

英国早石炭世大网叶肢介科一新属

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内 容 提 要

描述了采自英国伯维克郡下石炭统水泥石群(杜内阶)叶肢介一新属——*Longestheria* gen. nov.。据壳瓣生长带上发育大网状纹饰构造, 归属于 *Loxomegaglyptidae* 科, 从而使该科的地质历程从晚二叠世, 一直追溯到早石炭世早期。讨论了新属与该科其它属之间的形态特征联系。认为化石为原地埋藏, 含叶肢介岩层属非海相沉积。

关键词 早石炭世 叶肢介新属 非海相沉积

Loxomegaglyptidae 科以壳瓣生长带上发育有各种形状中一大网状纹饰(孔径 0.02—0.2mm)为特征。过去最早的地层记录报道于俄罗斯楚瓦什上二叠统鞑靼阶, 如 *Tshuvashium* (Novojilov, 1958)。三叠纪该科代表出现颇多, 计有 *Loxomegaglypta* (Novojilov, 1958), *Diaplexa* (Novojilov, 1954), *Anyuanestheria* 和 *Shipingia* (张天堂等, 1976)。侏罗纪和白垩纪有 *Nestoria* (Красинец, 1962), *Paleoleptestheria* (Novojilov, 1954), *Pseudoasmussia* (Novojilov, 1954)。据记载, 最晚的地层分布见于我国第三系始新统, 有 *Paraleptestheria* (陈丕基, 1975, Chen Peiji and Shen Yanbin, 1981)。它们都分布在欧亚大陆。

1991年笔者访问苏格兰博物馆(National Museum of Scotland), 观看了馆藏在那里的叶肢介标本, 发现有一类壳瓣生长带上具有大网状装饰的标本颇具意义。Mr. W. J. Baird 得知后, 主动提出交由笔者研究, 并热情地介绍了有关化石产出层位, 地质背景等情况, 还帮助复制了一些地质资料。本文英文初稿完成后他又提了不少有益的意见。化石标签注明, 这批叶肢介标本系由 Dr. Albert G. Long 赠送, 采于 Crooked Burn, Foulden, Berwickshire, 下石炭统钙质砂岩系(Calciferous Sandstone Series)水泥石群(Cementstone Group)。水泥石群在英国米德兰谷地(Midland Valley)中部及西部广为分布, 由灰色、灰绿色、红棕色泥岩、粉砂岩、泥灰岩、具波痕砂岩及火山岩组成, 与下伏老红砂岩一般为连续过渡(Francis, 1983)。福尔顿(Foulden)剖面水泥石群厚度不足 30m, 含多门类化石, 已报道有植物 *Lepidodendron*, *Stannostoma*, *Anemites*; 双壳类 *Modiolus latus* (Portlock); 蠕虫类 *Spirobis*; 板足鲎 *Cyrtoctenus peachi* Stømer and Waterston; 剑尾类 *Rolfeia fouldenensis* Waterston; 蝎类 *Trachyscorpia squarrosus* Kjellesvig-Waering 以及介形类、鱼类、两栖类等(Wood and Rolfe, 1985; Waterston, 1985)。上述节肢动物化石主要出现在剖面的上部。据该群析得的孢子指示其时代为晚杜内期(Late Tournaisian), 即英国的 Dinantian 亚系的

Courseyan 阶 (Clayton, 1985)。

叶肢介化石保存在灰色粉砂质泥岩中 (NMS G 1983. 49. 4; NMS G 1983. 49. 5), 同层面见有植物茎干的断枝。据岩性特征及福尔顿剖面化石产出情况判断, 很可能出自剖面上部。选供研究的 11 个个体壳瓣, 其中有 2 个的双瓣沿背缘张开, 有的双瓣叠压保存一起, 反映原地埋藏之状态。据叶肢介生态特性, 含化石岩层应属非海相沉积 (Tasch, 1969)。从岩石具微细层理看, 有可能是在低能条件下浅湖或池坑环境下的沉积。Anderton (1985) 通过对沉积岩的研究, 认为伯维克郡的水泥石群沉积在河网交叉入湾的沿海平原。沉积物及古动物化石是多次洪泛期盐度发生变化情况下的产物。

