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云南 *Bothriolepis* 属一新种

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1961 年春，笔者在云南霑益城北一公里的山坡上采到一些胴甲类的甲片。化石保存在坚硬的黄綠色細砂岩中。甲片經风化易破碎。其中部分保存較完好，經过鉴定，属于沟鱗魚属的一新种。

本文在写作过程中，承刘先亭、刘东生两先生热心指导，周明鎮教授审閱原稿，王哲夫先生摄制照片，沈文龙同志繪图，笔者于此向他們表示謝意。

标 本 描 述

星鱗魚目　Asterolepiformes

沟鱗魚科　Bothriolepidae

沟鱗魚属　*Bothriolepis* Eichwald 1840

云南沟鱗魚　*Bothriolepis yunnanensis*（新种）

材料　一块前中背片的內模（有极少部分前中背片仍保存）和其外模。古脊椎动物与古人类研究所登記号：V. 2462.1，V. 2462.2。

另一块后中背片的內模和其外模，侧角及其以后部分的甲片边緣保存不完整。V. 2462.3，V. 2462.4。

产地及时代：云南霑益城北一公里；晚泥盆世或中泥盆世。

特征：前中背片宽和长的比例为 82%，背中嵴发育。甲片后緣稍宽于前緣，前緣略凸出，后緣平直。外后举突不发育，其后无明显的缺刻。后頸刻略內凹，向前中傾斜程度小。举穴宽短。后举嵴不发育。后腹斜凹綫发育。甲片表面有由細的疣突构成的細密网眼，靠近甲片外侧排成平行于侧緣的行列。后中背片較狹长，宽与长之比为 85%，侧突前的部分宽度較一致。

描述：前中背片（Anterior median dorsal plate，图版 I，1，2；插图 1，A）。

前中背片大致呈縱长的六边形。两前侧角間的前緣宽为 19.5 毫米；两后侧角間的后緣宽为 20.5 毫米。两侧角之間的宽为 37.1 毫米；甲片中軸长为 45.4 毫米，甲片宽与长之比为 37.1/45.4 = 82%。背角（tergal angle）位于前緣后 18 毫米。以通过甲片两侧角的連綫将甲片分为前后两部分，前部分长 29.1 毫米，后部分长 16.3 毫米，前部分长与后部分长之比为 29.1/16.3 = 178%。

前緣稍向前凸，无显著突出的前角（anterior corner）。由前緣和側緣构成的前側角（anterior lateral corner）具清晰的稜角。后頸刻（postnuchal notch）略向內凹，向前中傾斜程度不大，两后頸刻边緣延綫的夹角約 70°，外后举突（external postlevator process）不很发育，不明显向外侧凸出，其后无显著向內收縮的缺刻。侧角（lateral corner）发育，它将

由前侧角至后侧角間的側緣分为前后两部分：側緣前部分微向外弯曲，于前 2/3 处有一缺刻，其后，側緣平直。側緣后部分較前部分平直。后緣平直，无后中突（posterior median process）。

前中背片背脊隆起，在背角之后形成发育的背中嵴（dorsal median ridge），向后直达甲片后緣，背角之前的部分呈拱状隆起，由背角两側各有一条平緩的凹陷谷（obliquely transversal depression）伸向前側角。后腹斜凹綫（posterior oblique obdominal pit-line groove）发育。紋飾細致，由細而較低平的疣突联合成細密的网眼。网眼与疣突寬窄相若，靠近側緣排列成行，且平行于側緣。

前中背片的腹面在 V. 2462.1 号标本保存完好。举穴（levator fossa）在內模上呈前边长于側边的三角形，后举嵴（postlevator crista）很不发育，仅为前腹坑之前側方的两条极短的沟所代表。后举加厚区（postlevaor thicking）发育，在印模上为沿着举穴側緣的两条凹谷。前腹坑（anterior ventral pit）向后上方穿入甲片。前腹突（anterior ventral process）、腹中嵴（ventral median ridge）和腹中沟（ventral median groove）发育，同于正常的 *Bothriolepis* 型，只是腹中嵴后端呈一个显著的突起，在印模上呈現为深的凹坑。

