A NEW SPECIES OF *YURIPOPOVIA* (COLEORRHYNCHA: PROGONOCIMICIDAE) FROM THE EARLY CRETACEOUS OF THE ISLE OF WIGHT

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ABSTRACT

A new species of *Yuripopovia* Jarzembowski (Coleorrhyncha: Progonocimicidae) is described from the Lower Cretaceous Vectis Formation (Wealden Group) of the Isle of Wight, southern England. *Yuripopovia vectense* **sp. nov.** differs from *Yuripopovia woottoni* Jarzembowski in the following characters: Sc undivided, branching from R basally; R_1, R_2 and RS evenly spaced; radio-medial cell apically sinuous and only slightly longer than the medial cell; and apical margins of medial and cubital cells off-set. A preliminary key to the species of Progonocimicidae from the Early Cretaceous of southern England is provided.

INTRODUCTION

Coleorrhyncha, or 'moss bugs', are a small group of obscure, cryptozoic Hemiptera widely considered to be the sister-group to Heteroptera (Fig. 1a). They are represented by a single living family, the Peloridiidae, with around 25 species in 13 genera restricted to temperate *Nothofagus* forests in Chile, Patagonia, eastern Australia, Tasmania, New Zealand, New Caledonia and Lord Howe Island (Grimaldi & Engel, 2005). Peloridiids are small (2–4 mm long) flattened insects with the eyes widely separated on short peduncles projecting laterally from the prognathous head; the pronotum is expanded laterally into broad paranotal lobes; the forewings are areolate and the hind wings are usually absent. As their vernacular name suggests, peloridiids live amongst wet mosses and liverworts and are most abundant in continually moist habitats characterised by high rainfall or humidity (Woodward, 1956). The modern distribution of Peloridiidae is a classic example of austral disjunction (Grimaldi & Engel, 2005) and the family was almost certainly effected by Gondwanan drift during the late Mesozoic. The taxonomy and biology of Peloridiidae was reviewed by Evans (1981), and their relationships discussed by Schlee (1969) and Popov & Shcherbakov (1996).

Fossil Coleorrhyncha are exceedingly rare. Peloridiidae are entirely unknown as fossils, perhaps due to their small size and cryptic habits, though their disjunct austral distribution suggests a Cretaceous origin. The only definitive fossil Coleorrhyncha are *Karabasia* (Karabasiidae) from the Late Jurassic–Early Cretaceous of eastern and central Asia, and *Hoploridium* (Hoploridiidae) from the Early Cretaceous of Siberia (Popov & Shcherbakov, 1996; Grimaldi & Engel, 2005). *Karabasia* and *Hoploridium* were placed along with Peloridiidae in the superfamily Peloridioidea by Popov & Shcherbakov (1996) based on the widened head, three-segmented antennae, free Sc, enlarged basal cell, longitudinal arculus and M_{3+4} fused with CuA_1 in the forewing. Popov & Shcherbakov (1996, p. 16) considered *Hoploridium* as a "blind off-shoot of the peloridioid lineage" (see also Bechly & Szwedo, 2007, fig. 11.53) though there are clear similarities between *Hoploridium* and Peloridiidae, including the entirely sclerotized metepisterna and the unarmed metathoracic legs with two-segmented tarsi. It is likely therefore, that *Hoploridium*