英国早石炭世叶肢介已描述的较少, 现知有 *Pseudestheria tenella* (Bronn) Raymond, *P. striata* var. *tateana* (Jones) Raymond, *Estheria youngi* Jones, *Estheria peachi* Jones, *Palaeolimnadiopsis jonesi* Raymond。另有壳瓣上具有隆起放射脊的 *Hemicycloleia salteriana* (Jones, 1862, p. 119, pl. I, fig. 21; Raymond, 1946, p. 287)。

Pseudestheria tenella (Bronn) Raymond 曾见于英国伯维克郡下石炭统 (Jones, 1885, p. 314, 324)。据 Jones (1862) 对该种描述, 近长方形的外形及宽而数目不多 (15 条左右) 的生长线, 与本文所描述的新种有些接近, 但前者生长带上所见到的是十分微小的点状纹饰, 与新种规则多边形大网状装饰有着明显的区别。

Pseudestheria striata var. *tateana* (Jones) Raymond 产于英国伯维克郡拉曼顿 (Lammerton) 下石炭统 Mountain-limestone Series (Jones, 1862, p. 26, pl. 1, figs. 15—18), 其壳瓣的生长线多而密集, 生长带上发育有蜂巢状小网格装饰, 在分类上与新属应分归不同的科。

Estheria youngi (Jones, 1891, p. 80, pl. 5, figs. 1a, b) 曾分别被归于 *Pseudestheria* (Raymond, 1946, p. 247) 和 *Lioestheria* (Kobayashi, 1954, p. 50) 其产于苏格兰格拉斯哥 Thornliebank 附近下石炭统灰岩 (Lower Carboniferous Limestone) 上部的页岩中。从所示图片看, 壳瓣具较大的胎壳区。然而 Jones (1891) 认为系标本保存时受损害所致。该种生长线与后背缘近直角相交, 生长带上有小点状装饰, 故无论外形或纹饰构造与新属均有较大的区别。

Estheria peachi 产于苏格兰爱丁堡 Salisbury Craigs 下石炭统页岩中 (Jones, 1870, p. 220, pl. 9, fig. 17), 具有近方形的外形, 未见装饰存留。尽管保存差, 曾分别被归于 *Pseudestheria* (Raymond, 1946) 及 *Euestheria* (Kobayashi, 1954)。

此外, 苏格兰 Renfrewshire 和 Thornliebank 附近石炭系灰岩系中的 *Estheria punctatella*, 壳瓣巨大, 长达 34mm, 高 24mm (Jones, 1865, p. 72, pl. 1, figs. 5, 5a)。如此种确属叶肢介化石, 那么, 除美国二叠纪的 *Palaeolimnadiopsis carpenteri* (Raymond, 1946, p. 271, pl. 4, figs. 7, 8) 外, 这是所知最大的叶肢介壳瓣。但从图版显示的一些点粒状构造散布于不规则的同心线之间来看, 与叶肢介规则的生长线有着一定的差别。因此, 尚需对模式标本作进一步的观察。

Palaeolimnadiopsis jonesi Raymond (Jones, 1878, p. 100, pl. 3, fig. 2; Raymond, 1946, p. 272) 的壳瓣生长线在后背缘向外反曲, 这一重要特征使其与新属归于不同的超科 (Verteioidea) (张文堂等, 1976; Kobayashi, 1954)。

从新属近三角形的外形,前腹部向前突出,后缘向后收缩,生长线与背缘依次相交的特征来看,它与早第三纪的 *Paraleptesheria* 似乎更为相近,只是后者具有横向拉长的网饰,在后腹部逐渐消失以及生长线较粗壮。在现生叶肢介中, *Leptestheria* 的生长带上亦具有多边形中一大网状装饰 (Daday, 1923)。无论就其外形或装饰构造, *Leptestheria* 与 *Paraleptestheria* 最为接近,彼此间很可能有着一定的演化关系。毋庸置疑,新属 *Longestheria* 作为大网叶肢介科的一个新成员,对于追溯该科的地质历程及分析各成员间支系演化都具有意义。前人曾推测 *Loxomegaglyptidae* 科可能是 *Euestheriidae* 科的一个演化分支 (张文堂等, 1976, 79 页), 现在看来, 由于新属 *Longestheria* 的发现, 还需寻找更多的证据。

属 种 描 述

宽网叶肢介科 *Loxomegaglyptidae* Novojilov, 1958

朗氏叶肢介属 (新属) *Longestheria* gen. nov.

