A new fossil Saldidae (Hemiptera: Heteroptera: Leptopodomorpha) from the Early Cretaceous in China

WEITING ZHANG1, JINGJING SONG1, YUNZHI YAO1,2,3 & DONG REN1
1Key Lab of Insect Evolution and Environmental Changes, Capital Normal University, Beijing 100048, China; 2State Key Laboratory of Palaeobiology and Stratigraphy (Nanjing Institute of Geology and Palaeontology, CAS), Nanjing 210008, China; 3Corresponding author. E-mail: yaoyz100@gmail.com

Abstract

Venustosalda locella gen. et sp. nov. is described and illustrated from the Lower Cretaceous Yixian Formation at Huangbanjigou Village, Liaoning Province, China. The new genus is established based on its unusual six cells on the membrane, with the second cell smallest.

Key words: Heteroptera, Saldidae, fossil, Early Cretaceous, Yixian Formation

Introduction

Saldidae, commonly called shore bugs, is the largest family in the Leptopodomorpha: about 335 species are recognized. They are distributed worldwide, especially in the Northern Hemisphere (Schuh et al. 1987; Schuh & Polhemus 2009). Saldids are usually found on rocky shores of streams and lakes (Brooks & Kelton 1967; Poinar & Buckley 2009). All saldids are predatory and most of them feed on organisms, found in the damp surface layers of the substrate (Brooks & Kelton 1967; Polhemus & Chapman 1979).

Schuh and Polhemus (1980) present a hierarchic classification in Leptopodomorpha and considered the Aepophilidae to be the sister group of Saldidae. Some subfamilies such as Aepophilinae, Leptosaldinae, Saldoniinae, were formerly erected in Saldidae (Cobben 1959, 1971; Popov 1973), but they are finally removed (Leston 1956; Schuh & Polhemus 1980; Popov 1985). The widely accepted classification of the family Saldidae is that it contains two subfamilies: Chiloxanthinae and Saldinae (Schuh & Slater 1995).

Records of fossil Saldidae are scarce and only seven species have been reported (Carpenter 1992). Only one incontrovertible Mesozoic species (Brevirimatus pulchaliifer Zhang, Yao & Ren, 2011) from the Early Cretaceous Yixian Formation of Duolun County, Inner Mongolia, China, has been reported (Zhang et al. 2011). Most of the fossil species are found from the Cenozoic, such as the Eocene species, Salda exigua Germar & Berendt, 1856 from Baltic amber; the Upper Oligocene species, Oligosalda rottensis Statz & Wagner, 1950, O. rhenana Statz & Wagner, 1950, and O. aquatilis Statz & Wagner, 1950 from Germany; the Miocene species, Propentacora froschneri (Lewis, 1969) (= Oreokora froschneri) from USA, and Salda littoralis found in recent Late Glacial clay (Jessen 1923).

In the present paper, a new genus and species of Saldidae is described from the Lower Cretaceous Yixian Formation (about 125 Ma; Swisher et al. 1999; Zhou et al. 2003; Xing et al. 2005) in Huangbanjigou, Chaomidian Village, Beipiao City, Liaoning Province, China. The Yixian Formation is considered part of the Jehol Biota, yielding beautifully preserved insects, reptiles, birds (Lei et al. 2005; Wang & Ren 2006; Ren et al. 2010; Yao et al. 2011). The stable ecosystem, abundant vegetation, and various species suggest that the region as a whole had a...
warm, humid climate (Liu et al. 2009). Because this species cannot be assigned to any known genera of Saldidae, we erected a new genus to accommodate it.

Material and methods

This fossil material is housed in the Key Laboratory of Insect Evolution & Environmental Changes, Capital Normal University, Beijing, China. The specimen was examined with a Leica MZ12.5 dissecting microscope. Photo was taken by a Nikon Digital Camera DXM1200C. Outline was drawed with Adobe Photoshop CS2. Basic terminology and the classification system follow Polhemus (1977) and Schuh and Polhemus (2009).

Body length was measured along the midline from the anterior margin of the head to the apex of the abdomen. Body width was measured at the maximal width of the body. The lengths of pronotum and scutellum were measured at the midline. Wing length was measured from the basal to the apex of anterior margin. Wing width was measured at the maximal width of the wing. All metrics are provided in millimeters.

Systematic paleontology

Order Hemiptera Linnaeus, 1758

Suborder Heteroptera Latreille, 1810

Infraorder Leptopodomorpha Popov, 1971

Family Saldidae Amyot & Serville, 1843

Subfamily Chiloxanthinae Cobben, 1959

Genus Venustsalda gen. nov.

Type species. Venustsalda locella gen. et sp. nov.

Diagnosis. Compound eyes large, covering most of head in lateral view. Rostrum reaching to the base of hind coxae. Posterior pronotal margin indented distinctly. Forewings covering abdomen, macropterous; medial fracture and costal fracture long; hypocostal ridge and associated secondary hypocostal ridge present on hemelytra; corial vein reaching to outermost cell; veins on membrane forming six closed cells. In male, parandrium tapered.

Etymology. The generic name is a combination of the Latin “venust-” (meaning “charming”) and “Salda” (the type genus of this family). Gender feminine.

Distribution. China.

