structure. For a long time the superfamily was considered as composed of three families, Evaniidae, Gasteruptiidae, and Aulacidae, until Townes (1950) has synonymised Aulacidae with Gasteruptiidae referring to existence of a transition between them. This approach has been accepted by Rasnitsyn (1980a, 1988, 2002) because of the smooth transitions between these families observed in Mesozoic fossils, which make it difficult to delimitate Gasteruptiidae and Aulacidae (even using a cladistic analysis, cf. Basibuyuk *et al.*, 2002). Other authors (e.g., Goulet, Huber, 1993; Hanson, Gauld, 1995; Gauld, Bolton, 1996; Grimaldi, Engel, 2005; Engel, 2006) retain family rank of Aulacidae.

In the past several decades a few extinct families have been proposed within the superfamily including Praeaulacidae, Anomopterellidae, Baissidae, Cretevaniidae, Kotujellitidae (as Kotujellidae; Rasnitsyn, 1975), and Andreneliidae (Rasnitsyn, 1972, 1975; Rasnitsyn, Martínez-Delclòs, 2000). Of them, however, Baissidae and Kotujellitidae have since been treated as subfamilies of Gasteruptiidae (Rasnitsyn, 1980a, 1980b), and Cretevaniidae and Andreneliidae synonymized with Evaniidae (Basibuyuk *et al.*, 2002; Grimaldi, Engel, 2005). Rasnitsyn (1988) has synonymised Anomopterellidae under Praeaulacidae as well, but apparently this synonymization was premature (Li *et al.*, in preparation). The cases of Kotujellitidae and Cretevaniidae raise no further discussions yet unlike Andreneliidae and Baissidae, which deserve closer considerations.

The reasons for synonymization of Andreneliidae and resurrection of Baissidae were given as follows: “The remainder of the superfamily [all evanioids but Praeaulacidae] can be segregated into two lineages: the Evaniiformes, including only the Evaniidae, and the Aulaciiformes, consisting of the modern families Evaniidae [sic! obviously *lapsus calami* for Aulacidae] and Gasteruptiidae (inclusive of Kotujellitinae) as well as the Cretaceous family Baissidae. The Evaniiformes previously consisted of several families, but cladistic work on evanioids (e.g., Basibuyuk *et al.*, 2002) suggests that these divisions are not warranted. Evaniiformes are defined by the elongate head and petiolate first metasomal segment with a stout, short gaster and short ovipositor (apparently reversed in the fossil *Andrenelia*), while Aulaciiformes are defined by the loss of the jugal lobe in the hind wing, fusion of the first and second metasomal terga, sexually dimorphic antennal segmentation, elongate propleura, and rigid attachment of the pronotum and mesepisternum ...”

“The monogeneric family Andreneliidae from the Early Cretaceous of Spain (Rasnitsyn, Martínez-Delclòs, 2000) consistently groups among primitive evaniid genera, and its presumed primitive features, such as the more elongate metasoma, did not exclude it from the family in the most conservative analyses by Basibuyuk *et al.* (2002). The family is therefore considered a synonym of Evaniidae. <...> Among the Aulaciiformes, the Baissidae (= Manlayinae) is presumably sister to a group comprised of the Aulacidae + Gasteruptiidae, which apparently share with these families sexually dimorphic antennal segmentation (Basibuyuk *et al.*, 2002) but are primitive in other traits for the lineage and superficially resemble aulacids” (Grimaldi, Engel, 2005, p. 419).

Concerning the case of Evaniidae and Andreneliidae as considered in the above text, noteworthy is that the reference to Basibuyuk *et al.* (2002) gives little support for the proposal by Grimaldi and Engel (2005), because Basibuyuk *et al.* (2002) describe in fact an opposite pattern: “The position of the recently established family Andreneliidae, from the Lower Cretaceous of Spain (Rasnitsyn, Martínez-Delclòs, 2000) is less certain. This family was distinguished from Evaniidae (including Cretevaniidae) because it lacks the high head and the massive (short) mesosoma, which appear to be synapomorphic Evaniidae. Our phylogenetic analyses are not consistent in its placement. In different analyses it appears either very basal, i.e. unresolved with respect to Praeaulacidae (Fig. 11), or within an Evaniidae + Gasteruptiidae clade terminal to *Lebanevania* and *Mesevania* (Fig. 13, 14) or within the Evaniidae (Fig. 9, 10, 12). Given this lack of certainty, we prefer to maintain Andreneliidae as a separate family at present” (p. 31).