名称来源 以志纪念赠送标本的 Dr. Albert G. Long。

模式种 *Longestheria berwickensis* gen. et sp. nov.

属征 壳瓣近三角形, 中等大小; 15 条左右宽而平的生长带上具有较规则的多边形中一大网状装饰, 网壁薄, 网底平浅, 网孔直径约 0.1—0.14mm。

讨论 除 *Paleolimnadiopseidae* 科外, 在壳瓣生长带上仅具有大网状装饰的叶肢介中, 目前此新属所出现的时代最早。从其壳瓣前腹部明显向外突出, 后部收缩, 生长线与背缘依次相交, 未汇聚成一线以及发育有较规则多边形网状装饰看, 它与报道于我国始新统的 *Paraleptestheria* 最为接近 (陈丕基, 1975; Chen Peiji and Shen Yanbin, 1981), 彼此的区别在于后者的网孔直径略小, 约 0.05—0.075mm。在腹部有横向拉长现象, 且在后部网状纹饰减弱乃至消失以及生长线较粗凸。

在古生代叶肢介中, 壳瓣生长带上具有网状装饰类型的 *Tshuvashium* 曾见于俄罗斯楚瓦什 (Чувашин) 上二叠统鞑靼阶 (Татарский ярус) (Novojilov, 1958)。它与新属的主要区别在于壳瓣前缘有一凹缘, 目前在其它地区尚未找到过这种类型。

Loxomegaglypta 的生长带上也具有中一大网状装饰, 被归于该属的有见于俄罗斯伏尔加维特奴河 (Р. Ветлуги) 地区下三叠统维特奴组的 *L. wetlugiana* (Novojilov, 1958, p. 10, fig. 4); 四川会理鹿厂上三叠统白果湾组上部的 *L. luchangensis* (Chen) (张文堂等, 1976, 141 页); 四川合川炭坝上三叠统须家河组的 *L. tanbaensis* Chen (张文堂等, 1976, 141 页)。这些标本的壳瓣外形与新属明显不同, 具有发育的前、后背角。

三叠系的 *Diaplexa* (Novojilov, 1946; ; 张文堂等, 1976) 的壳瓣生长带上发育的是中一大网状横向拉长的菱网状装饰, 网壁粗厚, 网底下凹, 易与新属区别。

伯维克朗氏叶肢介 (新属、新种) *Longestheria berwickensis* gen. et sp. nov.

(图版 I, 图 1—3)

名称来源 标本产于 Crooked Burn, Foulden, Berwickshire。

材料 选作研究的有 11 个个体壳瓣。

特征 壳瓣近三角形或椭圆形;个体中等大小,长 5.6—8.8mm,高 4—6mm;背缘直而长,或微拱,胎壳位于背缘前方,壳顶区微鼓起;前缘呈圆弧状向外突出,腹缘向下拱或呈宽弧状;后腹缘略有收缩,后缘较圆;前高大于后高;生长线细,约 15 条,与后背缘挨次相交,未汇聚成一线,然而前、后背角不甚发育;在壳顶区的几条生长线上(图版 I,图 3,4)显示了极细小的串珠状构造,但在生长线的外模及其余生长线上未见这一现象。

在宽而平的生长带上发育有较规则的多边形大网状装饰,网孔直径 0.1—0.14mm。网壁细弱,网底平浅,印在外模上呈彼此紧相毗邻的平瘤台状物,网孔形状在壳瓣上无明显变化,只是靠近中背部的网孔略小些。

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A NEW CONCHOSTRACAN GENUS (LOXOMEGAGLYPTIDAE) FROM LOWER CARBONIFEROUS OF BRITAIN

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Key words Conchostraca, Lower Carboniferous, Britain

