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动物分类学报

中国原哈格鸣螽科化石新发现(直翅目，哈格鸣螽科，阿博鸣螽亚科)

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摘 要 描述原哈格鸣螽科化石3新属，3新种：Flexaboilus retinervius gen. et sp. nov.，Angustaboilus fangianus gen. et sp. nov.，Novaboilus multifurcatus gen. et sp. nov.。所有化石标本均采自于内蒙古宁城道虎沟中侏罗世九龙山组地层，现保存于首都师范大学生命科学学院。

关键词 直翅目，原哈格鸣螽科，阿博鸣螽亚科，新属，新种，中国.
中图分类号 Q915.819.7

阿博鸣螽亚科 Aboilinae 是目前原哈格鸣螽科已发表的6亚科之一。Martynov 于1925年建立了阿博鸣螽科 Aboilidae，后来 Gorochov (1986) 将其调整为阿博鸣螽亚科 Aboilinae。Aboilinae 很可能是 Protaboilinae 的后裔，它是 Prophalangopsidae 最为丰富和多样性的亚科 (Gorochov, 2003)。

Aboilinae 目前已发表13属，主要分布年代为中侏罗世和晚侏罗世，主要分布地区为俄罗斯西伯利亚、中国、哈萨科斯坦及蒙古国 (Gorochov, 2003)。

最近作者自内蒙古宁城道虎沟九龙山组地层采得大量昆虫化石标本，其中包括了本文描述的3件阿博鸣螽亚科化石。其化石归属于中侏罗世九龙山组 (任东, 2002)。本文描述的标本保存于首都师范大学昆虫演化与变迁重点实验室。

本文所有线条图均借助于 Leica 显微镜附带绘图臂完成。采用的术语参考 Gorochov 所采用的系统。

原哈格鸣螽科 Prophalangopsidae Kirby，**1906**
阿博鸣螽亚科 Aboilinae Martynov，**1925**

Aboilidae Martynov, 1925. Bull. Aced. Sci. Russie, 569-598.
Aboilinae Gorochov, 1986. Trudy Zool. Inst. Akad. Nauk SSSR, 143: 65-100.
Aboilinae Gorochov, 1988. Paleontol. Zhurnal, (2): 54-66.
Aboilinae Gorochov, 1995. Pt. 1. Trudy Zool. Inst. Ross. Akad, 260: 126-137.

弯曲阿博鸣螽属，新属 Flexaboilus gen. nov.

模式种：Flexaboilus retinervius sp. nov.

词源：flex-(源自拉丁词 flex-，弯曲) + aboilus (Aboilinae 亚科 aboilus 属)，阳性。

鉴别特征 雄虫前翅 Fc 脉短，呈弧形，前缘域狭长。Sc 脉略呈 S 形，支脉多于15枝。R 脉在翅长1/3前分支，支脉5枝。Rs 脉支脉9枝。M-Cu 域基干部与 Sc-R 域基干部近等宽。MP + CuA_1 脉与 R 脉同时分支，支脉6枝。$2CuA_2$ 较倾斜，不与 $1CuA_2$ 平行。CuP 弯曲不强烈。

雌虫：未知。

比较与讨论 依据前翅 Fc 脉横切 Sc 脉支脉，MA 脉不与 Rs 脉汇合，MA 脉在 R-M 域最宽处分支，支脉2枝，MP 脉与 CuA_1 脉融合，合并一段后分支等特征将新属归于原哈格鸣螽科。又由 Fc 脉较发达，MP + CuA_1 支脉未到达翅顶角将其归入阿博鸣螽亚科。

