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中生代的虻类(昆虫纲)*

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内 容 提 要

记述山东莱阳上侏罗统莱阳组昆虫化石2新属2新种,分别隶属于Solvidae科和Rhagionidae科。这些虻类化石在我国中生代晚期地层中尚属首次发现,其中Solvidae科种类也是首次在世界中生代晚期地层中发现。文中对有关的古生态、昆虫与植物的关系进行了讨论。同时,对我国已记录的中生代的虻类化石在分类学中存在的问题提出了某些新的见解。

关键词 双翅目 短角亚目 分类学 生态学 中生代

虻类是昆虫纲(Insecta)双翅目(Diptera)短角亚目(Brachycera)的俗称,属于较为进化的一个高级分类阶元。世界上已知的这个类群在中生代主要分布于原苏联和蒙古,我国迄今仅见于辽宁的中侏罗统,计有3属3种。本文记述了山东莱阳晚侏罗世虻类化石2新属2新种,分别隶属于Solvidae科和Rhagionidae科。这些虻类化石在我国中生代晚期地层中尚属首次发现,其中Solvidae科过去仅见现生种类,目前在中生代晚期地层中的发现,把这个科的地质历史回溯至中生代晚期,这对研究这个科的系统发生和演化提供了重要材料。

文中对2个新属和新种的古生态、昆虫与植物的关系以及演化问题进行了讨论。同时,对已往我国已记录的虻类化石在分类学中所存在的问题提出了某些新的意见。

与昆虫共生的植物标本承蒙中国科学院南京地质古生物研究所孙革同志鉴定;图版照片由胡尚卿同志摄制,在此一并表示衷心感谢。

一、属种描述

木虻科 Solvidae

始木虻属(新属) *Archisolva* gen. nov.

模式种 *Archisolva cupressa* gen. et sp. nov.

属征 体中等大小。头宽大于长;复眼左右分离;触角长于头,第1节显长于第2节,第2节卵圆形,第3节甚长,由12个环节组成。胸部钝方形,几乎与头等宽。足细长,胫端距不可分辨,后跗节长于胫节,第1跗节显长于第2跗节。翅狭长;翅脉粗壮;c抵达翅顶;Sc止于翅长约2/3的C上;R_1止于翅长3/4的C上;Rs由翅长约1/3处从R上分出;m-m显长,与M_{1+2}分叉点连接;lst m_2室长且显宽于m_{3+4}室,后者呈狭长三角形。腹部筒形,8节,显长于头胸长度

* 国家自然科学基金资助项目成果之一。

之和。

比较　Solvidae 科是现代生存的分布较广的二个小科，包括数属几十种。关于这个科的分类位置，各家意见不一，有的把其置于 Stratiomyoidea 总科之中，作为单独的 1 个科，有的视其为 Stratiomyidae 科中的 1 个亚科；有的把其归入 Tabanoidea 总科，视其为单独的一个科。

这个新属与现代的 *Solva* Walker 较为相似，主要以触角第 3 节的环节数较多；胫端距不可分辨；翅 R_1 显长，Rs 分出点近翅基部，m-m 显长，与 M_{3+4} 分叉点连接，1st m_2 室显宽大等特征与后者不同

时代分布　晚侏罗世；中国山东。

柏始木虻(新属、新种)　*Archisolva cupressa* gen. et sp. nov.

(图版 I，图 1；插图 1)

材料　1 块虫体背面保存标本；黑褐色。登记号：L88811(Holotype)。

描述　头部：近三角形，宽为长的 1.4 倍。复眼近卵形，占据头的大部分。触角长为头长的 1.3 倍，第 1 节长柱状，长为宽的 2 倍，第 2 节宽大于长，第 3 节长为第 1、2 两节之和的 3 倍，各环节方柱形，基部数节长显大于宽，端部数节宽大于长，节芒短小。

胸部：长宽近相等，几乎全部为中胸盾片，唯后部似显小盾片的轮廓。足满布短毛；足跗节端部 4 节颜色较深，呈褐色，余淡黄褐色，但在头前似有 1 支从虫体上脱落下来的足，其股节似显长，为褐色；后足股节粗于且显短于胫节，跗节长为胫节长的 1.2 倍，第 1 跗节与余 4 跗节长度之和近等长，约为胫节长的 2/3。