Remark. It is indubitable to classify this species into the family Saldidae based on the combination of characters: compound eyes large, rostrum long, posterior margin of pronotum concave, hemelytra with costal fracture and medial fracture, membrane with few cells. The new genus has six cells on its membrane, which is different from the normal cell number in Saldidae. In most saldids, the innermost cell (first cell) is longest, whereas in this new genus the normal innermost cell seems to be divided into two cells, and then finally form six cells on membrane. Therefore, the six-cells system is speculated to be derived from the five-cells system. According to its long medial fracture and costal fracture, we intend to put this genus in Chiloxanthinae.

Both Venustsalda gen. nov. and Brevrimatus Zhang, Yao & Ren, 2011 come from the same formation; but the former easily differs from the latter in body size less than 6.5 mm (vs. reaches to 8.0 mm), medial fracture fused together with costal fracture (vs. medial fracture short, not connect with costal fracture), membrane with six closed cells (vs. membrane with five closed cells), and forewings surpassing the end of abdomen (vs. forewings at most reach to the end of abdomen).

Venustsalda gen. nov. is similar to Oligosalda Statz & Wagner, 1950 in body size, but can be distinguished from the latter: forewing with costal fracture (vs. without costal fracture), body dorsal surface smooth, without long hair (vs. body covered by long hair), membrane with six cells (vs. five cells).
FIGURE 1. Line drawing of *Venustsalda locella* gen. et sp. nov.
PLATE 1. Photograph of *Venutsalda locella* gen. et sp. nov., Holotype, CNU-HET-LB2010335.
Propentacora froeschneri (Lewis), initially assigned to the genus Oreokora (Lewis 1969) in the subfamily Saldinae, was transferred to the genus Propentacora in Chiloxanthinae (Polhemus 1977, 1985). Venustsalda gen. nov. compared with Propentacora (Lewis): length of hemelytra over 4 mm (vs. less 3 mm), membrane with six cells (vs. five cells), the innermost cell (first cell) shorter than the third cell (vs. the innermost cell longest, cells reduced gradually from the inner to the outer as the normal arrangement), and corial vein reaching to the outermost cell (vs. corial vein continue between cells three and four).

Salda is an extant genus with two fossil species. Most members of Salda have four cells and the fossil species S. exigua Germar & Berendt, 1856 has only three cells. Venustsalda gen. nov. has six cells, more than that in Salda.

Venustsalda locella gen. et sp. nov.
(Fig. 1, Plate 1)

Description. Body small, oval, 2.0 times as long as wide. Head short and broad, 1.7 times as wide as long, length of head almost subequal to length of pronotum on midline. Antennae long, slender, four-segmented, ratio of antennal segments I:II:III:IV=1:2.8:1.9:1.8. Pronotum subtrapezoid, 3.1 times as wide as long, moderately narrowed towards the front, anterior margin narrower than head, lateral margins nearly straight, posterior margin concave, posterior angles feebly rounded. Scutellum longer than pronotum on midline, triangle, and width about 1.4 times of length. Fore femora stout, subequal to length of corresponding tibiae, tibiae 1.9 times as long as tarsi; mid tibiae 2.0 times as long as tarsi; hind legs longest, tibiae about 1.7 times as long as femora, and 2.3 times as long as tarsi, tibiae with a row of stout setae on lateral margin, tarsi three-segmented, tarsomere I shortest, tarsomere II 1.3 times as long as tarsomere III; all tarsi with two claws. Hemelytra 0.8 times as long as body, covering apex of abdomen, clavus about half length of fore wing, claval commissure shorter than scutellum length at median line, corium with embolium, embolium similar in color to corium; outer edge of corium with a white spot at base of hemelytra; hypocostal ridge and associated secondary hypocostal ridge present; corial vein reaching to outermost cell; membrane with six cells, second cell smallest, less than half length of third cell, outermost cell reduced, about half length of adjacent cell.

Measurements. Body length 4.81, width 2.39. Head length 0.66, width 1.10mm. Antenna length I–IV: 0.38, 1.07, 0.75, 0.72. Rostrum length 2.92. Scutellum length 0.85, width 1.23. Length of fore leg: femur 1.19, tibia 1.23, tarsus 0.63; length of middle leg: tibia 1.51, tarsus 0.75; length of hind leg: femur 1.63, tibia 2.75, tarsomere I–III: 0.08, 0.62, 0.46. Length of hemelytra 4.09, width 1.29.

Type material. Holotype, ♂, CNU-HET-LB2010335.

Type locality and horizon. Huangbanjigou Village, Beipiao City, Liaoning Province, China, Yixian Formation. Early Cretaceous.

Etymology. The species name is derived from Latin word “locella,” which indicated the species with small cells. Gender feminine.

Acknowledgements

This research was funded by grants from the National Basic Research Program of China (973 Program) (No. 2012CB821900); National Natural Science Foundation of China (No. 30800095, 31071964, 40872022); Nature Science Foundation of Beijing (No. 5082002); the PHR Project of Beijing Municipal Commission of Education (No. 20090509, 201107120), the General Program of Science and Technology Development Project of Beijing Municipal Education Commission of China (No. KM201210028016), Fok Ying-Tong Education Foundation for Young Teachers in the Higher Education Institutions of China (No.131021), and the State Key Laboratory of Palaeobiology and Stratigraphy (Nanjing Institute of Geology and Palaeontology, CAS) (No.123114).

References