本亚科目前已发表13属 (Gorochov, 2003)，其中 Aboilus Martynov, 1925 分布于哈萨克斯坦和俄罗斯西伯利亚地区晚侏罗世；Sunoprophanlangopsis Hong, 1982 分布于中国中侏罗世；Bacharaboilus Gorochov, 1988 分布于蒙古国中侏罗世；Apsataboilus Gorochov, 1990 分布于俄罗斯西伯利亚晚侏罗世和早白垩世；Prophalangopseides Sharov, 1968 分布于俄罗斯西伯利亚早白垩世；Tettaboilus Gorochov, 1988 分布于俄罗斯西伯利亚早白垩世；Utanaboilus Gorochov, 1990 分布于俄罗斯西伯利亚早白垩世也可能是晚白垩世；Brunneus Hong, 1983 分布于中国中侏罗世；Pseudohagla Sharov, 1962 分布于俄罗斯西伯利亚中侏罗世到晚侏罗世；Pycnophlebia Deichmuller, 1886 分布于德国晚侏罗世；Nipponohagla Fujiama, 1978 分布于日本早白垩世；Baissaboilus Gorochov, 1996 分布于俄罗斯西伯利亚早白垩世；Karatailus Gorochov, 1996 分布于哈萨克斯坦晚侏罗世。

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新属与已知属差异较显著, 前翅 Fc 脉短, 前缘域狭长; R_1 脉, Rs 脉及 MP + CuA_1 脉分支均较早, 分支较多; $2CuA_2$ 较倾斜, 不与 $1CuA_2$ 平行。

新属与 Aboilus Martynov, 1925 较为相近, 但新属前缘域狭长, $2CuA_2$ 较倾斜, 不与 $1CuA_2$ 平行, R 脉与 MP + CuA_1 脉同时分支, CuP 弯曲不强烈。

网脉弯曲阿博鸣蟌, 新种 Flexaboilus retinervius sp. nov. (图 1, 6)

正模: 一块保存较完整的雄虫前翅标本, 编号: CNU-O-NN-2006107。

词源: "retinervius"源自拉丁词, 网状脉的。

产地及层位: 内蒙古宁城道虎沟, 九龙山组(中侏罗世)。

描述　雄虫前翅翅长 71 mm, 翅宽 33 mm (保存部分)。翅面具深色带斑 (见图 6)。翅基部较宽, 近端部逐渐收缩。Fc 脉短, 呈弧形, 在翅长 1/4 处达翅前缘。前缘域狭长, 亚前缘域宽阔。Sc 脉略呈 S 形, 在翅长 4/5 处融于前缘, 支脉 16 枝, 近平行排列, 其间有间插脉。R 脉自翅基部发出, 在翅长 1/3 稍前分支, R_1 脉在超过翅长 1/3 后再分支, 支脉 5 枝, 近平行排列, 其间规则横脉发育。Rs 脉在 R_1 脉分支后稍后分支, 支脉 9 枝, 梳状排列, 其间不规则横脉发育。Sc-R 域基干部较窄, 其间规则横脉发育。R_1-Rs 域基干部较窄, 其间规则横脉发育。M 脉自翅基部发出, MA 脉在 R 脉分支前叉状分支, 2 支脉弓形, 近平行排列, 其间 2 组横脉发育。R-M 域基干部较宽, 其间 2 组横脉发育。M-Cu 域基干部与 Sc-R 域基干部近等宽。MP 脉自 MA 脉分支前分出, 与 CuA 脉融合, 合并一段后分出。MP + CuA_1 脉与 R 脉同时分支, 末端 6 枝, 其间不规则横脉发育。$2CuA_2$ 较倾斜, 不与 $1CuA_2$ 平行。CuP 近端较倾斜, 远端呈弓形。

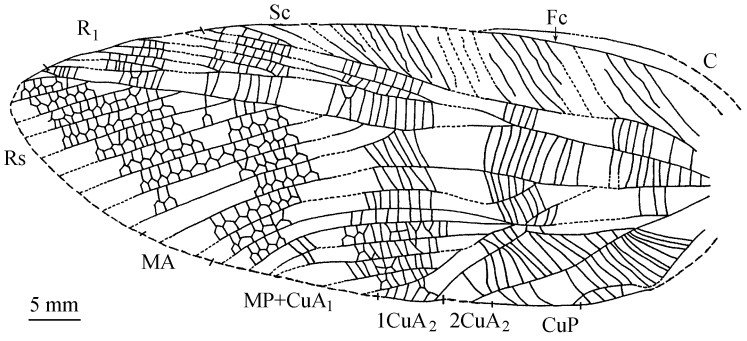

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图 1　网脉弯曲阿博鸣蟌, 新种 Flexaboilus retinervius sp. nov., 正模, 雄性 (holotype, male), CNU-O-NN-2006107, 前翅翅脉 (draw line of the forewing)

狭阿博鸣蟌, 新属 Angustaboilus gen. nov.