The above definition of Evaniidae by Grimaldi and Engel (2005) is questionable as well, for characteristics of the family are generally considered to include (i) a big (not high: it is often subcircular instead) head which keeps close to mesosoma, (ii) short, massive mesosoma (not gaster), and (iii) petiolate first metasomal segment, although the petiole is comparatively weakly developed in *Lebanevania*. The character, a stout short gaster, is not held by *Lebanevania* Basibuyuk et Rasnitsyn, 2002, and the short ovipositor is not characteristic of *Mesevania* Basibuyuk et Rasnitsyn, 2000. As a result, the only known possible synapomorphy of *Andrenelia* Rasnitsyn et Martínez-Delclòs, 2000 with Evaniidae is the petiolate first metasomal segment, a character state well known to appear homoplastically in related taxa [e.g., various Praeaulacidae (as described by Rasnitsyn, 1972), *Baissa* Rasnitsyn, 1975 and extant Gasteruptiidae s.l.], as opposed to somewhat incrassate pterostigma, a possible synapomorphy with Gasteruptiidae s.l., and elongate propleura, a synapomorphy of the clade comprising Kotujellitinae, Aulacinae and Gasteruptiinae.

Taking into consideration all the above observations, it is reasonable to conclude that the indication of monophyly of *Andrenelia* with Evaniidae is weak. Following a conservative approach we prefer to recognize Andreneliidae as a separate family until more information accumulates.

The case of Baissidae vs. Baissinae is of particular importance in respect to *Vectevania*. Representatives of this taxon (those designated as Manlayinae Rasnitsyn, 1986 and later synonymized under Baissinae by Rasnitsyn, 1991a) were found by Rasnitsyn (1980b) to form a smooth transition to both Aulacinae (through some former) and Gasteruptiinae (through Kotujellitinae and Hyptiogastritinae sensu Engel, 2006). Neither me nor Grimaldi and Engel (2005) and Engel (2006) were able to identify any synapomorphy of Baissinae in respect to any of other constituent subfamilies. This attests the taxon as a mother rather than a sister group in respect to other Gasteruptiidae s.l. (= Aulaciformis). Gasteruptiidae s.l. is generally a phenetically more homogeneous group than Evaniidae (= Evaniiformes). Under this circumstance the reason to resurrect Baissinae as a family is obscure, and I accept Aulaciformes as a single family Gasteruptiidae. The definition of Aulaciformes by Grimaldi and Engel (2005) is questionable, for fusion of the first and second metasomal terga and elongate propleura have never been recorded in Baissinae, and rigid attachment of the pronotum and mesepisternum is apparently a synapomorphy of all Evanioidea above Praeaulacidae. More adequate definition would include, besides the plesiomorphic alternatives to the evaniid synapomorphes listed above, only the sexually dimorphic antenna with 12 flagellomeres in female and 11 in males, and wide triangular or subcircular pterostigma (Rasnitsyn, 1988, 2002). However, the latter character state is very stable in the Cretaceous forms only and lost in some Cainozoic representatives.

