

Pristinochterus gen. n. (Hemiptera: Ochteridae) from the Upper Mesozoic of northeastern China

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Abstract. A new genus of velvety shore bugs, *Pristinochterus* gen. n., with one new species, *Pristinochterus zhangii* sp. n., are described. The specimens were collected from the Late Jurassic to Early Cretaceous Yixian Formation and Early Cretaceous Jiufotang Formation in northeastern China. This finding represents the first record of fossil velvety shore bugs from China. Among the specimens, four well-preserved nymphs are reported for the first time. The placement of the new genus within Ochteridae is briefly discussed. A key to the world genera of Ochteridae is provided.

INTRODUCTION

The extant Ochteridae is a small family with three genera and 55 species, distributed in the tropical and warm-temperate regions of the world (Baehr, 1989a; Schuh & Slater, 1995). These bugs are usually found along the shores of ponds or streams. They look like Saldidae, and feed on soil microfauna of the littoral zone (Shcherbakov & Popov, 2002). Only one species, *Ochterus marginatus* (Latreille), is recorded from China (Zheng, 1999). Records of fossil ochterids are scarce and only one species, *Propreocoris maculatus* Popov, Dolling & Whalley 1994, from the Early Jurassic (Lower Lias) Charmouth fauna in England has been reported. Recently we discovered 19 fossil specimens, including four parts and counterparts, of velvety shore bugs collected from the Yixian Formation in Huangbanjigou, Chaomidian Village, Beipiao City and Dawangzhangzi Village, Lingyuan City, Liaoning Province and Jiufotang Formation in Balihan Village, Ningcheng County, Chifeng City, Inner Mongolia Autonomous Region, China. As they can not be assigned into any known genera of Ochteridae, we erect a new genus to receive them.

Jiufotang Formation and Yixian Formation are considered as part of the Jehol Biota, yielding not only well-preserved primordial birds, pterosaurs, lizards and angiosperms, but also many beautifully preserved insects (Sun et al., 1998; Hou et al., 1999; Ren et al., 2002; Ren et al., 2003; Wang & Zhou, 2003; Wang, 2004). The age of the Jiufotang Formation is Lower Cretaceous (Tao et al., 2003; Liu et al., 2004). The Yixian Formation locates below Jiufotang Formation, its age remains contentious. There are three opinions about its age: Late Jurassic (Ren et al., 1997; Zheng et al., 2003), transition from Late

Jurassic to Early Cretaceous (Chen et al., 2004; Wang et al., 2004, 2005), and Early Cretaceous (Swisher et al., 1999; Li et al., 2001; Pang et al., 2002; Zhou et al., 2003). Here, we tentatively consider the geological age of the Yixian Formation as the transition from Late Jurassic to Early Cretaceous (Late Tithonian to the Berriasian).

MATERIAL AND METHODS

The material studied is deposited at the Key Lab of Insect Evolution & Environmental Changes, Capital Normal University, Beijing. All drawings were made using a camera lucida and binocular microscope. Morphological terminology in this paper mainly follows Baehr (1989b). All measurements are in millimeters.

SYSTEMATICS

Suborder Heteroptera Latreille, 1810

Infraorder Nepomorpha Popov, 1968

Superfamily Ochteroidea Kirkaldy, 1906

Family Ochteridae Kirkaldy, 1906

Genus *Pristinochterus* gen. n.

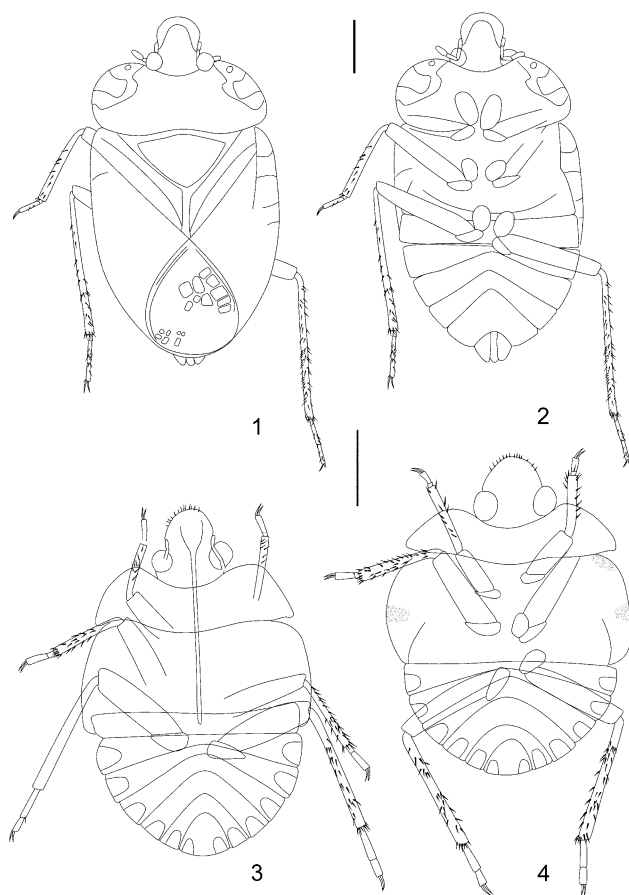
Type species. *Pristinochterus zhangii* sp. n.