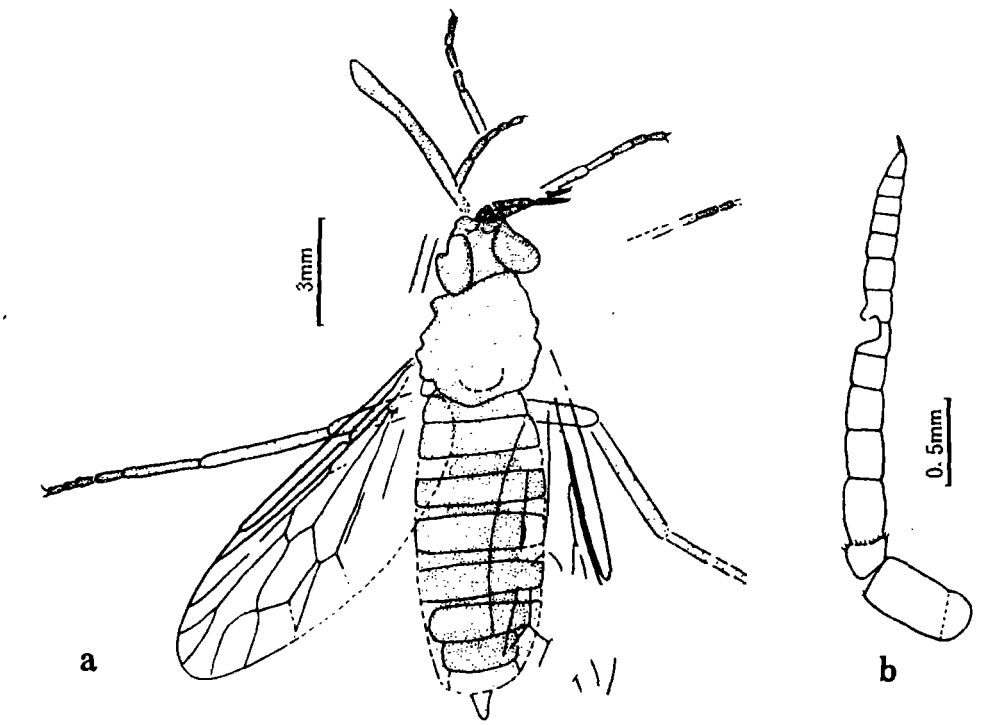

插图 1　*Archisolva cupressa* gen. et sp. nov.

a. 虫体背面观(body，dorsal view)，b. 触角(antenna)；登记号：L88811

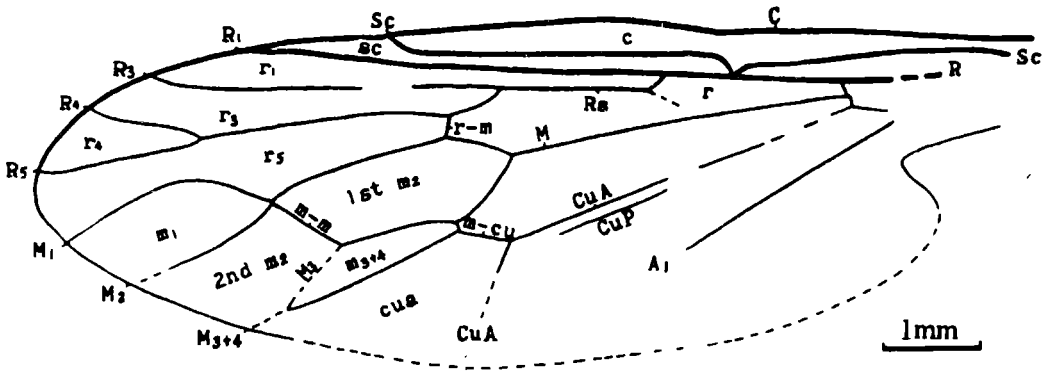

插图 2 *Archisolva cupressa* gen. et sp. nov. 左翅(left wing)

登记号:L88811

翅:无色透明;长为宽的 2.9 倍。C 粗壮,平直;Sc 粗壮,颜色略浅,近 R_1,在中部折断(左翅),但右翅完整;R 和 R_1 粗壮;Rs 几乎与 R_1 平行,彼此较接近,其分叉点较迟,几乎与 M 分叉点在同一条垂直线上,前分支简单,较平直,后分支略波曲,R_{4+5}分叉点较迟,显后于 M_{1+2}分叉点,R_5 止于翅顶略偏上方;M 约在翅中分叉,M_{1+2}和 M_{3+4}远离,M_{1+2}在 R_1 终点之前分叉,M_1 向上弧状弯曲,M_2 向下缓弧状弯曲,M_{3+4}分叉点在翅中偏端部,M_3 的基半部几乎与 M_{1+2} 平行,m-m 之后的端半部在左翅丢失,在右翅清晰可见,M_4 的基部呈 90°折曲,其后较平直;m-m 显长于 m-cu,后者长约为 r-m 长的 2 倍;CuA 和 A_1 的端部未保存。

腹部:长为头胸长度之和的 1.6 倍;最宽处位于第 3 腹节;第 8 腹节颜色显浅;产卵器颜色浅,短,略呈三角形。

虫体长 14.2mm,宽 3.7mm;头长 2.0mm;触角长 2.9mm;胸长 3.2mm;腹长 8.6mm;后足长 12.0mm;翅长 11.0mm。

产地层位 山东莱阳南李格庄村,上侏罗统莱阳组。

鹬虻科 Rhagionidae

足鹬虻属(新属) *Scelorhagio* gen. nov.

模式种 *Scelorhagio mecomastigus* gen. et sp. nov.

