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简报

湖南晚泥盆世短胸节甲鱼类一新属[1)]

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关键词: 湖南石门,晚泥盆世,节甲鱼类
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本文报道的鱼类化石产自湖南石门大京州的上泥盆统写经寺组。在中国泥盆纪地层分区上,化石产地属于华南区的湘、鄂、川交界分区(侯鸿飞等,1983),该分区泥盆系为一套厚度不超过 500 m 的近岸海相碎屑岩沉积,仅发育中泥盆统上部至上泥盆统(图 1),并普遍超覆在志留系温洛克统之上,以角度不整合伏于石炭系或二叠系之下。上泥盆统分两个组,从下而上分别为黄家磴组和写经寺组。黄家磴组系杨敬之、穆恩之(1953)创立,标准地点在湖北长阳马鞍山东端的黄家磴。岩性为砂岩夹少量页岩,植物化石丰富,并含有误订为植物化石的湖北长阳鱼(*Changyanophyton hupeiense* Sze, 1952)。根据植物化石组合面貌,黄家磴组的时代被认为是晚泥盆世早期。写经寺组是谢家荣、刘季辰(1927)创立的。岩性分为二段:下段以泥灰岩为主,含 *Yunnanella abrupta*、*Yunnanellina triplicata* 等腕足类化石;上段以砂页岩为主,含植物化石,其组合面貌除大致与黄家磴组相似外,还有一些新的分子,如 *Leptophloeum guanzhuangense*、*Cyclostigma hunanense* 等。根据动、植物化石群的性质,写经寺组的时代大致与法门期早期相当。多年来,在这一分区的泥盆纪地层里,很少鱼类化石。杨敬之、穆恩之(1953)曾提及在湖北长阳写经寺组底部发现的鱼化石,这些鱼化石与腕足类 *Yunnanella*、*Tenticospirifer* 等共生,但种属并未定出。已记述过的鱼化石只有湖北长阳黄家磴组的长阳鱼(潘江,1962)。

湖南是我国泥盆系地层发育地区之一,鱼类化石也很丰富,但多产自中泥盆统跳马涧组中,且从未报道过节甲鱼类化石。短胸节甲鱼类在我国已记述了 12 个属,其中包括厚甲鱼类(pachyosteomorphs)的 4 个属。迄今为止,在中国记述的厚甲鱼类皆归属邓氏鱼科(Dunkleosteidae, = 恐鱼科 Dinichthyidae),而在世界其他地区多样性相当高的缺棘短胸节甲鱼类(aspinothoracids)在我国尚未发现。因此,本文记述的鱼化石既是节甲鱼类在湖南的首次报道,也是缺棘短胸节甲鱼类在我国的首次发现。

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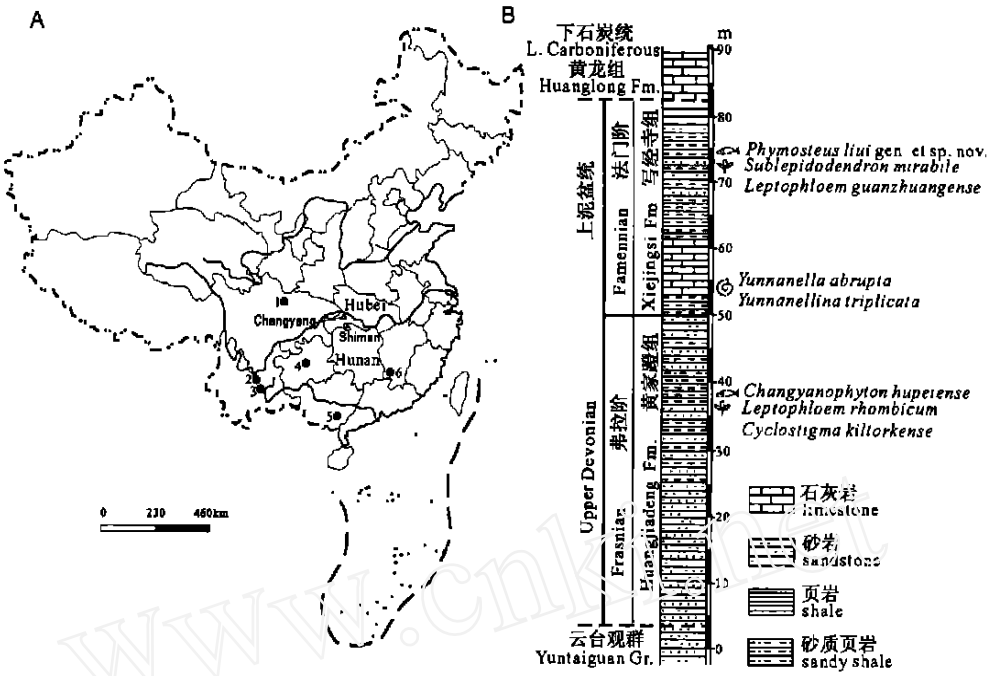