模式种: 房氏狭阿博鸣蟌 Angustaboilus fangianus sp. nov.

词源: angust-(源自拉丁词 angusti-, 狭) + aboilus (Aboilinae 亚科 aboilus 属), 阳性。

鉴别特征　雌虫前翅 Fc 脉短, 呈弧形。前缘域略呈三角形, 其间纵脉放射状排列。Sc 脉直, 约在翅长 3/4 处达前缘, 支脉多于 10 枝。R 脉约在翅长 1/3 处分支, 支脉 7 枝。Rs 脉分支较晚, 在 R_1 脉第 2 支脉稍后分支, 支脉 7 枝。M-Cu 域基干部与 Sc-R 域基干部近等宽。MP + CuA_1 脉与 R 脉同时分支, 支脉 3 枝。

雄虫: 未知。

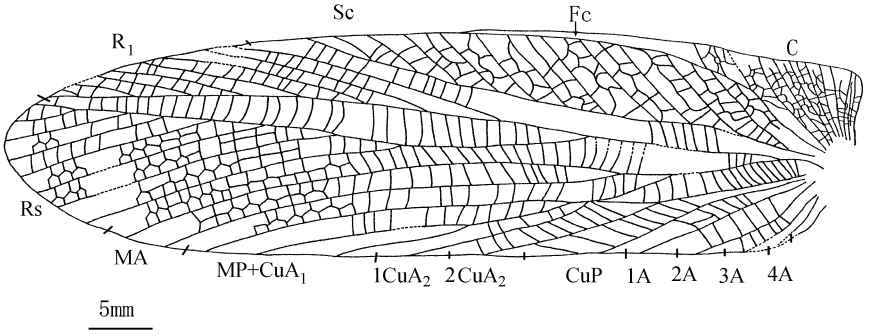
比较与讨论　新属与 Sunoprophanlangopsis Hong, 1982 较为相似, 但新属 Fc 脉成弧形, R_1 脉与 Rs 脉分支较多, Rs 脉分支较晚等特征与其区别明显。该属与 Utanaboilus Gorochov, 1990 较为相近, 但新属 R_1 脉分支较多, MP + CuA_1 脉分支较少, Rs 脉分支较晚等特征与其区别明显。

房氏狭阿博鸣蟌, 新种 Angustaboilus fangianus sp. nov. (图 2～4, 8～11)

正模: 一块前后翅均保存的雌虫标本, 编号: CNU-O-NN-2006108。

词源: 种名以房良先生的姓氏命名, 感谢他赠与的化石。

产地及层位: 内蒙古宁城道虎沟, 九龙山组(中侏罗世)。



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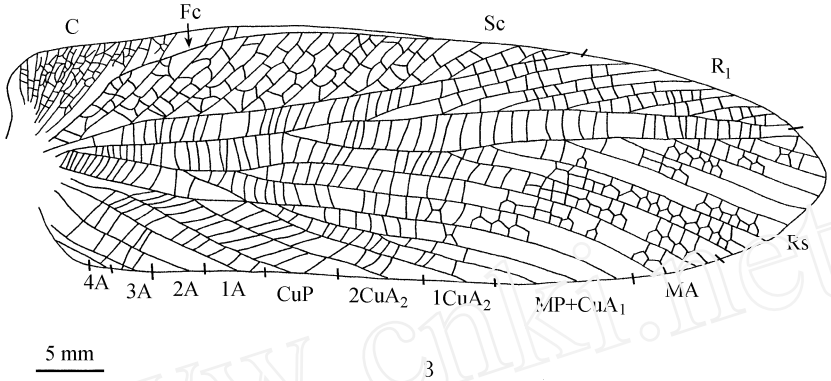