Summary

The family Loxomegaglyptidae is characterized by an ornament of moderate to large polygonal reticulations (with mesh 0.02—0.2 in diameter) on the broad and flattened growth bands of the valve. The earliest representative of the family is *Tshuvashium* from the Upper Permian Tatalian stage of Tshuvash, Russia (Novojilov, 1958). More forms of the family are found in the Triassic, such as *Loxomegaglypta* (Novojilov, 1958), *Diaplexa* (Novojilov, 1954), *Anyuanestheria* and *Shipingia* (Zhang Wentang *et al.*, 1976). Several genera belonging to this family from the Jurassic and Cretaceous were named *Nestoria* (Krasinets, 1962), *Paleoleptestheria* (Novojilov, 1954) and *Pseudoasmussia* (Novojilov, 1954). The genus *Paraleptestheria* from the Eocene of China is so far known as the youngest member of the family (Chen Peiji, 1975; Chen Peiji and Shen Yanbin, 1981). All the genera mentioned above are distributed in Eurasia.

During his visit to the National Museums of Scotland in 1991, the writer examined the conchostracan specimens in the collection. Some samples from the Carboniferous possess well-preserved, large, regular polygonal reticulations on the growth bands of the valve. Mr. William J. Baird of the Museum kindly allowed the writer to study these significant materials which were presented by Dr. Albert G. Long. The specimens described here came from the Lower Carboniferous Cementstone Group of the Calciferous Sandstone Series, Crooked Burn, Foulden, Berwickshire, Scotland. The Cementstone Group is widespread in western and central parts of the Midland Valley and parts of the Border Country in Scotland, comprising sequences of grey, green and red mudstones, argillaceous limestones, shales and ripple-marked sandstones (Francis, 1983). The Foulden section is located on the bank of the Foulden Burn, 8.4 km NW of Berwick-Upon-Tweed, where significant fauna and flora have been found, including the plants *Lepidodendron*, *Stamnostoma*, *Anemites*; the

bivalve *Modiolus latus* (Portlock); the worm *Spirobis*; ostacods; the eurypterid *Cyrtoctenus peachi* Stemmer and Waterston; the xiphosurid *Rolferia foulidenensis* Waterston; the eoscorpiid *Trachyscorpia squarrosus* Kjellesvig-Waering; fish remains and amphibian scutes (Wood and Rolfe, 1985; Waterston, 1985). The fauna mentioned above mainly occurs in the upper part of the section. The miospores obtained by Clayton (1985) indicate a late Tournaisian age, the British regional Courceyan stage of the Dinatian subsystem.

The conchostracans (NMS 1983. 49. 4; NMS 1983. 49. 5) are preserved in the slabs of dark greyish silty mudstone along with fragments of plant stem. Based on lithologic character, the conchostracan-bearing beds probably came from the upper part of the Foulden sequence. The conchostracan bivalve shells of some individuals overlap each other and the carapace valves of two individuals open along the dorsal margin. The features of preservation reflect the taphocoenosis. A study on the habitat of living conchostracans (Tasch, 1969) suggested that the conchostracan-bearing beds are related to a nonmarine depositional environment, probably flood-plain pools or shallow lakes. Anderton (1985) believed that the Berwickshire Cemenstone Group was deposited on a coastal plain crossed by meandering rivers flowing into a marine gulf. Sedimentation was mainly by overbank flooding onto an alluvial plain.

Only a few conchostracans of Early Carboniferous age have been recorded in Britain, which are *Pseudestheria tenella* (Bronn) Raymond, *Pseudestheria striata* var. *tateana* (Jones) Raymond, *Estheria youngi* Jones, *Estheria peachi* Jones, *Palaeolimnadiopsis jonesi* Raymond and *Hemicycloleia salteriana* (Jones) Raymond.

Among them, *Pseudestheria tenella* (Bronn) (Raymond, 1946) was reported from the Lower Carboniferous of Berwickshire (Jones, 1885, pp. 314, 324). According to description of the species (Jones, 1862), it somewhat approaches the new genus in the shape and few growth lines of the valve, but its growth bands are minutely pitted by the meshes of delicate reticulation.