The family Gasteruptiidae in the present sense embraces, the first, *Gasteruption* Latreille, 1796 (= Gasteruptiini sensu mihi), and *Hyptiogaster* Kieffer, 1903 with its relatives (*Hyptiogastrini sensu mihi*), jointly forming Gasteruptiinae sensu mihi. The second obvious group is composed of *Aulacus* Jurine, 1807 and *Pristaulacus* Kieffer, 1900 (= Aulacinae sensu mihi). The third, extinct (Cretaceous) taxon is Baissinae sensu mihi that covers *Baissa* Rasnitsyn, 1975, *Manlaya* Rasnitsyn, 1980. and their relatives reviewed by Rasnitsyn with co-authors (1998) and Zhang and Rasnitsyn (2004). The fourth, there are four extinct genera that need individual consideration, viz., *Vectevania*, *Hyptiogastrites* Cockerell, 1917, *Kotujellites* Rasnitsyn [in Pagliano and Scaramozzino, 1990 (= *Kotujella* Rasnitsyn, 1975, nom. preocc.)], and *Kotujisca* Rasnitsyn, 1991. Rather diverse array of the forms listed above under Gasteruptiidae sensu latissimo needs thorough classification. At the same time, the fossils that comprise a considerable part of this diversity are insufficiently known morphologically to allow efficient application of the standard cladistic procedure. That is why I have to employ more traditional approach. Further information on characters and relationship of the above taxa is available from Rasnitsyn (1975, 1991b), Jennings and Austin (2000), Jennings *et al.* (2004), and Zhang and Rasnitsyn (2004). Two more genera from the mid-Cretaceous Burmese amber, *Protofoenus* Cockerell, 1917 and *Electrofoenus* Cockerell, 1917, are insufficiently known and left aside as Gasteruptiidae incertae sedis until re-descriptions.

The comparatively plesiomorphic Baissinae, Aulacinae, and *Vectevania* can be jointly diagnosed after their complete venation with at least *2m-cu* present, and notauli that reach transverse suture separately. They oppose to a group composed of Gasteruptiinae s.l., *Hyptiogastrites*, *Kotujellites* and *Kotujisca*, all of which are advanced in having at least *2m-cu* and *3r-m* lost and notauli, unless incomplete, meeting each other before reaching transverse suture (unknown for *Kotujellites*). Additionally this group can be tentatively characterized by the immovably fused two basal metasomal segments (this is possible but not certain for *Kotujellites* and *Kotujisca* as well). The former, plesiomorphic group is variable in respect to this character (see below).

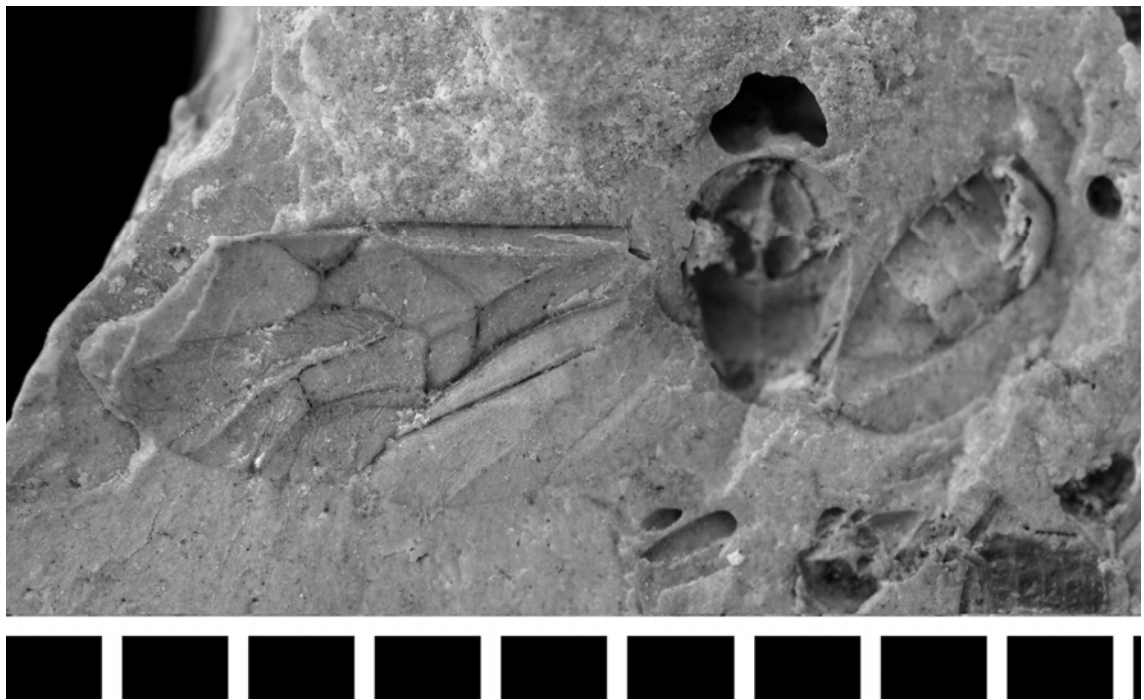


Fig. 1. *Vectevania vetula* Cockerell, 1922 (holotype "In.20535"), photograph of the fossil. Ruler units equal to 1.0 mm.