Diagnosis. Adults: Body medium sized, broad and ovoid, about twice as long as width. Head subquadrate, shorter than width across eyes, anterior margin strongly expanded, foliate-like, apex round, anteocular portion distinctly longer than diameter of eye in dorsal view; antennae arising from near middle of head, 4-segmented, short, visible dorsally, basal two segments slender, apical two segments stouter, all segments subequal in length; eyes relatively small, shorter than half width of head, round, contiguous to anterior margin of pronotum, projecting over lateral sides of head, interocular space longer

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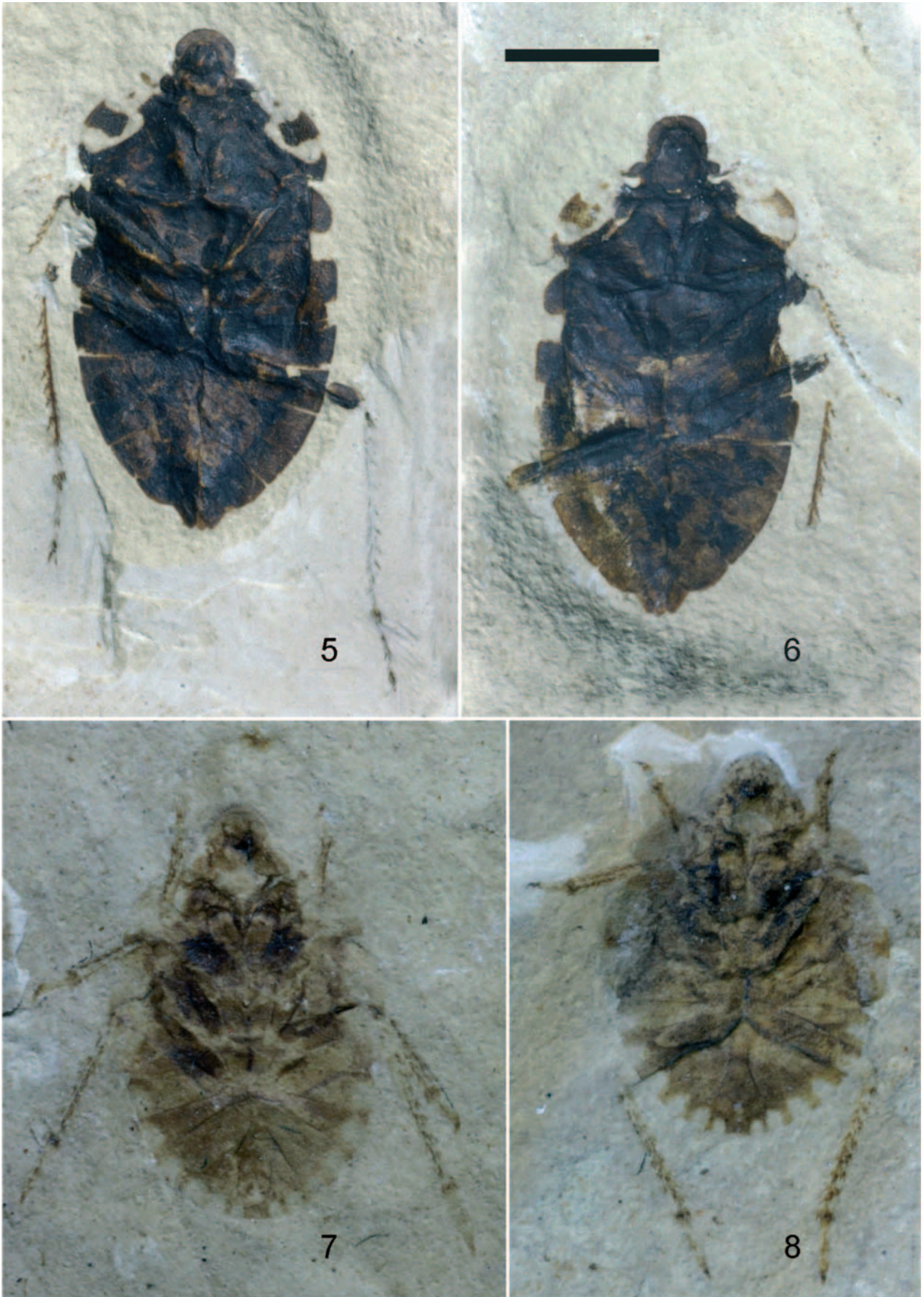
TABLE 1. Similarities and differences among the five genera of Ochteridae.