Pseudestheria striata var. *tateana* (Jones) was reported from the Lower Carboniferous Mountain Limestone Series of Lamberton (Lammerton), Berwickshire (Jones, 1862, p. 26, pl. 1, figs. 15—18; 1885, p. 313; Raymond, 1946); it is easily distinguished from the new genus and species by having a faint reticular tissue.

Estheria youngi (Jones, 1891, p. 80, pl. 5, figs. 1a, b) has been referred to *Pseudestheria* (Raymond, 1946, p. 247) and to *Lioestheria* (Kobayashi, 1954, p. 90) by different authors. The specimens were found from a shale in the upper part of the Lower Carboniferous Limestone near Thornliebank, Glasgow, Scotland. It seems that the large smooth umbonal area was caused by damage (Jones, 1891). The growth lines intersect the posterodorsal margin subvertically, while the growth bands display the punctulate sculpture. This species is apparently different from the new genus in the shape of the valve and the ornamentation.

Estheria peachi, a subquadrate form with no sculpture preserved, came from the Lower Carboniferous shales at Salisbury Craigs, Edinburgh (Jones, 1870, p. 220, pl. 9, fig. 17). Despite the poorly preserved and described specimens, this species has been attributed to *Pseudestheria* by Raymond (1946) and to *Euestheria* by Kobayashi (1954).

Estheria punctatella from the Carboniferous Limestone Series near Thornliebank, Renfrewshire possesses the valve attaining a large size of 34mm long and 24mm high (Jones, 1865, p. 72, pl. 1, figs. 5, 5a). If this is undoubtedly a conchostracan specimen, then it is only next to *Palaeolimnadiopsis carpenteri* from the Upper Permian of America with the biggest valve in conchostracans (Raymond, 1946, p. 271, pl. 4, figs. 7, 8). However, it is necessary to make a further examination of the holotype, because the delicate punctations shown in Jones's figure (5a) spread between the irregular concentric lines, which are somewhat different from those of the conchostracan.

Palaeolimnadiopsis jonesi Raymond (Jones, 1878, p. 100, pl. 3, fig. 2; Raymond, 1946, p. 272) and *Hemicycloleaia salteriana* (Jones) (Jones, 1862, p. 119, pl. 1, fig. 21; Raymond, 1946, p. 287) are quite different from the new genus in the shape of the valve. Since the former species has recurved growth lines on the posterodorsal margin and the latter species has two radial ridges on the valve, they belong to different superfamilies, i. e., Vertexioides (Kobayashi, 1954) and Leaioidea (Raymond, 1946).

The new genus *Longestheria* is closer to *Paraleptestheria* than to other genera of the family in its subtriangular outline, few growth lines and reticular sculpture on the growth bands. However, *Paraleptestheria* much resembles the living genus *Leptestheria* (Daday, 1923) in the shape of the valve and ornamentation on the growth bands. The latter seems to have derived from the former. Undoubtedly, the establishment of the new genus indicates the long evolutionary history of the family Loxomegaglyptidae; it is also significant in clarifying the evolutionary trend of the family.

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Family Loxomegaglyptidae Novojilov, 1958

Longestheria gen. nov.

Etymology Long, in honour of Dr. Albert G. Long who presented the conchostracan specimens to the National Museums of Scotland.

Type species *Longestheria berwickensis* gen. et sp. nov.

Occurrence Early Carboniferous (Tournaisian) of Britain (Wood and Rolfe, 1985).

Diagnosis Carapace valve subtriangular or subelliptical in outline, moderate in size;

about 5 broad and flattened growth bands with polygonal reticulation. Mesh wall thin; mesh base shallow and flattened, with mesh 0.1—0.14mm in diameter; dorsal margin intersected by growth lines.

Remarks The new genus is similar to *Paraleptestheria*, which is widely distributed in the Eocene deposits of China (Chen Peiji, 1975; Chen Peiji and Shen Yanbin, 1981), in the shape of the valve with round anterior and ventral margins and contracted posterior margin, but the latter has gradually weakened horizontal reticulation towards the posterior part of the valve, and stout growth lines.