属征 体小型。头中等大小,圆形;触角 3 节,第 1、2 节扁宽,第 3 节近圆形,大,端部具长节芒,似分节;喙粗且长,但柔软。胸部粗壮;盾片隆起。足细长;后足显长于前、中足;跗节第 1 节显长于第 2 节。翅狭长;C 抵翅顶;Sc 与 R 在基部合并,前者止于翅中 C 上,R_1 止于翅长约 2/3 的 C 上;R 分叉点约在翅长 1/3 处;R_1 粗壮;Rs 主干短,其前后分支长,R_3 在端部明显向上弯曲,R_{4+5}分叉点较 R_1 终点略偏翅基部,R_4 和 R_5 皆长,彼此靠近,向下弯曲;M 具 4 分支;1st m_2 室狭长;m-m 斜且长,与 M_2 连接;CuA 和 A_1 在近翅后缘处合并。腹部粗短,7 节;雌性产卵器短小,后伸。

比较 Rhagionidae 科是现代生存的一个大科,包括 400 余种。这个科在中生代已发现 14 属。其中原苏联西伯利亚外贝加尔(Trans Baikal)早—中侏罗世有 3 属:*Palaeobrachyceron* Kovalev,*Jurabra-chyceron* Kovalev,*Ija* Kovalev,中—晚侏罗世计有 4 属:*Palaeoptiolina* Ko-

valev，*Ussatchovia* Kovalev，*Palaeobolbomyia* Kovalev，*Kubekovia* Kovalev；原苏联哈萨克卡拉套(Karatau)晚侏罗世有 5 属：*Rhagionempis* Rohdendorf，*Probolbomyia* Ussatchov，*Archirhagio* Rohdendorf，*Protorhagio* Rohdendorf，*Rhagiophryne* Rohdendorf；蒙古西部戈壁阿尔泰(Gobi-altai)早白垩世计有 2 属：*Mongolomyia* Kovalev，*Ptiolinites* Kovalev。

本文所建立的这个新属与 *Ptiolinites* 比较接近，区别是新属的触角节芒甚长；足显长，R_3 端部明显向上弯曲，1st m_2 室更狭长，m-m 与 M_2 连接。虽然新属的翅脉特征与 *Jurabrachyceron* 颇为接近，但两者触角第 3 节的特征明显不同。

时代分布　晚侏罗世，中国山东。

长鞭足鹬虻(新属、新种)　***Scelorhagio mecomastigus* gen. et sp. nov.**

(图版 Ⅰ，图 2；插图 3)

材料　1 块虫体右侧保存标本；褐色。登记号：L88812(Holotype)。

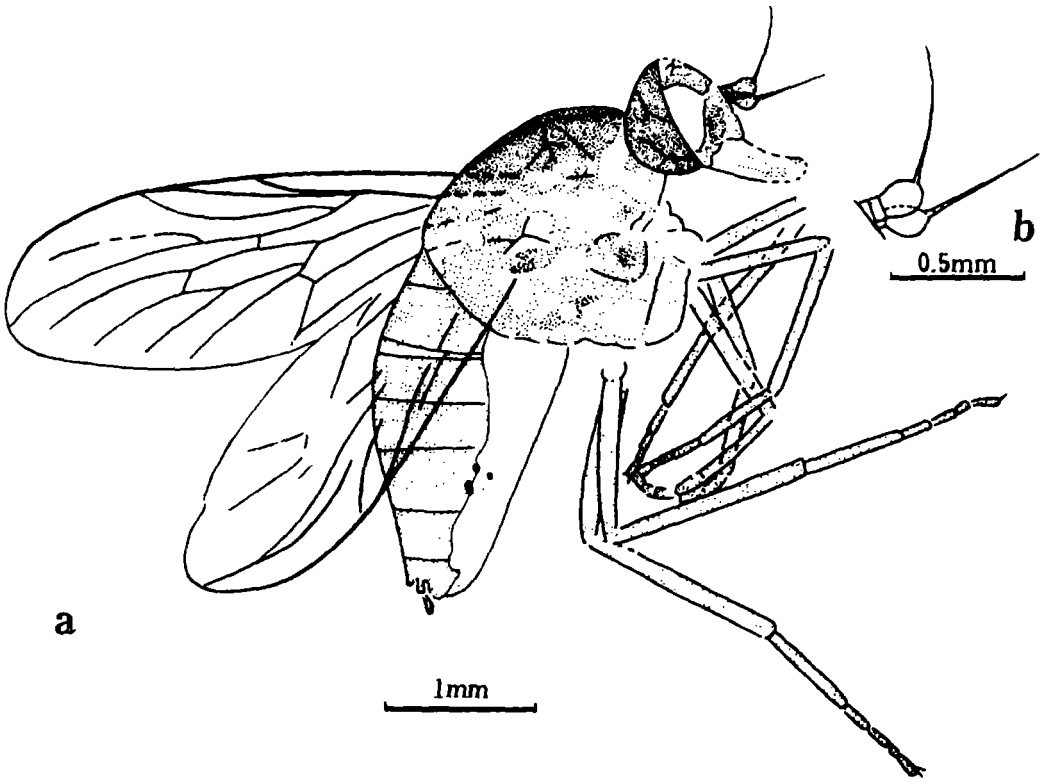

插图 3　*Scelorhagio mecomastigus* gen. et sp. nov.
a. 虫体右侧观(body，right lateral view)，b. 触角(antenna)
登记号：L88812