	<i>Ochterus</i>	<i>Ocyochterus</i>	<i>Megochterus</i>	<i>Pristinochterus</i>	<i>Propreocoris</i>
Body length (mm)	less than 6.5	5.17	8.3–9.8	10–12.9	5.4 (excluding head)
Dorsum of body	pronotum scutellum, clavus and corium finely punctate	pronotum scutellum, clavus and corium finely punctate	pronotum scutellum, clavus and corium finely punctate	pronotum scutellum, clavus and corium smooth, impunctate	pronotum scutellum, clavus and corium finely punctate
Head	anterior margin not expanded; much shorter than wide	anterior margin not expanded; much shorter than wide	anterior margin prolonged; much shorter than wide	anterior margin strongly expanded, flake-like; slightly shorter than wide	lacking data
Eye	large, diameter slightly shorter than head	large, diameter slightly shorter than head	large, diameter subequal to half of head length	relatively small, diameter much shorter than half of head length	lacking data
Rostrum	generally extended beyond hind coxae	reaching base of abdomen	generally extended beyond hind coxae	reaching to mid coxae	lacking data
Antennae	first 2 segments stouter and shorter than 2 apical segments	first 2 segments stouter and shorter than 2 apical segments	all 4 segments stout and subequal in thickness	all 4 segments subequal in thickness, 2 apical segments stouter than basal 2 segments	lacking data
Pronotum	with transverse sulcus, lateral margins not expanded	without transverse sulcus, lateral margins expanded	with transverse sulcus, lateral margins not expanded	without transverse sulcus, lateral margins strongly expanded	pronotum narrow, with transverse sulcus
Costal fracture	present	present	present	absent	present
Cells on membrane	with 7 cells in two rows	with 10–12 cells	with about 20 cells	with about 30 cells	with 6 longitudinal veins and forming some large cells, probably less than 7
Tibiae	with a row of fine spines ventrally	with a row of fine spines ventrally	with a row of fine spines ventrally	spines not forming in rows	lacking data