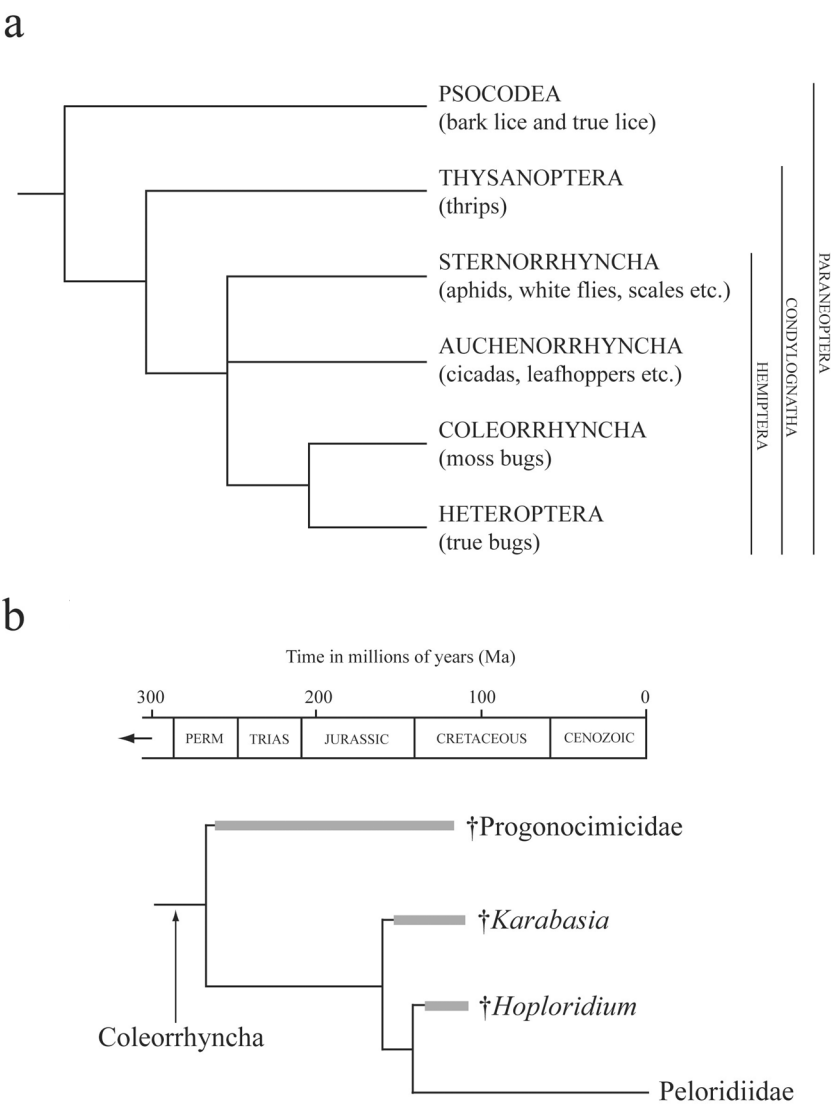

Fig. 1. Relationships of Coleorrhyncha. (a) phylogeny of Paraneoptera, showing the position of Coleorrhyncha within the Hemiptera. For an explanation of synapomorphies see Grimaldi & Engel, (2005). (b) phylogeny of Coleorrhyncha showing the likely relationships between the extant Peloridiidae and the various extinct groups. The thick grey lines indicate known geological ranges.

represents the sister-group to Peloridiidae as shown in Fig. 1b, further supporting a Cretaceous origin for the latter family.

Progonocimicidae are small to medium-sized stem-group Coleorrhyncha known from the Late Permian to mid-Cretaceous of Eurasia, Australia, Africa and South America. The family comprises around 18 genera and is subdivided into two subfamilies, Progonocimicinae and Cicadocorinae. Progonocimicids are primitive in general appearance and basal members of the family (e.g. *Actinoscytina*) are superficially similar to certain Ingruidae, though are more dorsoventrally flattened and (at least as far as is known) bear prominent lateral and apical metatibial spurs (Popov & Shcherbakov, 1996; Bechly & Szwedo, 2007). The monophyly of Progonocimicidae is doubtful (Grimaldi & Engel, 2005) and it is likely that the family constitutes a paraphyletic assemblage of stem-group Coleorrhyncha leading up to the clade comprising *Karabasia*, *Hoploridium* and Peloridiidae. Extensive revision of the family is required in order to elucidate their relationships and better understand the early evolution of the Coleorrhyncha.