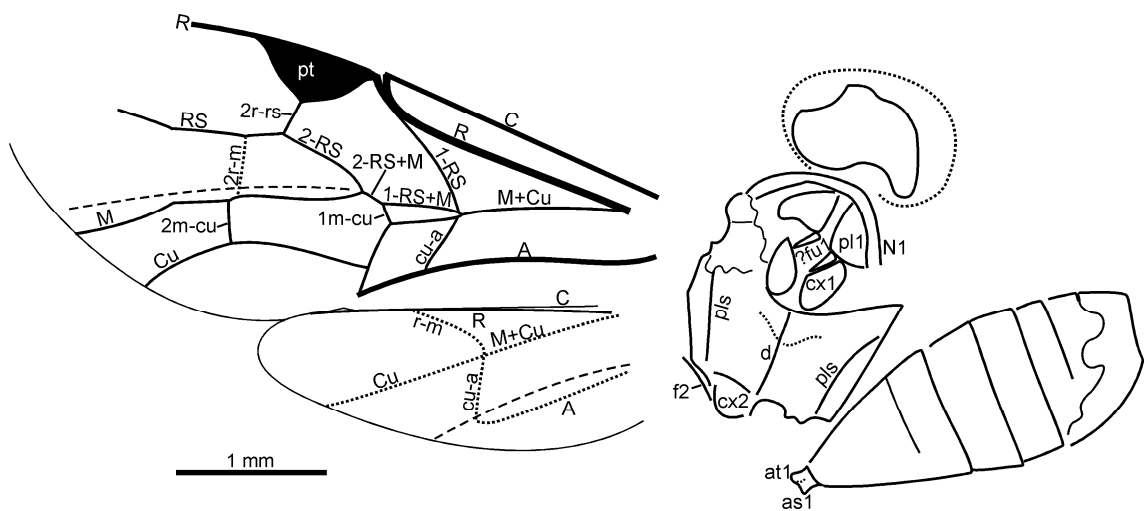


Fig. 2. *Vectevania vetula* Cockerell, 1922 (holotype "In.20535"), line drawing. For wings, spectral veins are shown by dots, membrane folds by dashes; for body, dot lines indicate the very tentative head contour and the bend between lower and anterior faces of mesospectus. The vein nomenclature is standard; other symbols: *at1*, *as1* – acrotergite and acrosternite of the first metasomal segment, *d* – discrimen (line of invagination of the mesothoracic sternum), *f2* – margin of mid femur, *?fu1* – supposedly parts of prothoracic furca, *N1* – fore margin of pronotum, *pls* – pleural suture; *cx1*, *cx2*, *pl1* – entrances into cavities of, respectively, fore and mid coxae and of propleura.

In the former of the above major groups of Gasteruptiidae, characteristic of Baissinae is ovoid, not compressed metasoma which is wide (rounded or short triangular) basally (this is essentially the case even of *Baissa* which is apomorphic in having the first metasomal segment very small triangular), with the first metasomal segments free. Additionally, Baissinae have propleura short and propodeum smoothly rounded (not pyramidal) with the metasomal articulation distant of metanotum. In contrast, Aulacinae have metasoma elongate basally, attached either to a pyramidal elevation of the propodeum, or close to metanotum (in that case elevation is often reduced), slightly to distinctly compressed, and with two basal segments fused immovably. Additionally, Aulacinae have long propleura. *Vectevania* combines some of above characters and will be considered separately below.