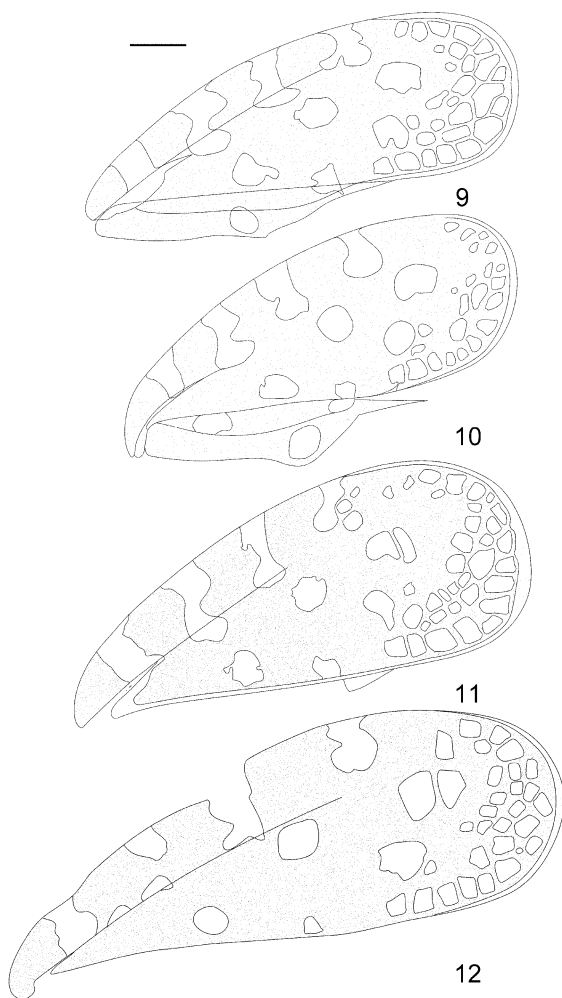


than diameter of eye in dorsal view; rostrum long, extending to hind coxae. Pronotum subquadrate, strongly expanded laterally, shorter than wide, anterior and posterior margins concave, without collar, dorsum smooth, without transverse sulcus, anterior and posterior angles nearly rounded, lateral margin convex. Scutellum as long as pronotum at midline, subtriangular, tip blunt. All legs cursory, fore coxae developed, oblong, narrowly separated, mid and hind coxae less developed, round, all trochanters rounded triangular, fore and hind femora distinctly shorter than corresponding tibiae, mid femur subequal in length to mid tibia, femur distinctly thicker than tibia, tapering, tibiae with setae and stout spines, spines not placed in rows, tarsal 2-2-3, with setae and stout spines, subequal in thickness, basal tarsomeres of all legs short, second tarsomere longest, claws slender and longer than basal tarsomere. Width of body across hemelytra in resting position slightly wider than abdomen, fore wing macropterous, corium-membrane boundary indistinct, corium with deep median fracture, ending at middle of fore wing, without costal fracture, clavus broad, claval commissure subequal to scutellum in length, nearly straight, membrane with about 30 cells. Abdomen oval, with eight visible segments, abdominal sterna IV–VII

Figs 1–4. *Pristinochterus zhangii* gen. et sp. n., outline. 1, 2. Holotype, ♀: 1 – CNU-HE-LB2006301, ventral view; 2 – CNU-HE-LB2006302, dorsal view; 3, 4. paratype, nymphs: 3 – CNU-HE-LB2006316; 4 – CNU-HE-LB2006314. Scale: 2 mm.



Figs 5–8. *Pristinochterus zhang* gen. et sp. n., photograph. 5–6 – Holotype, part and counterpart; 7–8 – paratype, nymphs. Scale: 4 mm.



Figs 9–12. Forewing, *Pristinochterus zhangi* gen. et sp. n., outline. 9 – CNU-HE-LB2006311; 10 – CNU-HE-LL2006006; 11 – CNU-HE-LB2006312; 12 – CNU-HE-NB2006002. Scale: 1 mm.

sinuate; male abdominal sternum VIII split into two independent plates, asymmetrical, ovipositor short, extending through last abdominal segment.

Nymphs (probably fifth instar): Body ovoid, about 1.5 times as long as width. Head length subequal to width, anterior margin with a row of small, erect spines; antennae short, protruding; eyes large, contiguous to anterior margin of pronotum, interocular space longer than diameter of eye in dorsal view; rostrum long, extending to hind coxae. Pronotum shorter than wide, without collar, dorsum smooth, without transverse sulcus, anterior margin concave, posterior margin nearly straight, lateral margins strongly expanded, anterior angles nearly rounded, posterior angles acute. All legs cursory, trochanters rounded triangular, fore and hind femora distinctly shorter than corresponding tibiae, mid femur subequal in length to corresponding tibia, femora distinctly thicker than corresponding tibiae, tapering, tibiae with stout spines, spines shorter than diameter of tibia, tarsus 2-segmented, tarsomeres subequal in thickness, fore tarsi similar to mid tarsi, basal tarsomere short, first tarsomere of hind tarsus longer than second. Abdomen

semicircular, with seven visible segments, abdominal sterna IV–VII sinuate.

Remarks. These specimens can be assigned to the family Ochteridae by the following combination of features: antennae 4-segmented, short, placed on the ventral side of eyes, visible dorsally; rostrum extending to hind coxae; all legs cursory, tarsal 2-2-3, basal tarsomeres of all legs short; male abdominal sterna VIII split into two independent plates, asymmetrical. The new genus can be distinguished from the other four genera by the following key. The main similarities and differences among the five genera can be found in Table 1.

Etymology. Genus name is a combination of the Latin *pristin* (primordial) and *Ochterus* (the type genus of this family).

Distribution. China.