Tshuvashium from the Upper Permian Tatar Formation of Tshuvash region, Russia also bears large reticulation on the growth bands; it differs from the new genus in having a concavity at the anteroventral margin of the valve (Novojilov, 1958).

Loxomegaglypta is mainly distributed in the Triassic deposits of Russia and China, including the type species (*L. wetlugiana* Novojilov) from the Lower Triassic Wetlug Formation of Volga, Russia (Novojilov, 1959, p. 10, fig. 4); *L. luchangensis* Chen from the Upper Triassic Baiguwan Formation of W Sichuan and *L. tanbaensis* from the Upper Triassic Xujiage Formation of Sichuan, China (Zhang Wentang *et al.*, 1976, pp. 141—142, pl. 28, figs. 1—5; pl. 29, figs. 1—6). They differ from the new genus in the umbo located near the central part of the dorsal margin and the distinct anterodorsal and posterodorsal angles. As a common genus from the Middle Triassic in Russia and China, *Diaplexa* bears irregular horizontal reticulation, with coarse mesh wall and deep concave mesh bases on the growth bands (Novojilov, 1946); it is easily distinguished from the new genus by its ornamentation.

***Longestheria berwickensis* gen. et sp. nov.**

(Pl. I, figs. 1—3)

Etymology From "berwick", referring to Crooked Burn, Foulden, Berwickshire, Scotland, the fossil-bearing locality.

Material Carapace valves of 11 individuals: National Museums of Scotland Cat. No. NMS G 1983. 49. 4 (Pl. I, figs. 1 and 3); two specimens on one slab figured separately, Cat. No. NMS G 1983. 49. 5 (Pl. I, fig. 2).

Description Carapace subtriangular or elliptical in outline, moderate in size, 5.6—8.8mm long, and 4—6mm high; dorsal margin long and straight or slightly arched upward. Umbo small, situated anteriorly; umbonal region slightly convex. Anterior and ventral margins rounded or arched; anteroventral margin obviously expanded, while posterior margin relatively straight and strongly contracted posteriorly. A total of 15 growth lines intersected with posterodorsal margin; 5—6 growth lines of umbonal region showing beaded structure (Pl. I, figs. 3, 4) but invisible on the external mold and others.

Broad and flattened growth bands ornamented with large polygonal reticulation, with

mesh 0.1—0.14mm in diameter, mesh wall very thin, while mesh base shallow and flattened.

图 版 说 明

标本均保存在国立苏格兰博物馆,采于伯维克郡福尔顿,克洛基特·邦,下石炭统钙质砂岩系水泥石群。化石图影由中国科学院南京地质古生物研究所胡尚卿摄制。

All the specimens are housed in National Museum of Scotland and were collected from Lower Carboniferous Cementstone Group of Calciferous Sandstone Series, Crooked Burn, Foulden of Berwickshire, Britain.

图 版 I

1—3. *Longestheria berwickensis* gen. et sp. nov.

1. 右瓣(right valve), $\times 10$, Cat. No. NMS G 1983. 49. 4-2。

2. 左瓣(left valve), $\times 10$, paratype Cat. No. NMS G 1983. 49. 5。

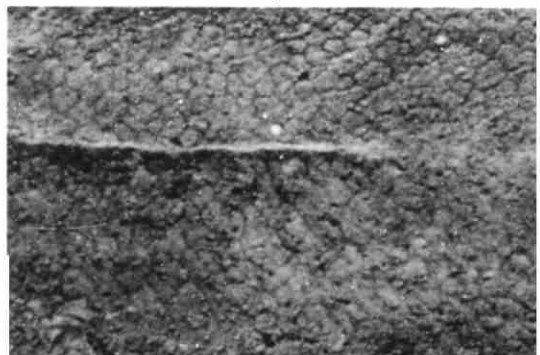
3a. 3b. 右瓣外模(external mold of right valve). $\times 6. \times 15$. holotype. Cat. No. NMS G 1983. 49. 4-1: 3c. 壳瓣后腹部外模生长带上装饰(showing the polygonal ornamentation on the external mold near postero-ventral side of the valve). $\times 20$ 。



1



2



3c



3a



3b