The other major group of Gasteruptiidae in the widest sense, the one defined above as having venation reduced and notauli interconnected before transverse suture, can be further split after the length of propleura (short in *Hyptiogastrites*, *Kotujellites* and *Kotujisca*, long in Gasteruptiini and Hyptiogastrini) and, in a parallel to the above case, after a form of the metasoma which is moderately long, slightly depressed, and not much attenuate basally in *Hyptiogastrites*, *Kotujellites* and *Kotujisca*, and distinctly long, compressed and distinctly attenuate basally in Gasteruptiini and Hyptiogastrini. Intriguing is presence of the ovipositor guide on the hind coxae of *Hyptiogastrites* (unknown for two other extinct genera). This character indicates wood drilling habits which is not at all characteristic of Gasteruptiini and Hyptiogastrini as predators in aculeate nests. This might imply a bionomical plesiomorphy of the *Hyptiogastrites* and possibly of two other extinct genera in respect to Gasteruptiini and Hyptiogastrini.

Jennings et al. (2004) classify *Hyptiogastrites* with their Aulacidae (my Aulacinae) based on results of their cladistic analysis. However, these results are questionable because of some problems with their character matrix as compiled by Jennings and Austin (2000) and updated for *Hyptiogastrites* in Jennings et al. (2004). Particularly, notauli (character 25) are described Y-shaped (interconnected in front of transverse suture) in *Hyptiogastrites*, and yet it is coded similarly with Aulacidae (state 2) in spite that the latter has notauli joining transverse suture separately. Similarly, propleura are described short in *Hyptiogastrites* (character 30, state 1) and coded identically with Aulacidae which have propleura elongate.

Additional characters among those used by Jennings and Austin (2000) to classify their Aulacidae and Gasteruptiidae, which are available for the fossils and meaningful for the present goal, can hardly modify the above scheme. Indeed, antennal insertion leveled with the lower eye margin (in Aulacidae) versus its midheight (Gasteruptiidae) (character 1), when is seen, is plesiomorphic (at lower eye margin or below) in Baissinae and intermediate between the outlined lower and higher positions in *Kotujellites*. Distance between antennal insertions (character 2) is rarely seen with certainty, but apparently the position is close in Baissinae. Eye size and form (character 7) is variable within Baissinae, small and subcircular in *Hyptiogastrites*, large and elongate in *Kotujellites*.

As a result of the above consideration, we can group the taxa under consideration in two different ways: either (Baissinae + (*Aulacus* + *Pristaulacus*)) + (*Hyptiogastrites* + *Kotujellites* + *Kotujisca* + (*Gasteruption* + Hyptiogastrini)), or (Baissinae + (*Hyptiogastrites* + *Kotujellites* + *Kotujisca*) + ((*Aulacus* + *Pristaulacus*) + (*Gasteruption* + Hyptiogastrini))). The first choice implies that (*Aulacus* + *Pristaulacus*) and (*Gasteruption* + Hyptiogastrini) have gained independently the attenuate metasomal base with two basal segments fused, and the propleura elongate. The alternative grouping equally implies homoplasy in two characters, viz., the interconnected notauli and the reduced venation. Both these groupings are highly tentative anyway, being based on a short list of characters available for the fossils (wing venation, structure of notauli, propodeum, and metasoma). Additionally, both ways of grouping result in defining paraphyletic groups, for Baissinae lack synapomorphy in respect to any other taxa considered (*Manlaya* is apparently free of apomorphies and models well a common ancestor of all the rest Gasteruptiidae sensu latissimo). Equally, *Hyptiogastrites*, *Kotujellites* and *Kotujisca*, if taken jointly, represent a good model of the common ancestor of (*Gasteruption* + Hyptiogastrini).

Because of the all these uncertainties, the group under discussion could be formalized in a number of different ways, e.g. as one family (Gasteruptiidae) with (i) two (Aulacinae and Gasteruptiinae) or (ii) four subfamilies (Baissinae, Aulacinae, Kotujellitinae, and Gasteruptiinae), or as two families (Aulacidae and Gasteruptiidae) with either (iii) two subfamilies each (Baissinae + Aulacinae, and Kotujellitinae + Gasteruptiinae), or (iv) with Aulacidae comprising three of four above subfamilies, viz., Baissinae + Kotujellitinae + Aulacinae. Or else we can admit (v) four families: Baissidae, Aulacidae, Kotujellitidae, and Gasteruptiidae.