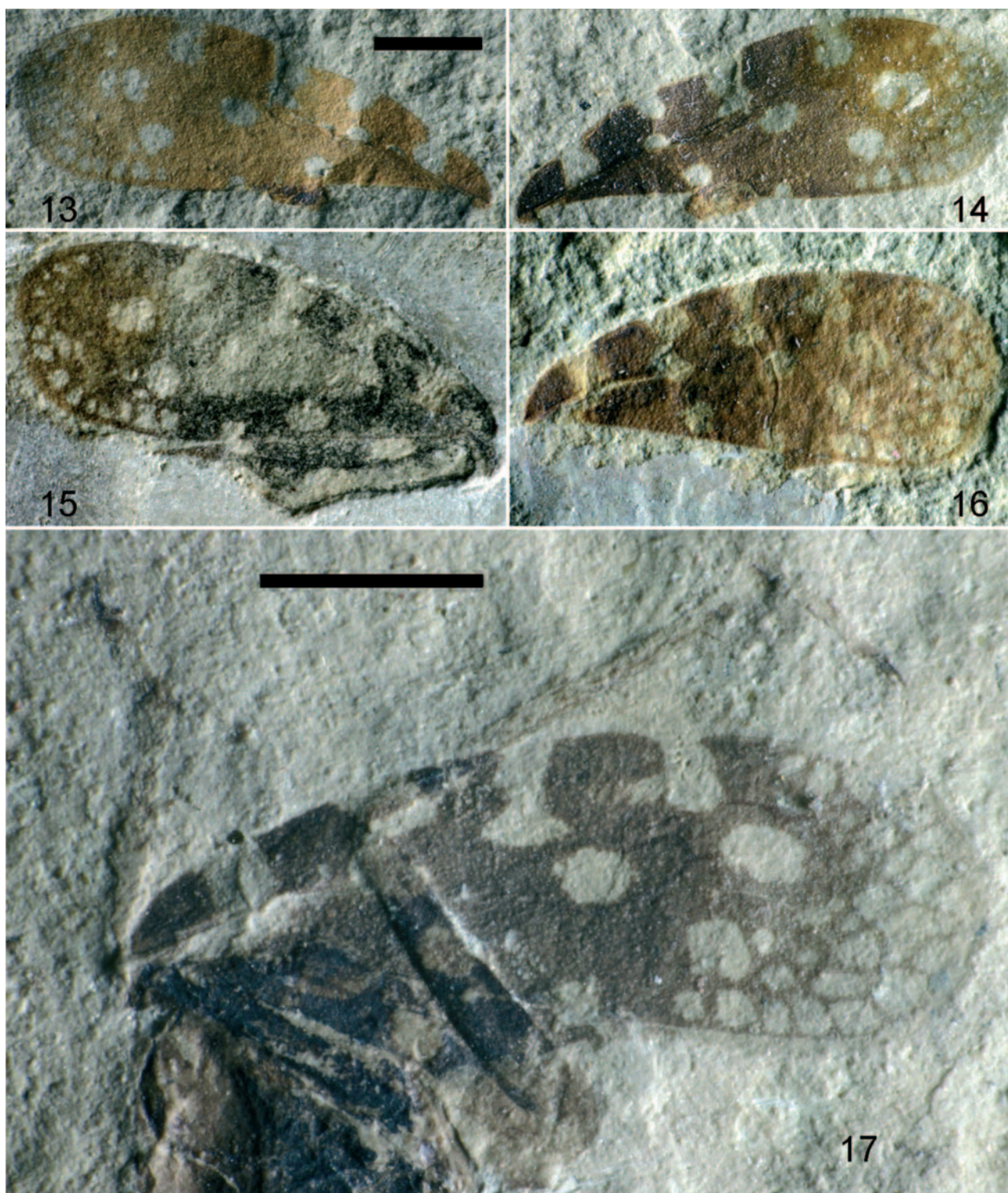
Key to genera of Ochteridae

- 1 Pronotum considerably narrower than width across forewings; veins on membrane parallel, reaching apical margin of fore wing. *Propreocoris* Popov, Dolling & Whalley, 1994
- Pronotum wider than width across forewings; veins on membrane not like above. 2
- 2 Less than 15 cells on membrane. 3
- More than 15 cells on membrane. 4
- 3 Membrane with seven cells in two rows. *Ochterus* Latreille, 1807
- Membrane with 10–12 cells. *Ocyochterus* Drake & Gómez-Menor, 1954
- 4 Body large, length ranging 10–14.3 mm; eye relatively small, diameter shorter than half of head width; lateral margins of pronotum strongly expanded; costal fracture absent, membrane with about 30 cells. *Pristinochterus* gen. n.
- Body length less than 10 mm; eye large, diameter subequal in length to half of head; lateral margins of pronotum expanded; costal fracture distinct, membrane with about 20 cells. *Megochterus* Jaczewski, 1934

Pristinochterus zhangi sp. n.

Description. Color. Pronotum with irregular markings along lateral sides, anterior area with two subquadrate spots, posterior part with 12 light yellow markings, arranged in two rows: five in anterior and seven in posterior row. Hemelytron with 11 light yellow markings: four large at costal margin, three in middle of fore wing, one near claval suture, one at claval suture, one at outer margin of clavus and one at inner angle of clavus. Markings varying in size and shape, but color pattern similar.