Cretaceous fossil insects from the Isle of Wight

Fossil insects are relatively abundant in the Lower Cretaceous deposits of mainland southern England, but are rarer and generally not as well preserved in coeval strata on the Isle of Wight. Brodie (1853) mentioned the discovery by Edward Forbes of fossil insects in the 'Hastings Series' of the island (see also Goss, 1879), though this material was never described or illustrated and is today almost certainly lost. It was not until the early 1990s that Twitchett (1994) reported the discovery of insect fossils from the Vectis Formation (Wealden Group). Twitchett (*op. cit.*) briefly outlined the fauna and figured a selection of specimens, though he did not describe his material in detail and it was only recently that systematic work on the fauna began (Heads, 2005). Fossil insects are known to occur at several horizons within the Vectis Formation where they are preserved in a variety of lithologies including siderite nodules, organic-rich shales and well cemented fine-grained sandstone gutter casts (see Fig. 2). Insects are also known as inclusions in amber from the underlying Wessex Formation (Jarzembowski, 1995), which has also yielded termite borings preserved in fossil wood (Francis & Harland, 2006).

Twitchett's collection of fossil insects from the Vectis Formation, which is deposited in the Dinosaur Isle Museum (formerly the Museum of Isle of Wight Geology) at Sandown, along with additional material collected during the Geologists' Association Field Meeting of April 1993 was studied during the summer of 2003. During the course of this study, a number of interesting specimens came to light including a trichopteran larval case (Heads, 2005) and several isolated hemipteran tegmina. One of these specimens was assigned to the extinct family Progonocimicidae by Twitchett (1994) and is described here as a new species of the cicadocorine genus *Yuripopovia* Jarzembowski, 1991.

Systematic palaeontology

Family Progonocimicidae Handlirsch, 1906
Subfamily Cicadocorinae Becker-Migdisova, 1958
Genus *Yuripopovia* Jarzembowski, 1991

1991 *Yuripopovia* Jarzembowski, p. 99.

Type species. *Yuripopovia woottoni* Jarzembowski, 1991, by original designation.