To add options, Engel (2006) has introduced a new subfamily Hyptiogastritinae to accommodate *Hyptiogastrites* within Aulacidae (my Aulacinae). He cites the following diagnostic combination of traits of the taxon: complete occipital carina and forewing with *1rs-m*, *2rs-m*, and *2mcu* lacking (p. 454). All these characters are equally applicable to *Kotujellites* and *Kotujisca*, except for the occipital carina insufficiently preserved there. Even the generic level distinction of *Hyptiogastrites* and *Kotujellites* is not beyond doubt (cf. Rasnitsyn, 1975, fig. 95, and Jennings et al., 2004, figs 1, 2A). That is why I consider Hyptiogastritinae Engel, 2006 a junior synonym of Kotujellitinae Rasnitsyn, 1975.

Selection of one of the above five options of the system of Gasteruptiidae s.l. remains mainly subjective, and yet it is mandatory, for the group under consideration must not be left totally unclassified. That is why I am taking a temporary and explicitly arbitrary decision which looks me (i) conservative (better agreeing with my previous usage), (ii) better balanced in scope and diversity with other main families of Evanioidea, viz., Evaniidae (as defined by Basibuyuk et al., 2002) and Praeaulacidae, and (iii) creates no explicitly paraphyletic families. I mean the only family Gasteruptiidae sensu lato with four subfamilies: Baissinae, Aulacinae, Kotujellitinae, and Gasteruptiinae. These four can be diagnosed as follows.

Gasteruptiinae Kirby, 1837: antennal base high on head, eye large, elongate, propleura long, notauli interconnected before transverse suture, forewing with *3r-m* and *2m-cu* lost, propodeum with metasomal attachment close to metanotum, metasoma compressed and attenuate basally, two basal metasomal segments fused immovably. Type genus: *Gasteruption* Latreille, 1796. Other genera: *Hyptiogaster* Kieffer, 1903 and its relatives (= Hyptiogastrini). Cainozoic only.

Aulacinae Shuckard, 1841: antennal base low on head, eye small, subcircular, propleura long, notauli meeting transverse suture independently, forewing with *2m-cu* present, propodeum with metasomal attachment elevated pyramidal or close to metanotum, metasoma at least slightly compressed, attenuate basally, two basal metasomal segments fused immovably. Type genus: *Aulacus* Jurine 1807. Other genus: *Pristaulacus* Kieffer, 1900. Cainozoic only.

Baissinae Rasnitsyn, 1975: antennal base low on head, eye size variable, propleura short, notauli meeting transverse suture independently, forewing with *2m-cu* present, propodeum with metasomal attachment not elevated pyramidal and distant of metanotum, metasoma not compressed, wide (rounded or wide triangular) basally, two basal metasomal segments joined movably. Type genus: *Baissa* Rasnitsyn, 1975. Other genera: *Manlaya* Rasnitsyn, 1980, *Humiryssus* Lin, 1980, *Mesepipolaea* Zhang et Rasnitsyn, 2004. Lower Cretaceous only.

Kotujellitinae Rasnitsyn, 1975 (1991b) (= Hyptiogastritinae Engel, 2006, **syn. n.**): eye size and form variable, propleura short, notauli interconnected before transverse suture, forewing with *3r-m* and *2m-cu* lost, propodeum with metasomal attachment not distant of metanotum and not distinctly pyramidal, metasoma not compressed, short to long triangular basally, not distinctly attenuate (sides not concave), two basal metasomal segments possibly fused immovably. Type genus: *Kotujellites* Rasnitsyn, in Pagliano and Scaramozzino, 1990. Other genera: *Hyptiogastrites* Cockerell, 1917, and *Kotujisca* Rasnitsyn, 1991. Lower Cretaceous only.