图 1　A. **湖南、湖北两省节甲鱼类化石产地(▲)以及中国其他地区短胸节甲鱼类产地(●)**;
B. **湖南、湖北交界地区上泥盆统地层柱状图(据杨敬之、穆恩之**,1953)

Fig. 1　A. map showing arthrodire-bearing sites in Hubei and Hunan provinces (in triangular) and the location of Chinese brachythoracid arthrodires (in solid circle); B. composite stratigraphic column of the Upper Devonian in the neighboring area of Hubei and Hunan, central China (based on Yang and Mu, 1953)

1. **四川江油**(Jiangyou, Sichuan), **乐氏江油鱼**(*Kiangyousteus yohii*); 2. **云南武定**(Wuding, Yunnan), **长枕旧城鱼**(*Jiuchengia longoccipita*), **大尹氏鱼**(*Yinosteus major*), **吴氏香水鱼**(*Xiangshuiosteus wui*), **中华利沃鱼**(*Livosteus sinensis*); 3. **云南华宁**(Huaning, Yunnan), **小眼盘溪鱼**(*Panxiosteus oculus*), **云南伊氏鱼**(*Eastmanosteus yunnanensis*), **一打得克氏鱼**(*Clarkeosteus yidadeensis*), **似扁平华宁鱼**(*Huaningichthys omalodes*); 4. **贵州贵阳**(Guiyang, Guizhou), **中华贵州鱼**(*Kueichowlepis sinensis*); 5. **广西玉林**(Yulin, Guangxi), **巴坎鱼**(*Buchanosteus* sp.); 6. **江西崇义**(Chongyi, Jiangxi), **崇义赣南鱼**(*Gannanichthys chongyiensis*)

盾皮鱼纲 Placodermi McCoy, 1848

节甲鱼目 Arthrodira Woodward, 1891

短胸节甲鱼亚目 Brachythoraci Gross, 1932

真短胸节甲鱼次目 Eubrachythoraci Miles, 1971

月骨鱼科?Selenosteidae?Dean, 1901 (sensu Lelièvre et al., 1987)

瘤骨鱼(新属) Phymosteus **gen. nov.**

特征　见属型种。

刘氏瘤骨鱼(新种) Phymosteus liui **sp. nov.**
(图 2～3)

词源 phyma (Gr.), 瘤子,肿大,osteus (Gr.) 骨甲。种名献给最早记述中国短胸节甲鱼类化石的古鱼类学家刘宪亭先生。

正型标本 一近完整的中颈片。标本登记号 V 13591。

产地与层位 湖南省石门县大京州,晚泥盆世,写经寺组(法门期早期)。

特征 个体较大的厚甲鱼类。颈缺较大。中颈片为三角形,短而宽,后缘明显前凹,其中间部分则较平直,并具小的中后突;侧缘被副颈片覆压;后降叶下方有一个横长的凹槽,副颈片后颈突镶嵌其中;内面中颈加厚和后横脊非常发育,有一对明显的凹窝。中颈片表面在不同部位饰以大小不一的瘤突或瘤点,骨片中后部小瘤点连成短脊并呈波痕状,前部则呈鱼鳞状,两侧部为较大的瘤突,瘤突之间布以小的粒状突起。