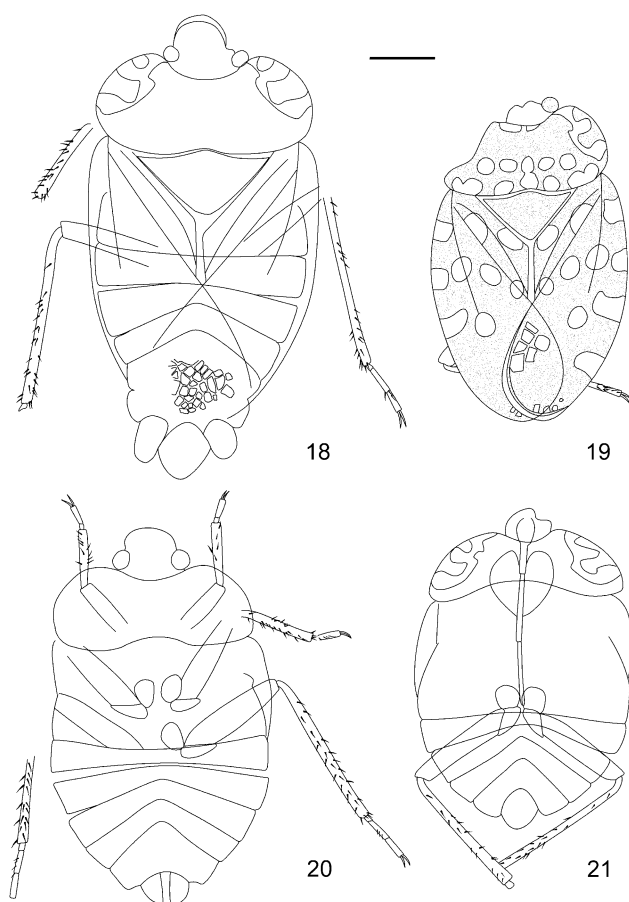
Adults (Figs 1, 2, 5, 6, 9–35): Length of body about 1.8 times its width. Head length subequal to that of pronotum at midline, 1.2 times as wide as long; eyes somewhat prominent, about 0.5 times as wide as interocular space; ocelli indistinct. Pronotum 3.2 times as wide as long. Scutellum 1.7 times as wide as long. Femora stout, more than twice as thick as corresponding tibiae, tibiae with dense spines, spines shorter than diameter of tibia; fore tibiae almost 1.4 times as long as corresponding femora, tarsi short, 0.3 times as long as corresponding tibiae; mid tibia slightly shorter than mid femur, tarsi similar to fore tarsi, 0.25 times as long as mid tibiae; hind legs distinctly longer than fore and mid legs, tibiae almost 1.4 times as long as femora, hind tarsi elongated, 0.33 times as long as



Figs 13–17 Forewing, *Pristinochterus zhangii* gen. et sp. n., photograph. 13–14 – CNU-HE-NB2006001-002, part and counterpart; 15 – CNU-HE-LL2006006; 16 – CNU-HE-LB2006312; 17 – CNU-HE-LB2006311. Scale: 2 mm.

hind tibiae, second tarsomere longest, 3.7 times as long as first and 1.2 times as long as third tarsomere. Hemelytron reaching tip of abdomen, almost 2.9 times as long as wide, costal margin of hemelytron feebly convex, middle with a deep median fracture, nearly 0.6 times as long as fore wing; clavus wide and large, nearly 4.5 times as long as wide, almost 0.6 times as long as hemelytron.

Nymphs (probably fifth instar, Figs 3, 4, 7, 8): Length of body about 1.4 times its width. Head longer than pronotum at midline, 1.2 times as wide as long; eyes somewhat prominent, about 0.7 times as wide as interocular space. Pronotum 4.6 times as wide as long; femora stout, over twice as thick as corresponding tibiae, tibiae with dense spines, spines shorter than diameter of tibia, fore



Figs 18–21. *Pristinochterus zhangii* gen. et sp. n., outline. 18 – ♂, CNU-HE-LB2006317; 19 – ♂, CNU-HE-LB2006310; 20 – ♀, CNU-HE-LB2006305; 21 – ♂, CNU-HE-LB2006309. Scale: 2 mm.

tibiae almost 1.1 times as long as fore femora, fore tarsi short, almost 0.3 times as long as fore tibiae; mid tibiae subequal in length to mid femora, tarsi similar to fore tarsi, almost 0.3 times as long as mid tibiae; hind legs distinctly longer than fore and mid legs, tibiae almost 1.2 times as long as femora, tarsi elongated, almost 0.37 times as long as tibiae, first tarsomere about twice as long as second tarsomere. Abdomen broad, wider than long, with U-shaped paler markings at lateral sides of each segment.