With the system of Gasteruptiidae being outlined, it is possible now to consider the taxonomic position of *Vectevania*. Unfortunately it is not apparent as well, because the characters available are sufficient to rule out its belonging to either Gasteruptiinae or Kotujellitinae (because *2m-cu* is present), but not to select between two remaining subfamilies, Aulacinae and Baissinae because of intermediate combination of the character states. *Vectevania* has metasoma depressed (as in Baissinae) and moderately long triangular basally (unlike Baissinae) but not clearly attenuate there, with sides slightly convex and not concave (unlike Aulacinae). Additionally, it has hind wing *C* tubular (unlike Aulacinae). As a result, *Vectevania* takes an intermediate taxonomic position between Baissinae and Aulacinae in parallel to that of Kotujellitinae between Baissinae and Gasteruptiinae. However, information available is badly insufficient to create new subfamily based on such incomplete fossil as *Vectevania*. That is why one more tentative and essentially arbitrary taxonomic decision is necessary to take here, and my decision is to attribute *Vectevania* temporarily to Aulacinae. Subjective reason of this decision is in part the Cainozoic age of *Vectevania*. We know very limited number of the insect taxa which cross the Cretaceous/Palaeogene boundary and then die out before present. For the hymenopterous insects, I am aware of only one such example, the scoliid wasp subfamily Archaeoscolinae whose range extends from the Lower Cretaceous till Oligocene (Zhang et al., 2002). The case of *Vectevania* is too little known to create the second example on such a shaky basement.

Because of its incomplete preservation and isolated taxonomic position, record of *Vectevania* in the Bembridge Marls makes little bearings on palaeoecology of the past biota, except for simple inference that trees existed there. Extant Aulacidae parasitise internally xylophagous horntail and beetle larvae, and morphology of Baissinae does not contradict to similar bionomics (I mean particularly the trans-ridged mesonotum of a number of *Manlaya*, the trait characteristic of xylobiotic hymenopterans). Being intermediate in many its characters, *Vectevania* gives no reason to hypothesize it as deviant bionomically.

Conclusion

Taxonomy of Evanioidea is insufficiently explored making possible to outline it only preliminary and even arbitrarily for the present. Evanioidea are taken tentatively as composed of four families: Evaniidae s.l., Gasteruptiidae s.l., Praeaulacidae, and Andreneliidae. Gasteruptiidae s. l. is considered embracing four subfamilies, Gasteruptiinae (*Gasteruption* Latreille + *Hyptiogastrini*), Aulacinae (*Aulacus* Jurine, *Pristaulacus* Kieffer and, tentatively, *Vectevania* Cockerell), Baissinae (*Baissa* Rasnitsyn, *Manlaya* Rasnitsyn, *Humirysus* Lin, and *Mesepipolaea* Zhang et Rasnitsyn), and Kotujellitinae (*Kotujellites* Rasnitsyn, *Hyptiogastrites* Cockerell, and *Kotujisca* Rasnitsyn). When better known, *Vectevania* may well be found deserving to be placed into a subfamily of its own or accommodated within Baissinae. *Vectevania* was probably a parasite of xylophagous insect larvae, so this record imply presence of arboreal vegetation in the Bembridge Marls biota.

Acknowledgements

I am thankful to Andrew J. Ross (BMNH, London) for his help, to Phil Crabb (BMNH, London) for photography, and to Sergey Belokobylskij (ZISP, St Petersburg) for invitation to participate in this volume. This paper contributes to INTAS Project No. 03–51–4367.