描述　头部：中部有块近三角形的区域，颜色甚浅；复眼保存似不佳，似满布头侧面，仅个别小眼面可以分辨。触角 1、2 节同形，宽近相等，约为各自长的 2.5 倍，第 3 节长几乎与第 1、2 节之和相等，节芒长为第 1、2、3 节长度之和的 2 倍，其中，左侧触角节芒似有分节痕迹；触角全长与头长几乎相等。喙基部粗于端部，颜色甚浅，仅端部略深，为浅黄褐色，长度略短于头。

胸部：显厚于头和腹；盾片弧状弯曲；小盾片不可分辨；无鬃，未见任何毛丛。足满布短毛，

颜色统一，为淡褐色；股节短于胫节，后者短于跗节；第1跗节长与余4节长度之和近相等；第2、3、5节近等长，第4节显短；爪长，爪垫不可分辨。

翅：无色透明，长约为宽的2.8倍。除C、Sc、R和R_1粗壮外，余细弱。C较平直；Sc在翅长约1/3处自R发出，缓弯；R_1略有弯曲；在R_1终点处R_3明显向上折曲，终点近R_1；Rs分叉点之后的R_{4+5}斜向翅顶，显短于R_4和R_5，后两者均明显向上弧状弯曲，R_5止于翅顶；M分叉点较Rs分叉点略迟，M_{1+2}分叉点较R_{4+5}分叉点略迟，M_{1+2}和M_1与R_{4+5}和R_5近平行，M_2基部折曲，其后与M_1近平行，M_{3+4}主干显短，M_3和M_4近平行；CuA和A_1在近翅后缘处合并；m-m显长且斜，为m-cu长的2倍，后者略长于r-m.1st m_2室长为宽的4.5倍。

腹部：几乎与头胸长度之和相等；基部最宽，向端部渐窄；近腹面颜色甚浅；产卵器细小，长柱形。

虫体长4.0mm，厚1.7mm；触角（包括节芒）长0.7mm；头长0.7mm；胸长1.6mm；腹长2.4mm；后足长4.1mm；翅长3.4mm。

产地层位 山东莱阳南李格庄村，上侏罗统莱阳组。

二、讨 论

Solvidae科的化石种类罕见。我国山东莱阳晚侏罗世的*Archisolva cupressa* gen. et sp. nov.是中生代无疑问的Solvidae科的分子，因此这个现生科的历史可以延伸到中生代晚期。与现代种类比较，这个化石绝灭种的触角第3节的环节数目显然较多，由12节组成，而现代种类通常为8节；胫端距在化石种类上不可分辨，而现代种类十分发育，也是Solvidae科与其近缘科如Stratiomyidae科的重要区别之一；在翅脉特征上，*Archisolva cupressa* gen. et sp. nov.的R_1显长，Rs由近翅基部的R上分出，1st m_2室十分宽大等特征也明显不同于现代的种类。因此，似可以做出以下推断：上述特征是属于原始性状，Solvidae科的演化在触角和翅脉特征上比较明显，触角第3节环节数目减少，翅R_1变短，Rs分出点向翅中移动，1st m_2室变小变窄等。

由于Solvidae科的现代种类通常生活于林区，因此，推断*Archisolva cupressa*也是森林昆虫。在这个化石绝灭种的同一产地同一层位发现有不少松柏类植物化石，其中1种极似现代扁柏*Brachyphyllum obesum* Heer的数量较多。由此推断这种木虻与当时的松柏植物关系可能十分密切，有可能就是*B. obesum*的居主。

虽然Rhagionidae科中生代的种类在原苏联和蒙古已有不少报道，然而，*Scelorhagio mecomastigus* gen. et sp. nov.是我国中生代的第一个化石记录。这个类群的现代种类通常生存于近水边的林地或在树皮下、粪便、菌类、木材或泥中。根据含化石层位的埋葬学特征的分析，在当时莱阳古湖边仅有一种木贼类（Equisetales）植物生存。因此，这个化石种的生境很可能与木贼有关。

我国虻类化石在此之前仅记录3属3种，全部产于辽宁北票中侏罗统海房沟组。其中，*Beipiaoplecia malleformis* Lin被视为长角亚目（Nematocera）Eopleciidae科的分子（林启彬，1976；洪友崇，1983），而原苏联虻类化石分类学者Ковалев（1982）认为其应归入短角亚目的食虫虻类（Asilomorpha）。根据这个种发表时的图版照片（林启彬，1976，图版Ⅰ，图9），其头部前方具有甚短的触角，节芒清晰可见，因此，柯氏的意见无疑是正确的。就其余2种，即*Mesosolva*

parva Hong 和 *Prosolva huabeiensis* Hong 来说，其科级分类位置值得商榷。这两个种的创名者(洪友崇，1983)把其置于 Solvidae 科的理由主要根据两点：复眼属离眼式；翅 m_{3+4} 室封闭。但是，Solvidae 科的另一个重要的鉴别特征，即触角第 3 节由 8 个环节组成，整个触角形态颇似长角亚目的 Bibionidae 科在原文描述和讨论中并未涉及。由于 *M. parva* 的触角第 3 节简单且显短，端部具较长的节芒(原文描述和绘制的插图似有误，原文触角第 2 节应为第 3 节，因为虻类触角通常为 3 节，第 3 节端部具节芒)，所以，这个种不能置于 Solvidae 科。*P. huabeiensis* 的触角特征(洪友崇，1983，图版 23，图 7)似与 *M. parva* 相似，在头部的前面很短且具节芒。根据上述依据也不能归入 Solvidae 科。根据原文描述，这两个种的翅脉特征颇似现代 Solvidae 科的种类。如果观察翅脉特征无误的话，很可能是属于与 Rhagionidae 科近缘的一个未知的类群，其科级分类位置尚值得进一步研究。