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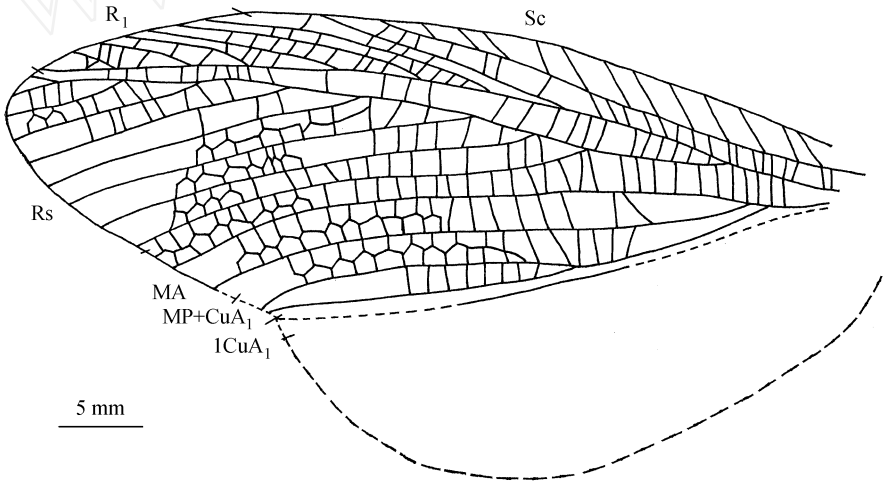

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图 2～4　美丽狭阿博鸣螽，新种 Angustaboilus fangianus sp. nov.
正模，雌性 (holotype, male), CNU-O-NN-2006108　2. **左前翅** (left forewing)　3. **右前翅** (right forewing)　4. **后翅** (hind wing)

描述　雌虫前翅翅长 57 mm，左翅翅宽 15 mm，右翅翅宽 16 mm。翅面狭长，呈深褐色 (图 8～11)。Fc 脉短，呈弧形，在翅长 1/2 稍前达翅前缘。前缘域狭长，略呈三角形。亚前缘域宽阔。Sc 脉直，约在翅长 3/4 处融于前缘，左翅支脉 11 枝，右翅支脉 12 枝，近平行排列，其间不规则横脉发育。R 脉自翅基部发出，约在翅长 1/3 处开始分支，R_1 脉在越过翅长 1/3 处再分支，左翅支脉 8 枝，右翅支脉 7 枝，近平行排列，其间规则横脉发育。Rs 脉在 R_1 脉第 2 支脉稍后分支，支脉 7 枝，梳状排列，其间不规则横脉发育。Sc-R 域基干部较窄，其间规则横脉发育。R_1-Rs 域基干部较宽，其间有规则横脉发育。M 脉自 R 脉基部发出，MA 脉在 R 脉分支前叉状分支，2 支脉弓形，近平行排列，其间有 2 组横脉

发育。R-M 域基干部较窄，其间有 2 组横脉发育。M-Cu 域基干部与 Sc-R 域基干部近等宽。MP 脉自 MA 脉分支前分出，与 CuA 脉融合，合并一段后分出。MP + CuA_1 脉与 R 脉同时分支，末端 3 枝，近平行排列，其间规则横脉发育。1CuA_2 脉与 2CuA_2 脉，CuP 脉平行。1CuA_2-2CuA_2 域与 2CuA_2-CuP 域较窄，其间规则横脉发育。A 脉 4 枝，其间规则横脉发育。

后翅翅长 45 mm，翅宽 15.5 mm（保存部分）。翅面呈深褐色（图 11）。翅基部强烈收缩。Sc 脉直，在翅长 1/2 稍后达翅前缘，支脉 12 枝，近平行排列。R 脉在翅长 1/5 处分支，R_1 脉在翅长 1/3 处再分支，支脉 7 枝，近平行排列，其间规则横脉发育。Rs 脉在 R_1 脉分支前分支，支脉 8 枝，近梳状排列，其间不规则横脉发育。MA 脉在 R 脉分支前叉状分支，两支脉平行排列，其间 2 组横脉发育。MP 自 M 脉基部发出，支脉 2 枝，其间规则横脉发育。

新阿博鸣螽，新属 Novaboilus gen. nov.

模式种：多叉新阿博鸣螽 Novaboilus multifurcatus sp. nov.