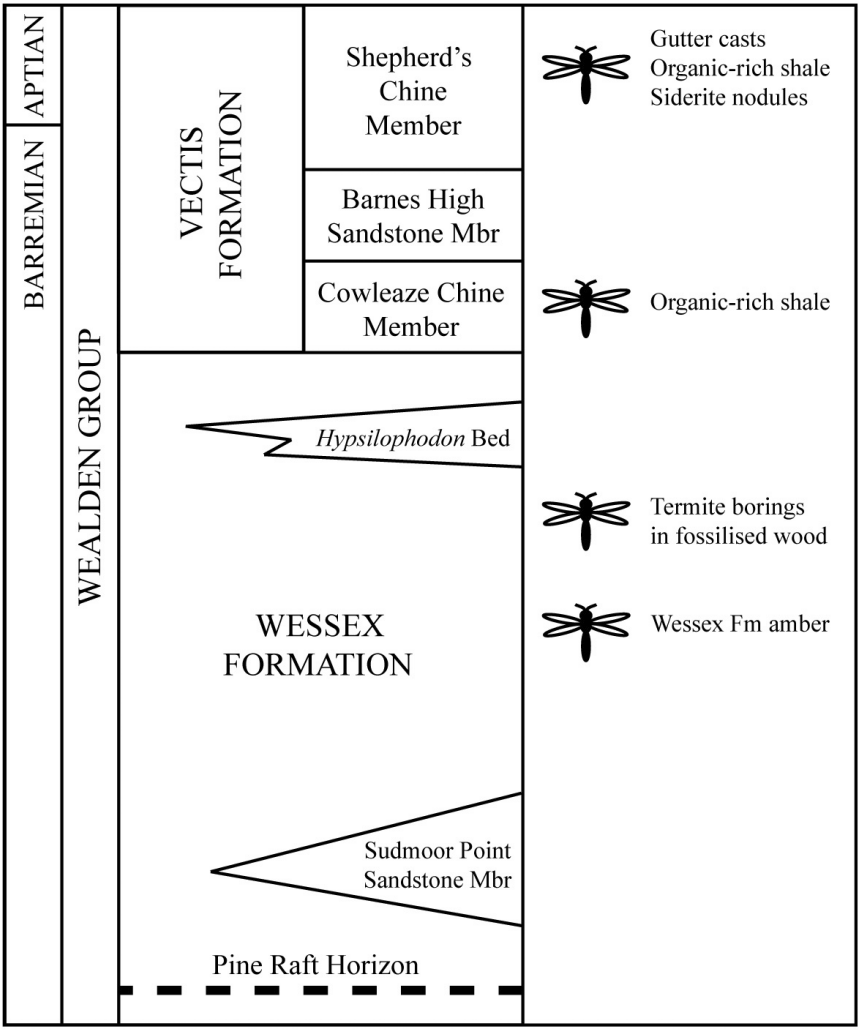

Fig. 2. Generalised stratigraphy of the Wealden Group on the Isle of Wight showing the stratigraphic distribution and lithology of insect-bearing units. The Early Cretaceous Wealden Group is represented on the Isle of Wight by two formations: the mostly fluvial Wessex Formation (Barremian) and the overlying, marginal marine Vectis Formation. The Vectis Formation is subdivided into three members: the Cowleaze Chine Member and the Shepherd's Chine Member are similar in overall lithology, comprising organic rich lacustrine clays and silts and are separated by the Barnes High Sandstone Member, comprising coarse grained sandstone. Note that vertical thicknesses are not drawn to scale (modified from Heads, 2005).

Remarks. *Yuripopovia* differs from all other Wealden Cicadocorinae in having a two branched R and a free RS; the latter is usually fused with M_1 at least basally. Vein Sc in the type species is remarkable in being three-branched (see Jarzembowski, 1991, Fig. 11), though this is apparently not the case in the new species (*vide infra*).

Yuripopovia vectense sp. nov.
Figure 3

1994 Progonocimicidae Twitchett, p. 49.

Holotype. MIWG 7090; isolated left tegmen preserved in a well-cemented sand-filled gutter cast; Upper Shepherd's Chine Member, Vectis Formation, Wealden Group; near Atherfield, Isle of Wight, 1992, leg. R. J. Twitchett. Dinosaur Isle Museum, Sandown, Isle of Wight.