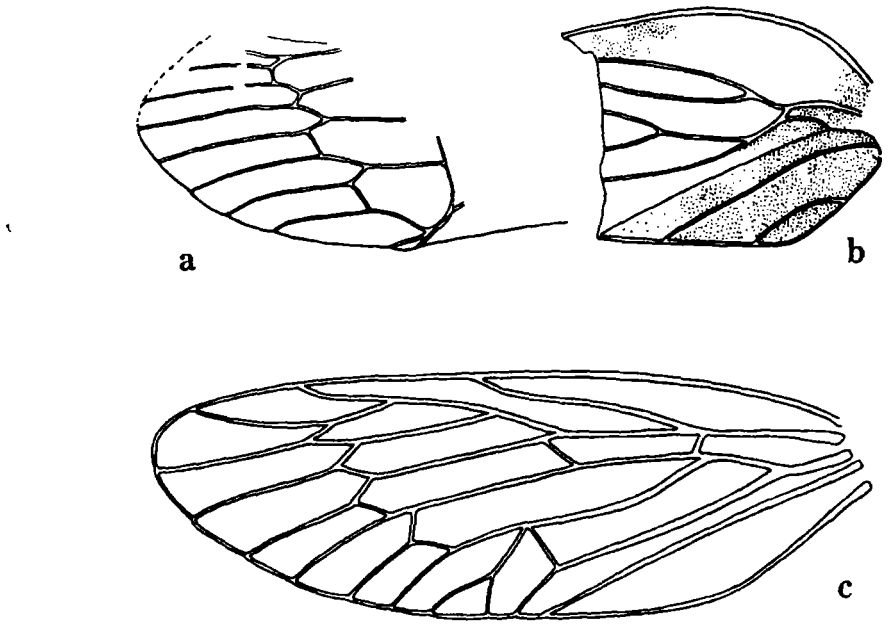

插图 4　翅脉序对比(Correlation of wing venation)

a. *Turutanovia karatavica* B.-M.，b. *Shuraboprosbole plachutai* B.-M.

c. *Protabanus chaoyangensis* Hong

另外，根据辽宁朝阳中侏罗统的一块化石标本所建立的 *Protabanus chaoyangensis* Hong，其分类位置尚有问题。原文作者(洪友崇，1982)把其置于 Tabanoidea 总科之中，并建立了一个化石绝灭科：Protabanidae。根据原文图版照片，这个种的基本特征如下：翅无翅基片(tegula)，臀域略呈三角形，前缘脉粗，前缘域显阔，脉序完整，翅端部具有一排整齐的封闭的小翅室，具围脉(ambient vein)；足跗节第 1、2 节显短，第 3 节显长，无爪垫；前胸背板十分宽大，骨化明显；雄性腹末生殖器大，圆形。上述特征与双翅目的任何类群(包括 Tabanoidea 总科)都无相似之处，却颇似同翅目(Homoptera)Tettigarctidae 科的种类。现代的 Tettigarctidae 科仅局限于澳大利亚，包括 1 属 2 种；但在中生代种类十分丰富，除分布于澳大利亚外，在原苏联，比利时和英国等都有化石记录。我国辽宁中侏罗统的这个化石种与原苏联中亚上侏罗统的 *Turutanovia karatavica* Becker-Migdisova 的翅脉序特征颇为相似，惜后者翅基半部未保存。就翅基

半部的特征而言，我国中侏罗统的种类与原苏联中亚下侏罗统的 *Shuraboprosbole plachutai* B.-M. 最为接近(插图 4)。因此，辽宁中侏罗统的 *Protabanus chaoyangensis* 归入同翅目 Tettigarctidae 科较为合理。

综上所述，我国中生代虻类化石共发现 5 属 5 种，其中上侏罗统的 2 属 2 种分别隶属于 Solvidae 科和 Rhagionidae 科；中侏罗统的 3 属 3 种为食虫虻类无疑，但它们的科级分类位置尚值得进一步研究。

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MESOZOIC GADFLIES (INSECTA: DIPTERA)

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Key words Diptera, Brachycera, taxonomy, bioecology, Mesozoic

Summary

This study involves two new species and two new genera separately belonging to the families Solvidae and Rhagionidae within the suborder Brachycera of Diptera, which are discovered from the Upper Jurassic Laiyang Formation of Laiyang, Shandong, with a review on the known fossil gadflies from Mesozoic of China. The species *Beipiaoplecia malleformis* Lin, *Mesosolva parva* Hong and *Prosolva huabeiensis* Hong from Middle Jurassic of Liaoning, China may be placed in the Asilomorpha within Brachycera, with the question still left open in taxonomic positions at the familial level.