词源：nov-（源自拉丁词 novi-，新）+ aboilus (Aboilinae 亚科 aboilus 属)，阳性。

鉴别特征　雄虫前翅 Fc 脉较短，呈弧形。前缘域较宽。Sc 脉直，在翅长 2/3 处达前缘，支脉少于 10 枝，其间支脉再分支。R 脉约在翅长 1/3 处分支，R_1 脉支脉 4 枝。Rs 脉在 R_1 脉分支前分支，支脉 8 枝。M-Cu 域基干部与 Sc-R 域基干部近等宽，MP + CuA_1 脉分支略早于 R 脉，支脉 5 枝。

雌虫：未知。

比较与讨论　新属与 Aboilus Martynov，1925 较为相近，但新属 Sc 脉分支较少，Rs 脉分支早于 R_1 脉，MP + CuA_1 脉末端带 5 支等特征与其区别明显。新属与 Brunneus Hong，1983 较为相近，但新属 Fc 脉短；前缘域较宽；Rs 脉，MP + CuA_1 脉分支较多；R_1 脉，Rs 脉分支点距离 R 脉分支点较近等特征与其区别明显。

多叉新阿博鸣螽，新种 Novaboilus multifurcatus sp. nov.（图 5，7）

正模，一件保存较好的雄虫前翅标本，编号：CNU-O-NN-2006090。

词源："multifurcatus"源自拉丁词，多叉。

产地及层位：内蒙古宁城，九龙山组（中侏罗世）。

描述　雄虫前翅翅长 50 mm，翅宽 18 mm（保存部分）。翅面具深色带斑（图 7）。Fc 脉直，在翅长 1/2 稍前融于前缘，前缘域较宽。Sc 脉直，约在翅长 2/3 处达翅前缘，支脉 9 枝，其支脉再次分支，其间有间插脉发育。R 脉自翅基部发出，在翅长 1/3 处分支，R_1 脉在翅长 1/2 处再次分支，支脉 4 枝，其间规则横脉发育。Rs 脉在 R_1 脉分支前分支，支脉 8 枝，近梳状排列，其间不规则横脉发育。Sc-R 域基干部较宽，其间规则横脉发育。R_1-Rs 域基干部较宽，其间规则横脉发育。M 脉自翅基部发出，MA 脉在 R 脉分支前叉状分支，2 支脉弓形，近平行排列，其间规则横脉发育。R-M 域基干部较宽，其间规则横脉发育。M-Cu 域基干部与 Sc-R 域基干部近等宽。MP 脉自 MA 脉分支前分出，与 CuA 脉融合，合并一段后分出。MP + CuA_1 分支稍早于 R 脉，末端 5 枝，其间规则横脉发育。2CuA_2 较倾斜，不与 1CuA_2 平行。MP + CuA_1-1CuA_1 域及 1CuA_1-2CuA_2 域较窄，其间规则横脉发育。

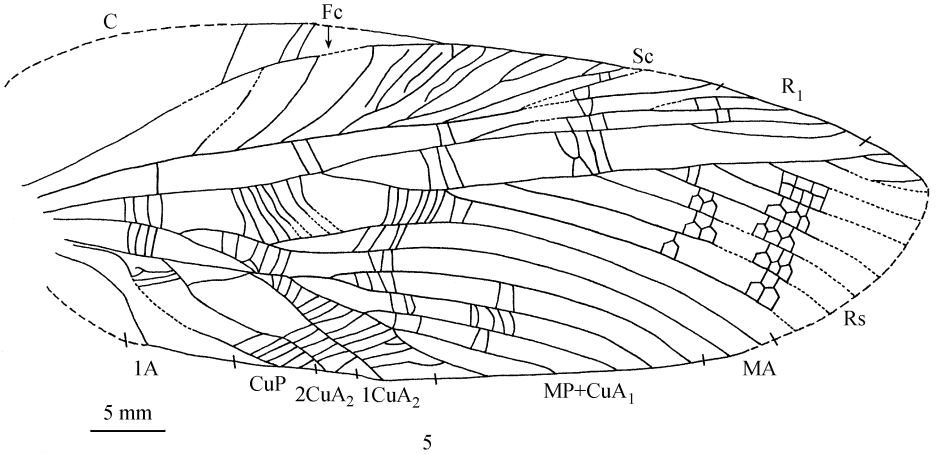

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图 5　多叉新阿博鸣螽，新种 Novaboilus multifurcatus sp. nov.，正模，雄性（holotype，male），CNU-O-NN-2006090，前翅翅脉（draw line of the forewing）

图 6 **网脉弯曲阿博鸣螽，新种** Flexaboilus retinervius sp. nov.
图 7 **多叉新阿博鸣螽，新种** Novaboilus multifurcatus sp. nov.