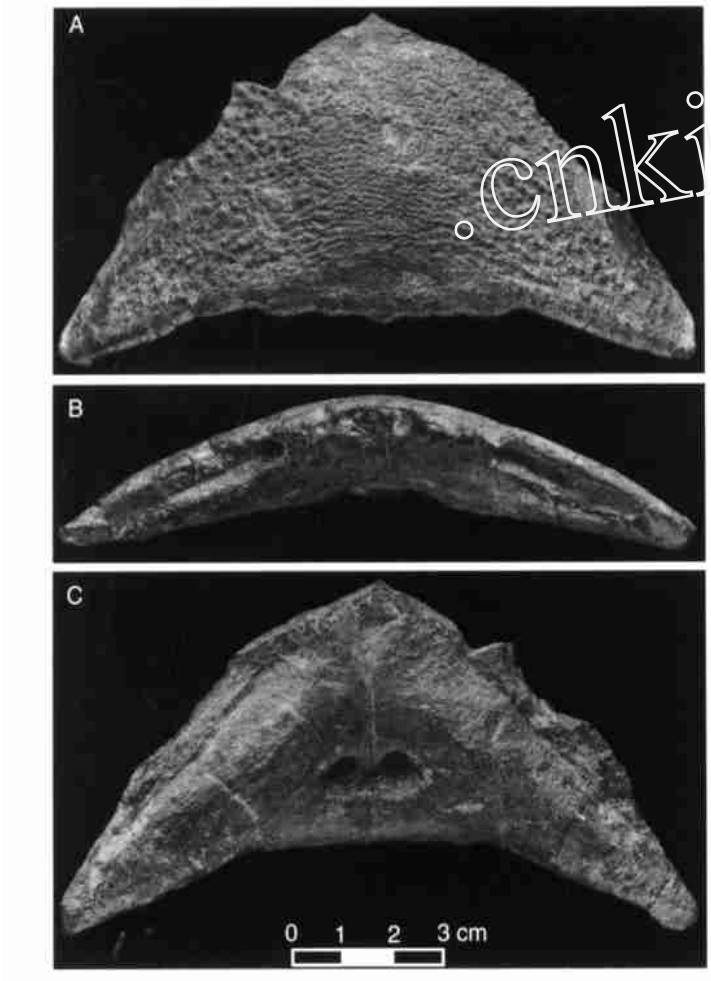

图 2 刘氏瘤骨鱼(新属、新种)中颈片(V 13591, 正型标本)
Fig. 2 *Phymosteus liui* gen. et sp. nov. (V 13591, holotype) A nearly complete nuchal plate in dorsal (A), posterior (B) and visceral views (C)

比较 新材料具有短胸节甲鱼亚目(Miles and Dennis, 1979)以下 4 个特征:1)中颈片后部横向扩展;2)副颈片具后颈突;3)中颈片内面具中颈加厚;4)中颈片内面具一对凹窝。短胸节甲鱼亚目包括粒骨鱼类(coccosteomorphs)、厚甲鱼类(pachyosteomorphs)和一些基干类群(Holonematidae, Buchanosteidae, Homosteidae, Groenlandaspidae, Gemuendenaspidae 等),前两个单系类群又一起组成了真短胸节甲鱼类(eubrachythoracids)(Carr, 1995)。新材料中颈片后缘明显前凹,颈缺较大,这是厚甲鱼类中某些缺棘短胸节甲鱼类的特征。缺棘短胸节甲鱼类包括月骨鱼科(Selenosteida e)、Mylostomatidae、Titanichthyidae、Bungartiidae、Trematosteidae、Leiosteidae、Lep-

tosteidae、Rachiosteidae 和一些曾归入 Dunkleosteidae (= Dinichthyidae)的属种,如 *Dinichthys herzeri*、*Heintzichthys gouldii*、*Gorgonichthys clarki*、*Holdenius holdeni* (Carr, 1995),但迄今为止这些类群之间的系统发育关系并不清楚。

在缺棘短胸节甲鱼类中,只有 Selenosteidae、Titanichthyidae、Leiosteidae 三个科和 *Heintzichthys* 的中颈片呈前缘前凸、后缘明显前凹的三角形。Titanichthyidae 和 Leiosteidae 都只有一个属(Denison, 1978)。*Titanichthys* 是一种非常特化的节甲鱼,个体很大,头甲长度达到 60～90 cm,副颈片后颈突较小,此外,骨片表面光滑,这些都与新材料区别明显。*Erromenosteus* (Leiosteidae 中的惟一属)过去曾被归入 Selenosteidae (= Pachyosteidae) (Gross, 1932; Miles, 1969),其骨片表面光滑,副颈片后颈突不明显,中颈片中后突发育,这些特征可以同新材料区分。*Heintzichthys* 过去被归入厚甲鱼类中的邓氏鱼科(= 恐鱼科,Denison, 1978),后经 Carr (1991)研究归入缺棘短胸节甲鱼类。新材料与 *Heintzichthys* 在中颈片内面的特征上有着明显的差别。*Heintzichthys* 中颈片内面中隔嵴向后延伸成为中后突并将后横脊分成两瓣,而新材料的后横脊非常发育,并使前面一对凹窝的位置显得很深。另外 *Heintzichthys* 骨片表面光滑,副颈片后颈突不发育也与新材料不同。