All the type specimens described are now deposited in the Shandong Provincial Museum, Jinan.

I. DESCRIPTION OF NEW GENERA AND NEW SPECIES

Family Solvidae

Archisolva gen. nov.

Type species *Archisolva cupressa* gen. et sp. nov.

Diagnosis Body median-sized. Head wider than long. Eyes separated from each other. Antennae longer than head, with the first segment distinctly longer than the second, the latter oval, the third (flagellum) rather long, containing 12 annulate segments. Thorax obtuse-quadrate, nearly as wide as head. Legs thin and long, with spurs indistinguishable. Posterior tarsi longer than tibiae, with the first tarsal segment obviously longer than the second. Wings narrow and long, with veins stout. C running to apex. Sc running about two-thirds the length of wing, and ending at C. R_1 running three-fourths the length of wing, also ending at C. Rs originating from R about one-third the length of wing. Cross vein m-m rather long, connected with fork of M_{1+2}. Cell 1st m_2 long and exceedingly wider than cell m_{3+4} which is narrow long, and triangular. Abdomen cylindrical, 8-segmented, much longer than head and thorax combined.

Comparison The present new genus is close to *Solva* Walker (=*Xylomyia* Mijere), but differs in the flagellum of antenna consiting of 12 annulate segments; the spurs invisible; R_1 distinctly

long;Rs originating from R quite close to wing base;and the cell 1st m_2 extraordinarily wider than cell m_{3+4}.

Distribution Shandong;Late Jurassic.

***Archisolva cupressa* gen. et sp. nov.**

(Pl. I, fig. 1;Text-figs. 1,2)

Description A single specimen (Holotype;L88811) in dorsal view showing body blackish brown. Head subtriangular,1.4 times as wide as long. Eyes suboval,occupying most parts of head. Antennae 1.3 times as long as head,with the first segment oblong,twice as long as wide;the second wider than long, the third 3 times as long as the first and second united,with each annulate segment subquadrate,longer than wide at basal aprt but wider than long at terminal part;styles small and short. Thorax nearly as long as wide,almost wholly occupied by scutum but scutellum likely appearing in posterior part. Legs clothed with short,dense hairs. Tarsi with the first four segments brown and remainder of leg light yellowish brown in color. Posterior femora stouter but evidently shorter than tibiae. Tarsi 1.2 times as long as tibiae,with the basitarsi nearly as long as remainders combined,about two-thirds the length of tibiae. Wings lipochromous and hyaline,2.9 times as long as wide. C stout and straight. Sc stout but light-colored. Both R and R_1 stout. Wing venation as shown in text-fig 2. Abdomen 1.6 times as long as head and thorax united,with the widest part lying in the third segment;the last one clearly light-colored. Ovipostor short,subtriangular,and light-colored.

Length Body 14.2mm (3.7mm in width); head 2.0mm;antenna2.9mm;thorax 3.2mm;abdomen 8.6mm;posterior leg 12.0mm;wing 11.0mm.

Horizon and Locality Nanligezhuang Village,Laiyang;Upper Jurassic Laiyang Formation.

Family Rhagionidae

***Scelorhagio* gen. nov.**

Type species *Scelorhagio mecomastigus* gen. et sp. nov.

Diagnosis Body small-sized. Head median in size,circular. Antennae 3-segmented,with the first and second segments much more transverse;the third large,subcircular,and armed with elongate,likely segmented style. Proboscis stout and long but soft. Thorax massive;scutum elevated. Legs thin and long,with basitarsi much longer than the second ones; posterior legs distinctly longer than anterior and middle ones. Wings narrow and long. C running to apex. Both Sc and R coalescing basally,and Sc ending at midwing at C;R_1 stout,running about two-thirds the length of wing,and ending at C. Rs originating from R about one-third the length of wing. Stem of Rs short, with branches rather long. R_3 obviously curved upward terminally. Fork of R_{4+5} somewhat before terminal point of R_1. Both R_4 and R_5 elongate,running close to each other;and curved downward. M with 4 branches. Cell 1st m_2 narrow and long. Cross-vein m-m long and running oblique,coalescing with M_2. Both CuA and A_1 coalescing near hind margin of wing. Abdomen massive and short,7-segmented. Ovipostor small,short,and straight backward.

Comparison *Scelorhagio* gen. nov. bears an affinity to the *Ptiolinites* Kovalev, but may be distinguished from the latter by the rather elongate style of antenna, the long and thin legs, the upward curved R_3 at terminal, the narrow and long cell 1st m_2, as well as the cross-vein m-m coalescing with M_2. On the other hand, although this new genus is similar to *Jurabrachyceron* Kovalev in wing venation, it is easy to separate them because in the feature of the third antennal segment, both genera have nothing in common.

Distribution Shandong; Late Jurassic.