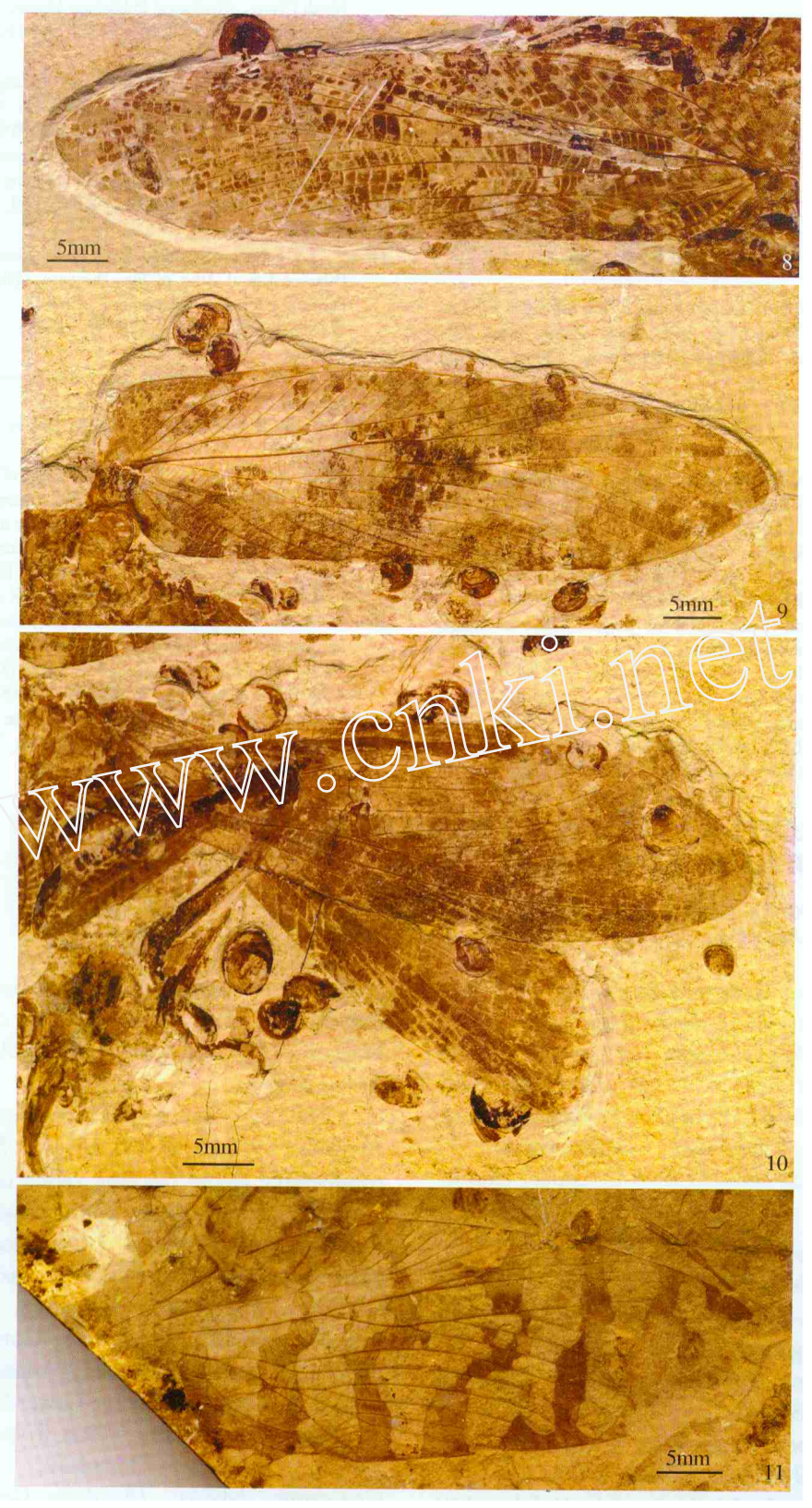

图 8～11　美丽狭阿博鸣螽, 新种 Angustaboilus fangianus sp. nov.
8. 整体 (body with wings)　9. 左前翅 (left forewing)　10. 右前翅 (right forewing)　11. 后翅 (hind wings)

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NEW FOSSIL PROPHALANGOPSIDS FROM CHINA (ORTHOPTERA, PROPHALANGOPSIDAE, ABOILINAE)

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Abstract In this paper three new genera and three new species were described: Flexaboilus retinervius gen. et sp. nov., Angustaboilus fangianus gen. et sp. nov. and Novaboilus multifurcatus gen. et sp. nov. All type specimens were collected from the Middle Jurassic Jiulongshan Formation at Daohugou Village, Ningcheng, Inner Mongolia, China and deposited in Capital Normal University.

Flexaboilus gen. nov.

Holotype: Flexaboilus retinervius sp. nov.

Etymology. Flex- (from Latin flex-, means bend) + aboilus (name of genus aboilus), masculine.

Diagnosis. Male, Fc short, arched. Precostal field narrow. Sc S-shaped, with more than 15 branches. R forked before 1/3 of the wing length, with 5 branches. Rs with 9 branches. Width of the basal part of M-Cu field equal to the basal part of Sc-R field. MP + CuA_1 and R forked at the same level, with 6 branches. $2CuA_2$ quite incline, and not parallel to $1CuA_2$. CuP slightly curve.

Female: unknown.

Discussion. The new genus was assigned to the family Prophalangopsidae by elytrum with branches of Sc intersected by developed Fc; MA not fused with Rs and branched off from most convex part of R-M field, with 2 branches; MP coalesced with CuA_1 basally and then diverged again.