月骨鱼科是目前缺棘短胸节甲鱼类中研究程度最高的一个科(Stensiö, 1963; Denison, 1978; Lelièvre et al., 1987; Carr, 1994, 1996),包括 *Microsteus*、*Enseosteus*、*Pachyosteus*、*Rhinosteus*、*Melanosteus*、*Gymnotrachelus*、*Selenosteus*、*Stenosteus* 和 *Paramylostoma* 等 9 个属,其中,中颈片形状与新材料相近的有 *Microsteus*、*Pachyosteus*、*Rhinosteus*、*Melanos-*

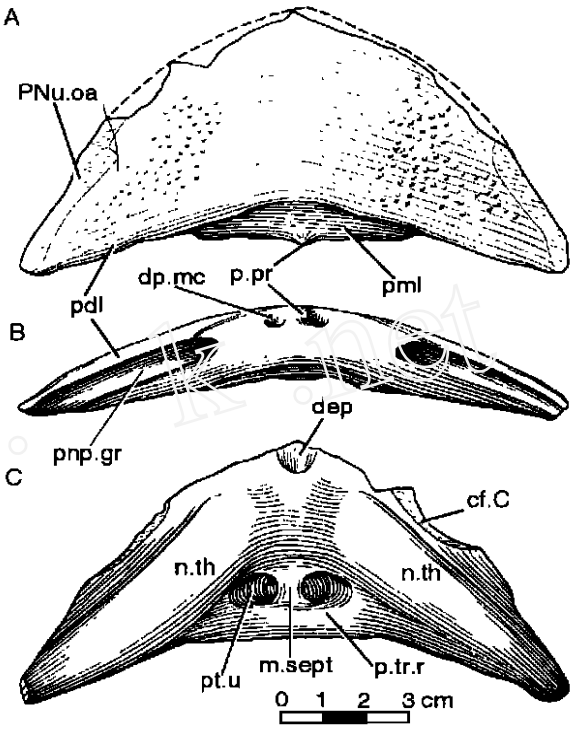

图 3　刘氏瘤骨鱼(新属、新种)中颈片(V 13591,正型标本)

Fig. 3　*Phymosteus liui* gen. et sp. nov. (V 13591, holotype) A nearly complete nuchal plate in dorsal (A), posterior (B) and visceral views (C)

简字说明 Abbreviations: cf. C. contact face for central plate 中心片接触面; dep. anteromedian depression on visceral surface of nuchal plate 中颈片内面的前中凹; dp. mc. depression in posteromedian cusp of nuchual plate 中颈片后坑; m. sept. median septum 中隔嵴; n. th. nuchal thickening 中颈加厚; pdl. posterior descending lamina of skull-roof 颅顶甲后降叶; pml. posteromedian lamina on external surface of nuchal plate 中颈片背面的后中叶; pnp. gr. contact groove for postnuchal process of paranuchal plate 与副颈片后颈突相接触的沟; PNu. oa. overlap area for paranuchal plate 副颈片覆压区; p. pr. median posterior process of nuchal plate 中颈片中后突; p. tr. r. posterior transverse ridge 后横脊; pt. u. paired pits on visceral surface of nuchal plate 中颈片内面凹窝

teus、*Selenosteus* 和 *Stenosteus* 等。就纹饰特征而言,新材料与 *Rhinosteus* (Stensiö, 1963) 相近,尽管后者的瘤点比较稀疏。*Melanosteus* (Lelièvre et al., 1987) 在眶下片和眶前片的边缘部位也有一些瘤点分布,但在中颈片上是光滑的。新材料中颈片后缘中间部位比较平直,该特征与 *Melanosteus* (Lelièvre et al., 1987) 和 *Enseosteus* (Stensiö, 1959; Denison, 1978) 相似。从差别看,新材料中颈片与副颈片的覆压关系比较特殊。月骨鱼类的中颈片通常覆压两侧的副颈片,而在新材料中是中颈片被两侧的副颈片覆压。这种反转的覆压关系过去只见于 *Selenosteus* (Denison, 1978)。从中颈片内面特征看,新材料的后横脊非常发育,这与 Dunkleosteidae 和粒骨鱼类接近,而在已描述的月甲鱼科鱼类中,中颈片内面凹窝靠后,后横脊不明显。根据以上比较,新材料以其发育的后横脊、中颈片与副颈片之间的反转覆压关系、特有的纹饰等特征同月骨鱼科已描述的属种明显区分。因此,新材料应代表一新属、新种,即刘氏瘤骨鱼 (*Phymosteus liui* gen. et sp. nov.)。综合地看,新属存在归入月骨鱼科的可能性,然而由于新材料只有一件中颈片,提供的鉴定特征毕竟有限,其在缺棘短胸节甲鱼类中的系统学位置还有待新材料的补充。