***Scelorhagio mecomastigus* gen. et sp. nov.**

(Pl. 1. fig. 2; Text-fig. 3)

Description A single specimen (Holotype: L88812) in right lateral view, showing body brown in color. Head with a subtriangular region in middle, rather light-colored. Eyes ill-preserved, probably occupying the whole head, but with only a few facets visible. Antennae with the first and second segments identical in shape and width, each about 2.5 times as wide as long; the third almost as long as the first and second combined; style twice as long as that of the first, second and third united, and left one likely segmented. Proboscis barely shorter than head, stouter basally than apically, rather light-colored, only a little darker and light yellowish brown in color terminally. Thorax distinctly thicker than head and abdomen. Scutum curved arcuately; scutellum indistinguishable, not clothed with any bristles and hairs. Legs clothed with short, dense hairs showing light brown in color. Femora shorter than tibiae, the latter being shorter than tarsi; basitarsi nearly as long as remainders united, with the second as long as the third or fifth; the fourth evidently shorter than others. Claws long, with onychia invisible. Wings achromatic and pellucid. Veins thin and faint except for C, Sc, R and R_1. Wing venation as shown in text-fig. 3. Abdomen almost as long as head and thorax combined, widest at base, and gradually narrowing terminally, with segment venter rather light-colored. Ovipostor small, thin, and cylindrical.

Length Body 4.0mm (1.7mm in thickness); antenna (including style) 0.7mm; head 0.7mm; thorax 1.6mm; abdomen 2.4mm; posterior leg 4.1mm; wing 3.4mm.

Horizon and Locality Nanligezhuang Village, Laiyang; Upper Jurassic Laiyang Formation.

Ⅱ. DISCUSSION

So far, few fossils assigned to the family Solvidae have already been recorded throughout the world. *Archisolva cupressa* sp. nov. is the first undoubted finding within this group in the Mesozoic era. As compared with the oldest and modern solvids, this new species shows certain primitive characters, such as the third antennal segment consisting of 12 annulate segments; R_1 running about three-fourths the length of wing; the lay of the fork of R close to the wing base, about one-third the length of wing; and the cell 1st m_2 appearing much more widened. *Archisolva cupressa* might be of a forest insect, for the extant members of Solvidae live usually in woods. As the dominant *Brachyphyllum obesum* Heer coexists with this insect from the same location and the same horizon, a deduction may be derived that it is probably the host plant of *Archisolva cupressa*.

Most snipe flies are common in woodland, especially near moist places, and usually found on foliage. Only a single kind of the Late Jurassic Equisetales recovered from the Laiyang Formation is regarded as a plant living in marshland near the shore of ancient Laiyang lake. *Scelorhagio mecomastigus* sp. nov. might have a close relation to this herb in bioecology.

There are three species and three genera of gadflies from the Middle Jurassic of Liaoning, China, among which *Beipiaoplecia malleformis* Lin was originally placed in the family Eopleciidae within the suborder Nematocera (Lin, 1976). Hong (1983) agreed with Lin's opinion. However, Kovalev (1982) regarded this species as a gadfly and classified it in the Asilomorpha of Brachycera. The authors consider Kovalev's opinion as well-founded, because the antenna of *B. malleformis* shows a typical character of gadflies (Lin, 1976, pl. I, fig. 9). Hong (1983) described two species and two genera and assigned them to the family Solvidae, namely, *Mesosolva parva* Hong and *Prosolva huabeiensis* Hong. Based on the features of antenna (Hong, 1983, pl. 24, fig. 2; pl. 23, fig. 9), they should not be regarded as members of Solvidae; just like *B. malleformis*, they are quite similar to the Rhagionidae in antennal characters. Perhaps they belong to an unknown group at the familial level, if their wing venations were drawn correctly.