The new genus was assigned to the subfamily Aboilinae by well developed Fc, MP + CuA_1 ending considerably before reaching vertex of elytrum.

At present, the subfamily consists of 13 previously described extinct genera (Gorochov, 2003). Aboilus Martynov, 1925 from Upper Jurassic, Kazakhstan and Siberia; Sunoprophanlangopsis Hong, 1982 from middle Jurassic, China; Bacharaboilus Gorochov, 1988 from Middle Jurassic, Mongolia; Apsataboilus Gorochov, 1990 from Upper Jurassic or Lower Cretaceous, Siberia; Prophalangopseides Sharov, 1968 from Lower Cretaceous, Siberia; Tettaboilus Gorochov, 1988 from Lower Cretaceous, Siberia; Utanaboilus Gorochov, 1990 from Lower and Possibly Upper Cretaceous, Siberia; Brunneus Hong, 1983 from middle Jurassic, China; Pseudohagla Sharov, 1962 from Middle-Upper Jurassic of Siberia; Pycnophlebia Deichmuller, 1886 from Upper Jurassic of Germany; Nipponohagla Fujiama, 1978 from Lower Cretaceous of Japan; Baissaboilus Gorochov, 1996 from

Lower Cretaceous of Siberia; Karatailus Gorochov, 1996 Upper Jurassic, Kazakhstan. The new genus different from them by Fc short; precostal field narrow; R_1, Rs and MP + CuA_1 beginning to branch very early, with numerous branches; $2CuA_2$ slightly curve, and not parallel to $1CuA_2$.

The new genus is similar to Aboilus Martynov, 1925, but were different from it in following characters: Precostal field narrow; $2CuA_2$ quite incline and not parallel to $1CuA_2$; R and MP + CuA_1 forked at the same level and CuP slightly curve.

Flexaboilus retinervius sp. nov. (Figs. 1, 6)

Etymology. "retinervius" from Latin, means meshwork.

Locality and horizon: Daohugou Village, Ningcheng, Inner Mongolia. Middle Jurassic, Jiulongshan Formation.