References

- Basibuyuk H.H., Rasnitsyn A.P., Fitton M.G., Quicke D.L.J. 2002. The limits of the family Evaniidae (Insecta: Hymenoptera) and a new genus from Lebanese amber. *Insect Systematics and Evolution*, **33**: 23–34.
- Cockerell T.D.A. 1922. Two families of insects new to British Tertiary strata. *Canadian Entomologist*, **54**: 33–34.
- Engel M.S. 2006. Two ensign wasps in Cretaceous amber from New Jersey and Myanmar (Hymenoptera: Evaniidae). *Polskie Pismo Entomologiczne*, **75**: 443–454.
- Gauld I.D., Bolton B. (Eds). 1996. The Hymenoptera (second edition). British Museum (Natural History). Oxford: London and Oxford University Press. 332 pp.
- Goulet H., Huber J.T. 1993. Hymenoptera of the world: An identification guide to families. Ottawa: Canada Communication Group. 668 pp.
- Grimaldi D., Engel M.S. 2005. Evolution of the insects. New York: Cambridge University Press. 755 pp.
- Hanson P.E., Gauld I.D. 1995. The Hymenoptera of Costa Rica. Oxford: Oxford University Press. 893 pp.
- Hooker J.J., Grimes S.T., Matthey D.P., Collinson M.E., Sheldon N.D. 2009. Refined correlation of the UK Late Eocene-Early Oligocene Solent Group and timing of its climate history. *In*: Koeberl C., Montanari A. (eds). *The Late Eocene Earth – Greenhouse, Icehouse, and Impacts. Geological Society of America Special Paper*, **452**: 179–195.
- Jennings J.T., Austin A.D. 2000. Higher level phylogeny of Aulacidae and Gasteruptiidae (Hymenoptera). *In*: Austin A.D., Dowton M. (eds). *The Hymenoptera: Evolution, Biodiversity and Biological Control*. Melbourne: CSIRO Publishing: 155–164.
- Jennings J.T., Austin A.D., Stevens N.B. 2004. *Hyptiogastrites electrinus* Cockerell, 1917, from Myanmar (Burmese) amber: redescription and its placement within the Evanioidea (Insecta: Hymenoptera). *Journal of Systematic Palaeontology*, **2**: 127–132.
- Rasnitsyn A.P. 1972. Praeaulacidae (Hymenoptera) from the Upper Jurassic of Karatau. *Paleontologicheskii Zhurnal*, **1**: 72–87. (In Russian).
- Rasnitsyn A.P. 1975. Hymenoptera Apocrita of Mesozoic. *Trudy Paleontologicheskogo Instituta AN SSSR*, **147**: 1–134. (In Russian).
- Rasnitsyn A.P. 1980a. Origin and evolution of Hymenoptera. *Trudy Paleontologicheskogo Instituta AN SSSR*, **174**: 1–192. (In Russian).
- Rasnitsyn A.P. 1980b. On system of the family Aulacidae (Hymenoptera) in connection with a new finding in the Cretaceous of Manlay. *In*: Kalugina N.S. (ed.). *The Early Cretaceous Lake Manlay. Transection of Joint Soviet-Mongolian Paleontological Expedition*, **13**: 65–67. (In Russian).

- Rasnitsyn A.P. 1988. An outline of evolution of the hymenopterous insects (order Vespida). *Oriental Insects*, **22**: 115–145.
- Rasnitsyn A.P. 1991a. New hymenopterans of the genus *Baissa* (Gasteruptiidae s.l.) from Early Cretaceous in Buryatia and Mongolia. *Vestnik Zoologii*, **1991**(1): 78–79. (In Russian).
- Rasnitsyn A.P. 1991b. Early Cretaceous members of Evaniomorphous hymenopteran families Stigmaphronidae, Cretavaniidae, and subfamily Kotujellitinae (Gasteruptiidae). *Paleontologicheskii Zhurnal*, **1991**(4): 128–132. (In Russian; translated into English in *Paleontological Journal*, **25**: 172–179).
- Rasnitsyn A.P., Jarzembowski E.A., Ross A.J. 1998. Wasps (Insecta: Vespida = Hymenoptera) from the Purbeck and Wealden (Lower Cretaceous) of southern England and their biostratigraphical and paleoenvironmental significance. *Cretaceous Research*, **19**(3/4): 329–391.
- Rasnitsyn A.P. 2002. Superorder Vespidea Laicharting, 1789. In: Rasnitsyn, A.P., Quicke, D.L.J. (eds). *History of Insects*, Dordrecht etc.: Kluwer Academic Publishers: 242–254.
- Rasnitsyn A.P., Martínez-Delclòs X. 2000. Wasps (Insecta: Vespida = Hymenoptera) from the Early Cretaceous of Spain. *Acta Geologica Hispanica*, **35**: 65–95.
- Townes H.K. 1950. The Nearctic species of Gasteruptiidae (Hymenoptera). *Proceedings of the United States National Museum*, **100**: 85–145.
- Zhang H., Rasnitsyn A.P., Zhang J. 2002. The oldest known scoliid wasps (Insecta, Hymenoptera, Scoliidae) from the Jehol biota of western Liaoning, China. *Cretaceous Research*, **23**: 77–86.
- Zhang J., Rasnitsyn A.P. 2004. Minute members of Baissinae (Insecta: Hymenoptera: Gasteruptiidae) from the upper Mesozoic of China and limits of the genus *Manlaya* Rasnitsyn, 1980. *Cretaceous Research*, **25**: 797–805.