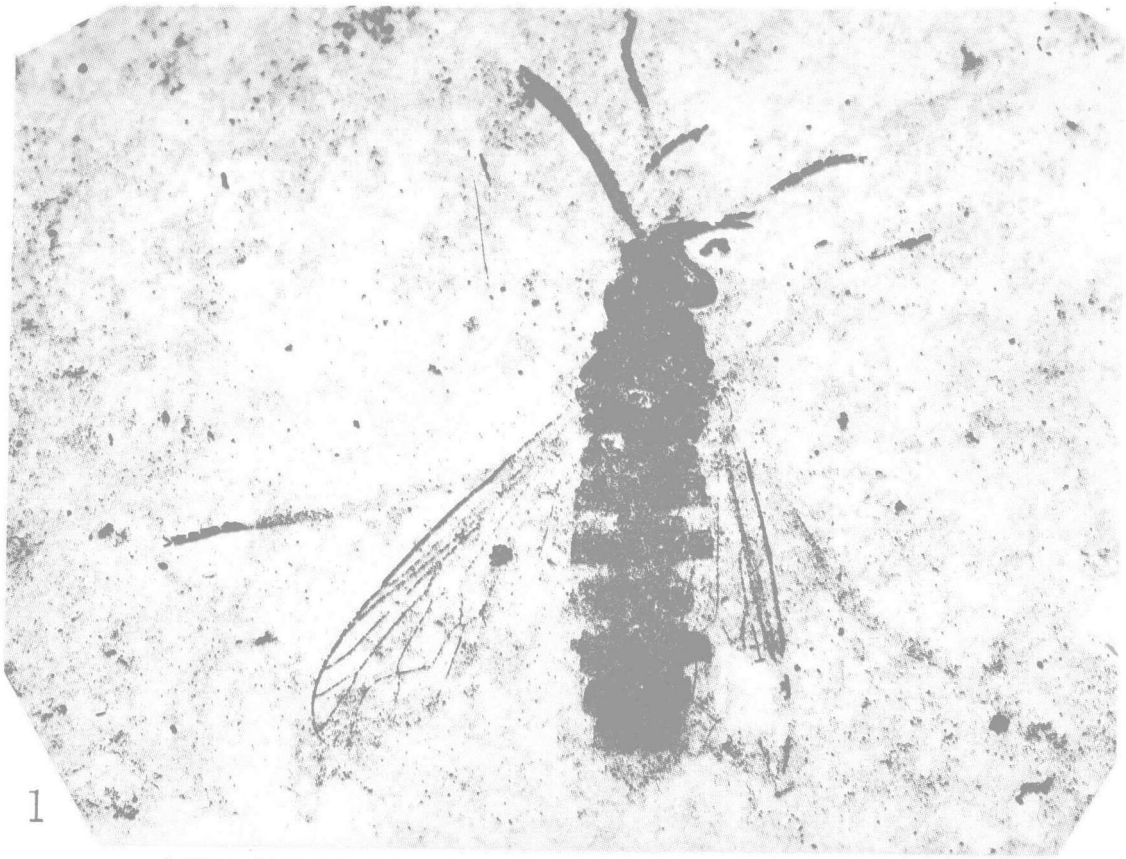
Acoording to Hong (1982), *Protabanus chaoyangensis* Hong from the Middle Jurassic of Liaoning was placed in Asilomorpha. Most striking is the condition of wing venation which resembles that of the family Tettigarctidae within the order Homoptera. In addition, this species possesses a wide and fully developed pronotum, a large circular genitalia, the short basitarsal and second tarsal segments, the rather elongate third one, and the absence of onychia. Bearing these characters, it must be a representative of tettigarctids rather than a gadfly, and it is closely similar to *Turutanovia karatavia* Becker-Migdisova and *Shuraboprosbole plachutai* B.-M. wich were discovered from the Jurassic of Russia.

图 版 说 明

标本均采自山东莱阳南李格庄村，层位为上侏罗统莱阳组；保存于山东省博物馆。

图 版 I

1. *Archisolva cupressa* gen. et sp. nov.
   虫体背面观，×5.2，Holotype；登记号：L88811。
2. *Scelorhagio mecomastigus* gen. et sp. nov.
   虫体右侧保存，×15.6，Holotype；登记号：L88812。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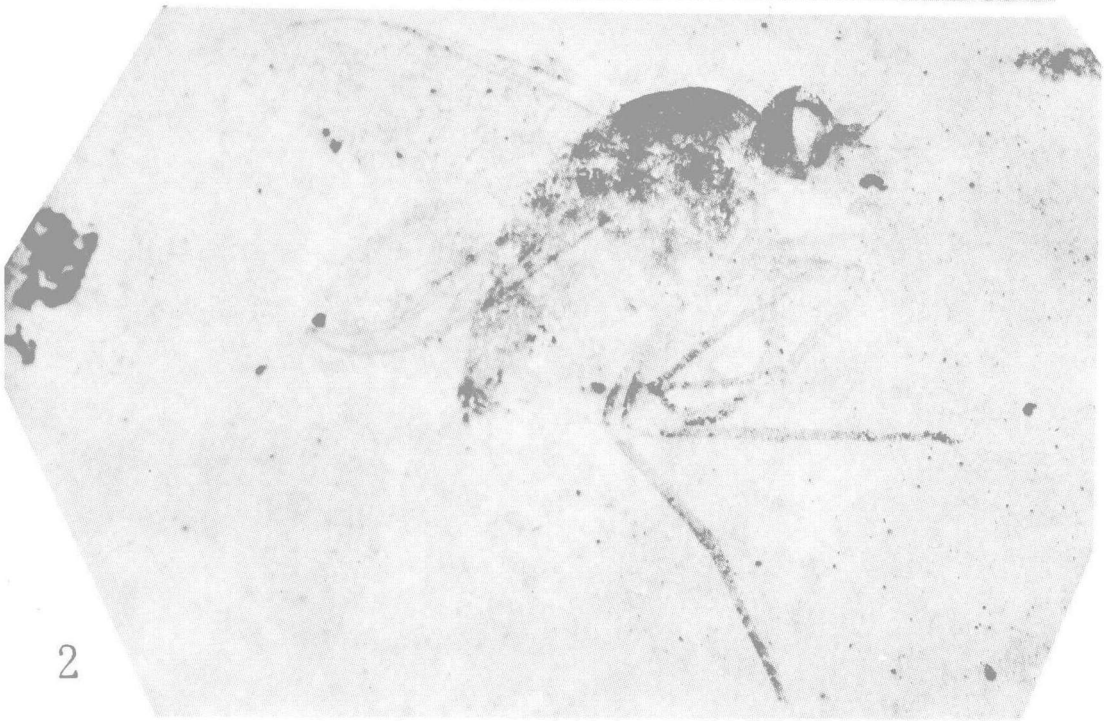
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