Description. Forewing length 71 mm, width 33 mm (as preserved). Fc short, arched. Sc S-shaped, with 16 parallel branches. R forked before 1/3 of the wing length, with 5 parallel branches. Rs forked later than R_1, with 9 parallel branches. MP + CuA_1 and R forked at the same level, with 6 branches. $2CuA_2$ quite incline, and not parallel to $1CuA_2$. CuP slightly curve.

Angustaboilus gen. nov.

Holotype: Angustaboilus fangianus sp. nov.

Etymology. angust- (from Latin angusti-, means narrow) + aboilus (name of genus aboilus), masculine.

Diagnosis. Female, Fc short, arched. Precostal field triangle, veinlets radial. Sc straight, extending about 3/4 of the wing length, with more than 10 branches. R forked at 1/3 of the wing length, with 7 branches. Rs forked after second branch of R_1, with 7 branches. Width of the basal part of M-Cu field equal to the basal part of Sc-R field. MP + CuA_1 and R forked at the same level, with 3 branches.

Male: unknown.

Discussion. This new genus is similar to Sunoprophanlangopsis Hong, 1982, but were different from the latter by following characters: Fc arched, R_1 and Rs with several branches and Rs forked very late. The new genus is also similar to Utanaboilus Gorochov, 1990, however, it could be distinguished from the latter by following characters: Rs with numerous branches, MP + CuA_1 with few branches and Rs branched very late.

Angustaboilus fangianus sp. nov. (Figs. 2-4, 8-11)

Etymology. "fangianus" was name after Fang Liang for the fossil that he donated.

Locality and horizon. Daohugou Village, Ningcheng, Inner Mongolia. Middle Jurassic, Jiulongshan Formation.

Description. Forewing length 57 mm, width 15 mm. Fc short, arched. Precostal field triangle, veinlets radial. Sc straight, extending at about 3/4 of the wing length, left forewing with 11 branches, right forewing with 12 branches. R forked at 1/3 of the wing length, left forewing with 8 branches, right forewing with 7 branches. Rs forked after second branch of R_1, with 7 branches. MP + CuA_1 and R forked at the same level, with 3 branches. Hind wing length 45 mm, width 15.5 mm (preserved). Sc straight, with 12 branches. R forked at 1/5 of the wing length, with 7 parallel branches. Rs forked earlier than R, with 8 parallel branches.

Novaboilus gen. nov.

Holotype: Novaboilus multifurcatus sp. nov.

Etymology. nov- (from Latin novi-, means new) + aboilus (name of genus aboilus), masculine.

Diagnosis. Male, Fc short, arched. Precostal field broad. Sc straight, extending at about 2/3 of the wing length, with less than 10 branches, the branches forked again. R forked at 1/3 of the wing length. R_1 with 4 branches. Rs forked earlier than R_1, with 8 branches. Width of the basal part of M-Cu field equal to the basal part of Sc-R. MP + CuA_1 forked earlier than R, with 5 branches.

Female: unknown.

Discussion. This new genus is similar to Aboilus Martynov, 1925, but were different from it in following characters: Sc with few branches, Rs forked earlier than R_1 and MP + CuA_1 with 5 branches. The new genus is also similar to Brunneus Hong, 1983. Whereas the new genus could be distinguished from the latter by Fc short, precostal field broad, Rs and MP + CuA_1 with numerous branches, R_1 and Rs beginning to branch very far from their bases.

Novaboilus multifurcatus sp. nov. (Figs. 5, 7)

Etymology. "multifurcatus" from Latin, means many forks.

Locality and horizon: Daohugou Village, Ningcheng, Inner Mongolia. Middle Jurassic, Jiulongshan Formation.

Description. Forewing length 57 mm, width 15 mm (as preserved). Fc short, arched. Sc straight, extending at about 2/3 of the wing length, with 9 branches. R forked at 1/3 of the wing length, with 4 branches. Rs forked earlier than R_1, with 8 parallel branches. MP + CuA_1 forked earlier than R, with 5 branches.

Key words Orthoptera, Prophalangopsidae, Aboilinae, new genus, new species, China.