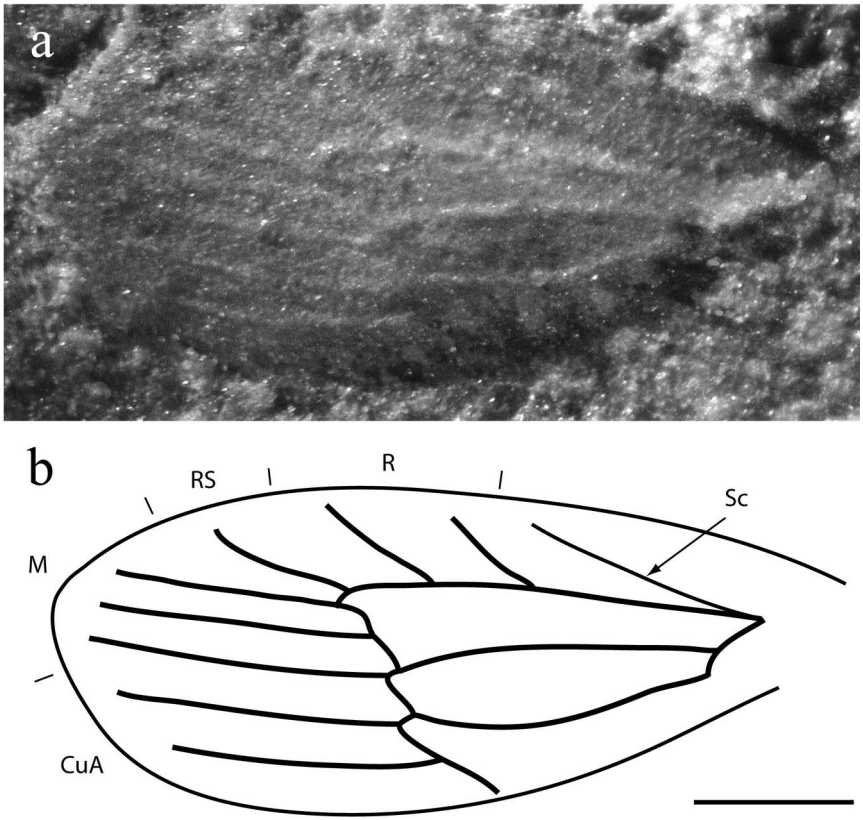

Fig. 3. *Yuripopovia vectense* sp. nov. (a) photograph of the holotype MIWG 7090; (b) camera lucida drawing of the holotype. Abbreviations for wing veins are as follows: Sc, subcosta; R, radius; RS, radial sector; M, media; CuA, anterior cubitus. Scale bar represents 1 mm.

Etymology. The specific epithet is derived from *Vectis*, the Graeco-Roman name for the Isle of Wight, which first appears in Ptolemy's *Geographia*, written around the mid 2nd Century AD.

Diagnosis. *Yuripopovia vectense* differs from its congener in the following characters: Sc undivided, branching from R + Sc stem near the apex of the basal cell; R_1, R_2 and RS evenly spaced; radio-medial cell sinuous apically, only slightly longer than medial cell. *Y. vectense* is further characterised by the off-set apical margins of the main cells.

Description. Tegmen 4.25 mm long; Sc weak, branching from R + Sc stem near apex of basal cell, confluent with the costal margin near mid-wing; R two-branched; R_1, R_2 and RS evenly spaced; rs-m_1 crossvein distinct; M with three closely spaced branches; radio-medial cell with sinuous apical margin; CuA two-branched; apical margins of medial and cubital cells off-set; the three main cells become progressively smaller posteriorly.

Remarks. Assignment of the new species to the genus *Yuripopovia* is supported by the presence of a two-branched R and a free RS (i.e. not fused with M_1). Interestingly, the three-branched Sc characteristic of *Y. woottoni* is absent in *Y. vectense*, which has a simple, undivided Sc more typical of the family. *Yuripopovia* is unusual amongst Cicadocorinae in the morphology of the radio-medial cell, which is elongate in *Y. woottoni* and apically sinuous in *Y. vectense*. The radio-medial cell is moderately elongate in *Cicadocoris* Becker-Migdisova, 1958 and *Heterojassus* Evans, 1961, but not to the same extent as in *Y. woottoni*. The unusual, sinuous apex of the radio-medial cell in *Y. vectense* is unknown in any other species and would appear to be unique.

Preliminary key to the Wealden Progonocimicidae

The following key allows identification of the six progonocimicid species that have been described to date from the Wealden Group (Klimaszewski & Popov, 1993). However, there are numerous undescribed taxa in the collections of the Natural History Museum in London, the Booth Museum in Brighton and the Maidstone Museum in Kent (E. A. Jarzembowski, pers. comm. 2008).

1. R with one branch 2
– R with two branches 5
2. RS fused with M_1 basally, but free distally 3
– RS fused with M_1 for its entire length 4
3. RS undivided distally . . . . . *Valdiscytina jarzembowskii* Popov
– RS with two distal branches . . . . . *Valdiscytina picta* Popov
4. M_2 closer to RS + M_1 than to M_3. . . . . *Ildavia shcherbakovi* Popov
– M branches more or less evenly spaced . . . . . *Ildavia incompleta* Popov
5. Sc with three branches, radio-medial cell elongate . . . . . *Yuripopovia woottoni* Jarzembowski
– Sc simple, radio-medial cell apically sinuous. . . . . *Yuripopovia vectense* Heads

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