Dimensions (in mm). Adults. Body length 10–14.3 (♂) (14.3 measured from a squeezed specimen, 11.60–12.90 (♀); maximal width of body 5.88–7.06 (♂), 6.59–6.65 (♀); length head 2.00–2.18 (♂), 1.65–2.18 (♀), width 2.24–2.59 (♂), 2.35–2.47 (♀). Length antennal segments I–V: 0.37, 0.34, 0.39, 0.41 (♀); length rostral segments I–IV: ?, ?, 2.12, 2.00 (♂), total 5.76 (♂); length pronotum 1.82–2.12 (♂), 1.76–1.94 (♀), width 5.88–6.65 (♂), 6.18–6.47 (♀); length scutellum 1.47–2.00 (♂), 2.00 (♀), width 2.65–4.00 (♂), 3.24 (♀); length hemelytron 7.76–8.72 (♂), 8.82–10.00 (♂), width 3.06–2.92 (♂), 3.65–3.68 (♀), length clavus 4.18–5.52 (♀); length fore leg: femur 1.30 (♀), tibia 1.88 (♀), tarsomeres I–II: 0.18, 0.59 (♂), claw 0.35; length mid leg: femur 3.08–3.29 (♂), 3.12–3.47 (♀), tibia 2.76 (♂), 2.47–3.94 (♀), tarsomeres I–II: 0.20, 0.80 (♂), 0.15, 0.71–0.76 (♀), claw: 0.40 (♂), 0.35–0.41 (♀); length hind leg: femur 3.12–3.60 (♂), 3.41–3.82 (♀), tibia 4.35–5.29 (♂),

4.94–5.41 (♀), tarsomeres I–III: 0.12–0.18, 0.68–0.71, 0.53–0.56 (♂), 0.21–0.23, 0.76–0.82, 0.65–0.71 (♀), claw: 0.41–0.44 (♂), 0.35–0.47 (♀).

Nymphs (probably fifth instar): Body length 8.23–9.11; maximal width of body 6.00–6.35. Head length 1.82–2.06, width 2.12–2.15; length antennal segments I–V: 0.29, 0.41, ?, ?, length rostrum 5.30. Length pronotum 0.88–1.17, width 5.18–5.40; length fore leg: femur 1.35, tibia 1.71, tarsomeres I–II: 0.12, 0.35, claw: 0.35; length mid leg: femur 2.24, tibia 2.00–2.24, tarsomeres I–II: 0.12–0.19, 0.47–0.59, claw: 0.29–0.35; length hind leg: femur 2.35–2.71, tibia 3.24–3.29, tarsomeres I–II: 0.76–0.88, 0.41, claw: 0.35.

Type materials. Holotype, ♀, CNU-HE-LB2006301-302 (part and counterpart); paratypes, 9♂: CNU-HE-B2006303-304 (part and counterpart), CNU-HE-LB2006305/306/307/308/309/310/313/317 (CNU-HE-LB2006306 was donated by Dr. ChungKun Shih); 1♀: CNU-HE-LB2006305; two specimens, sex unknown: CNU-HE-LB2006012/021; 4 fore wings: CNU-HE-LB2006311/312, CNU-HE-NB2006001-002 (part and counterpart), CNU-HE-LL2006006; 4 nymphs: CNU-HE-LB2006314/315/316.

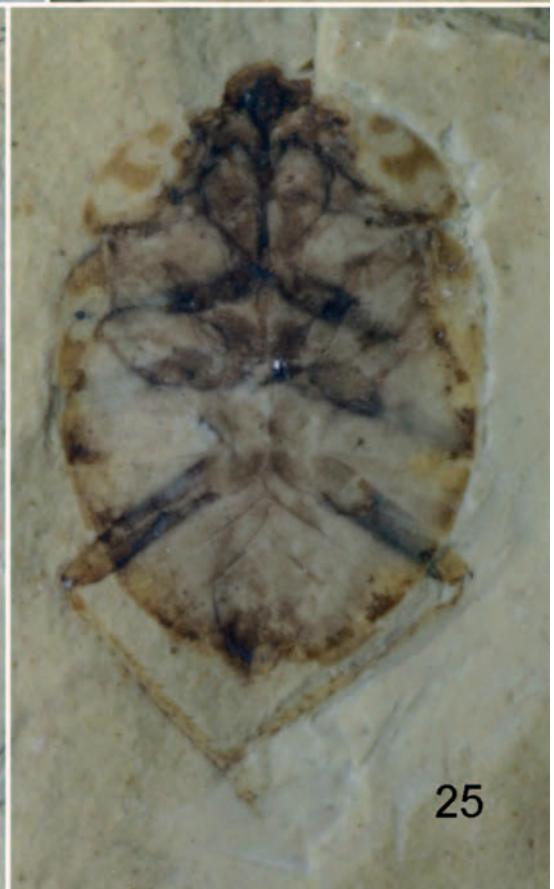
Locality and horizon. Huangbanjigou, Chaomidian Village, Beipiao City and Dawangzhangzi Village, Lingyuan City, Liaoning Province, Yixian Formation, Late Jurassic; Balihan Village, Ningcheng County, Chifeng City, Inner Mongolia Autonomous Region, China, Jiufotang Formation, Early Cretaceous.