记述 新材料为一件近完整的中颈片,呈三角形。该骨片后缘明显前凹,但其中间部分较平直,并具有小的后中突 (p. pr, 图 3A～B)。骨片在纵横两个方向上均明显向上拱起。中颈片的后缘形状与 *Melanosteus* (Lelièvre et al., 1987) 较为相似。后缘保存完整,骨片的最大宽度在后缘,其两后侧角之间的距离约为 13.5 cm。骨片的中长约为 6 cm, 侧缘长约为 10 cm。从后面看,后中突的两侧各有一个明显的浅坑 (dp. mc, 图 3B),可能是头甲举肌前端的固着点。在节甲鱼类中,此窝均存在,只是大小和深浅不同而已 (Dennis-Bryan and Miles, 1983)。在中颈片后坑两侧,后降叶 (pdl, 图 3A～B) 下方各有一个横长的凹槽 (pnp. gr, 图 3B),向两侧延伸一直到中颈片后侧角的顶端,槽横宽约 4.5 cm, 内侧较深,向外则逐渐变浅,副颈片的后颈突就镶嵌在此槽内,这表明副颈片的后颈突十分发育。这一浅槽在粒骨鱼类 *Incisoscutus* (Dennis and Miles, 1981) 中看得十分清楚,而在厚甲鱼类其他各属中因中颈片覆压在副颈片上而不存在。从背面看,中颈片后缘中部有一窄而无纹饰的后中叶,宽 5 cm, 长 0.5 cm, 以浅沟与中颈片分开 (pml, 图 3A)。骨片两侧缘的后部被副颈片覆压 (PNu. oa, 图 3A),这种反转覆压的情况在节甲鱼类里是少见的。覆压区较短,约占侧缘长度的 1/3 强。覆压区的前部宽,后部窄,说明副颈片在前方明显向中间凸,致使中颈片的侧缘形成短而明显的侧突。

从腹面看,不完整的侧缘前部残存了部分覆压中心片的接触面 (cf. C, 图 3C)。中颈加厚 (n. th, 图 3C) 非常发育,由骨片后侧角向前中方向伸展,大致与侧缘平行。在中颈加厚的位置,骨片厚度达到 2 cm。中颈加厚之间,有一对深而圆的凹窝 (pt. u, 图 3C)。它们位于一个横置的槽内。该槽后壁陡,前壁较缓,中间被宽的中隔嵴 (m. sept, 图 3C) 完全分开。凹窝较深,呈圆锥形,顶端指向骨片背面,顶部尖,底部宽,其直径可达 1 cm。中隔嵴的前、后两端宽,中间窄,两端宽 0.7 cm, 中间宽 0.5 cm。凹窝曾被解释成为头甲举肌的附着处 (position of levator pit, Stensiö, 1963),但由于凹窝通常向前腹方向开口,Westoll 和 Miles (1963) 将其解释成为脑颅枕区背突的对应构造。新材料显然支持后一种解释。在凹窝之后,后横脊 (p. tr. r, 图 3C) 相当发育,此处的骨片厚达 1.5 cm。在骨片内面的前端有一个圆形凹坑 (dep, 图 3C),类似的凹坑见于粒骨鱼类的 *Mcnamaraspis* (Long, 1995)。此外,骨片内面正中有一条非常明显的沟 (图 2B～C),窄而浅,类似骨缝,从前到后贯穿骨

片并止于后中突,在骨片的背面则看不到。在节甲鱼类里,中颈片是一完整的骨片,只有一个骨化中心,位于骨片的中后部。因此,该沟不可能是骨缝,至于它的成因和功能尚不清楚。

在大多数厚甲鱼类中,骨片表面是光滑的,或仅有少许瘤状纹饰,如在 *Rhinosteus* 和 *Eastmanosteus* 中。但石门的材料非常特殊,不仅骨片表面布满纹饰,而且在不同的区域有不同的纹饰。在骨片的中后部,细小的瘤状突起彼此相连成嵴,嵴间宽度不等,很像砂丘上的波痕,前缓后陡,此区约占中颈片长度的 1/3。在此区的前面,纹饰则呈不规则的鳞片状,片的大小不等,其间偶有一些小的粒状突起。在该骨片的侧翼,则饰以个体较大的瘤状突起,其间有小的粒状突起分布。