Etymology. This species is named after Mr. Lin Zhang for his assistance and contribution in collecting Liaoning fossils.

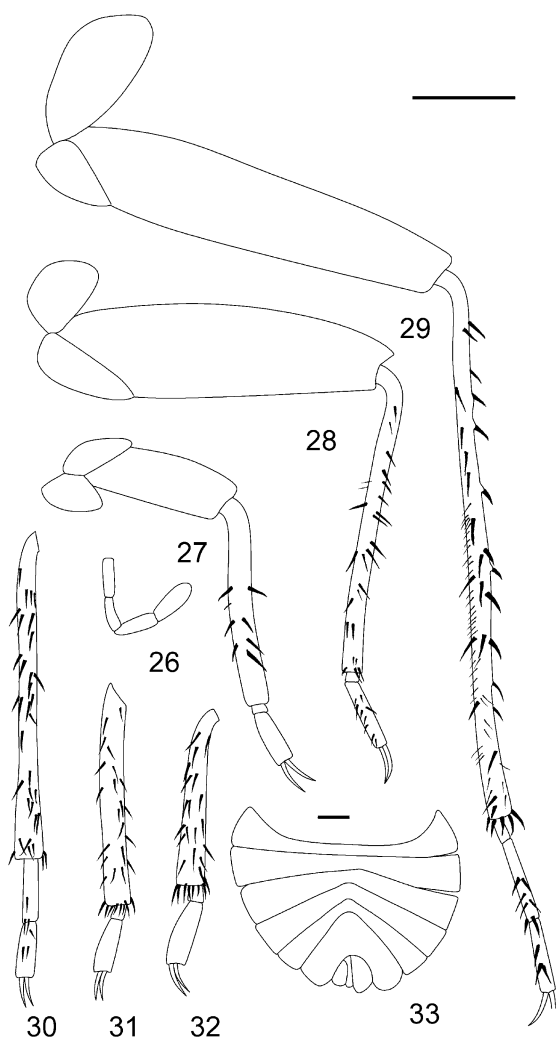
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Figs 22–25. *Pristinochterus zhangi* gen. et sp. n., photograph. 22 – ♂, CNU-HE-LB2006317; 23 – ♂, CNU-HE-LB2006310; 24 – ♀, CNU-HE-LB2006305; 25 – ♂, CNU-HE-LB2006309. Scale: 2 mm.



Figs 26–33. *Pristinochterus zhangi* gen. et sp. n., outline. 26 – antenna, CNU-HE-LB2006302; 27–29 – legs of adults: 27 – fore leg, CNU-HE-LB2006305, 28 – mid leg, CNU-HE-LB2006302, 29 – hind leg, CNU-HE-LB2006301; 30–32 – legs of nymphs, CNU-HE-LB2006316: 30 – fore leg, 31 – mid leg, 32 – hind leg; 33 – abdomen of male. Scale: 1 mm.

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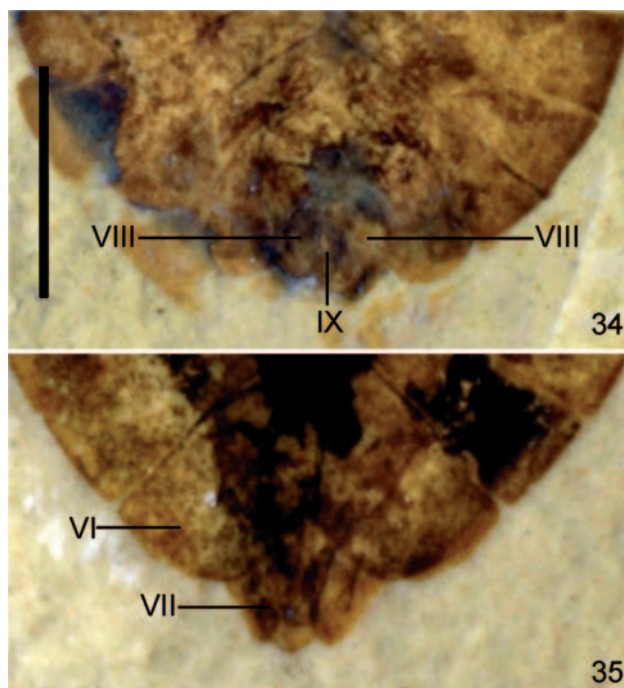
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Figs 34–35. *Pristinochterus zhangi* gen. et sp. n., photograph. 34 – abdomen of male; 35 – abdomen of female. Scale: 2 mm.

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