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A NEW EUBRACHYTHORACID ARTHRODIRE FROM THE UPPER DEVONIAN OF HUNAN, CHINA

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Key words　Shimen, Hunan, Late Devonian, Arthrodira

Summary

A new eubrachythoracid arthrodire, *Phymosteus liui* gen. et sp. nov., is described from the Upper Devonian (Early Famennian) Xiejingshi Formation of Shimen County, Hunan, central China. The specimen under study, a nearly complete nuchal plate, was collected from the upper part of the formation in association with plant fossils, such as *Leptophloeum guanzhuangense* and *Cyclostigma hunanense*, by Dr. Gen Baoyin of Institute of Botany, Chinese Academy of Sciences in 1990s. The new form is at the pachyosteomorph level of organization having a large nuchal gap and possibly referred to the Selenosteidae of aspinothoracid arthrodires. It is the first record of the aspinothroacid arthrodires from China, but whether it widens the distribution of the Selenosteidae from Europe and North America to Asia needs further fossil materials.

Family Selenosteidae ? Dean, 1901 (sensu Lelièvre et al., 1987)

Genus Phymosteus **gen. nov.**

Etymology　*phyma* (Gr.), nubble, *osteus* (Gr.) bone; an allusion to the tubercular character of the ornament.

Type species　*Phymosteus liui* sp. nov.

Diagnosis　Large sized pachyosteomorph arthrodire with a large nuchal gap; nuchal plate triangular in external view with a deep embayed posterior margin; middle portion of posterior margin relatively straight with a small median posterior process; lateral margin overlapped by paranuchal plate; long transverse groove receiving postnuchal process of paranuchal plate; nuchal thickening and posterior transverse ridge developed; large and deep paired pits on visceral surface; ornamentation comprising unevenly distributed tubercles on the surface of nuchal plate, large tubercles on lat-

eral portions and small tubercles forming short ripple-like ridges on posteromedian portion.

Remarks The new form bears following eubrachythoracid characters: nuchal plate posteriorly expanded, paranuchal plate with postnuchal process, nuchal thickening on visceral surface of skull-roof, and paired pits (housing processes of the neurocranium) on visceral surface of nuchal plate (Miles and Dennis, 1979). The triangular nuchal plate with a deep embayed posterior margin suggests a large nuchal gap between skull-roof and trunk shield. This is a character of some aspinothoracid arthrodires, including the Selenosteidae, the Titanichthyidae, the Leiosteidae (Denison, 1978), and *Heintzichthys* (Carr, 1991). *Titanichthys* (only genus of the Titanichthyidae) is a very specialized fish whose skull length reaches 60～90 cm. It is distinguishable from the new genus with its smooth bone and small postnuchal process of the nuchal plate. Like *Titanichthys*, *Erromenosteus* (only genus of the Leiosteidae) lacks any tuberculation on the surface of dermal bone and has a small postnuchal process. It also differs from the new form in its strong median posterior process. *Heintzichthys*, previously a member of the Dunkleosteidae (= Dinichthyidae, Denison, 1978), is now placed within aspinothoracid arthrodires (Carr, 1991, 1995). The distinction between *Heintzichthys* and the new genus is obvious in the visceral surface of the nuchal plate, as well as the ornament. In the former, the median septum dividing the paired pits, is continuous with the median posterior process thus separating the posterior transverse ridge into two separate halves. In the new form, the posterior transverse ridge is a wide thickening which descends below the median septum. With regard to the shape of the nuchal plate and the tuberculation of the dermal bone, the new genus is more suggestive of *Rhinosteus* of the Selenosteidae. The external surface of the nuchal plate of the selenosteid arthrodires except *Rhinosteus* is smooth. The new form resembles *Melanosteus* of the Selenosteidae in its relatively straight middle portion of the posterior margin of the nuchal plate. The new genus is unique in its reversed overlap relationship between nuchal and paranuchal plates (i.e. paranuchal plate overlapping nuchal plate), and unevenly distributed tubercles on the surface.

Phymosteus liui **sp. nov.**

(Figs. 2～3)

Etymology After Professor Liu Xian-Ting (Liu H.-T.) who described first eubrachythoracid arthrodire in China.

Holotype a nearly complete nuchal plate, IVPP V 13591.

Locality and horizon Upper Devonian (early Famennian), Xiejingsi Formation, Dajingzhou area, Shimen County, Hunan Province, China.

Diagnosis As for genus (the only species).

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