前中背片与其邻近甲片的連接关系属于 *Bothriolepis* 型中不正常的一种；側緣前部分的前 2/3 复盖于前側背片（Anterior dorso-lateral plate）之上，其后的 1/3 則为前側背片所复盖。側緣的后部分和后緣同于正常的 *Bothriolepis* 型，分别为复側片（mixilateral plate）和后中背片所复盖。上頸区（supranuchal area）为沿着前緣的条带状印痕所代表。复盖和被复盖区都較狹窄，尤其是被前背側片和复側片复盖区，在印模上仅呈現为一条很窄的嵴，被后中背片复盖区略寬，中部向前凸。

后中背片（posterior median dorsal plate，图版 I，3，4；插图 1，B）。

后中背片較狹长，側突以前的部分寬度較一致。甲片中軸长約 33 毫米，两側角間的寬約 28 毫米，寬和长之比为 28/33 = 85%。

前緣保存不完整，根据殘缺痕迹判断，前緣向前突出，因标本保存不好，观察不到前角。側緣微向外弯曲，由側突往前略向前中合攏。側突較圓鈍，分不出側角与后側角。后緣呈弧形凸出，无明显突出的后中角（posterior corner）。腹中沟发育，在后腹坑（posterior ventral pit）部位因标本受压挤而殘損，观察不到后腹坑、腹結节（ventral tuberasity）和后腹突。后中背片与前中背片和复側片的連接关系为正常的 *Antiarchi* 型。无复側刻（mixilateral notch）。

比較討論：从上面的描述中，可以看出我們所記述的前中背片其腹中沟和腹中嵴均发育較完全，因此当属于一成年个体較小的沟鱗魚种，其背甲长約 90 毫米。甲片的形状、比例和紋飾都是沟鱗魚中較常見的类型。

前中背片与以前在我国湖南跳馬澗发現的中华沟鱗魚（*Bothriolepis sinensis* Chi 1940）最为接近，但后者以显著的狹长及前緣寬于后緣不同于我們的标本（見表 1）。并且中华沟鱗魚具有显著突出的后举突，其后并有向內收縮的缺刻，两側后頸刻边緣延綫的夹角約达 100°，举穴狹长，后举嵴发育。我們的标本，举穴短而寬，后举突不发育为显著的隆起，其后亦无明显的缺刻，后举嵴不发育，仅为举穴外側的极短的嵴所代表。后頸刻边緣延綫夹角約 70°。

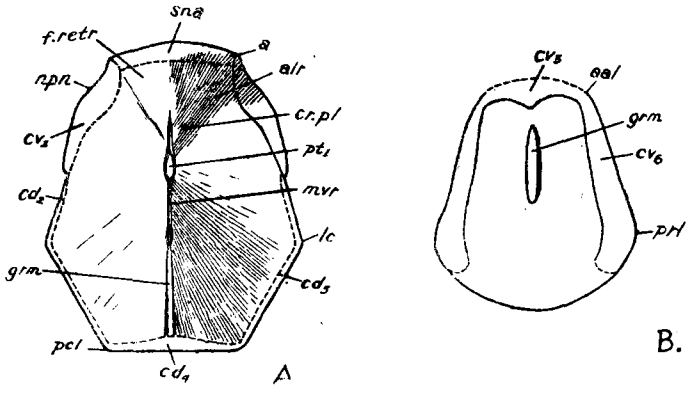

图 1 云南沟鳞鱼 *Bothriolepis yunnanensis* (新种)

A. 前中背片腹面視； B. 后中背片腹面視；× 1 (略小于原大)。a-前側角，aal-后中背片之前側角，alr-后举加厚区，cd_2-被前側背片复盖区，cd_3-被复側片复盖区，cd_4-被后中背片复盖区，cr. pl-后举嵴，cv_1-复盖前側背片区，cv_5-复盖前中背片区，cv_6-复盖混合側片区，f. retr-举穴，grm-中腹沟，lc-側角，mvr-中腹嵴，npn-后頸刻，pcl-后側角，prl-側突，pt_1-前中腹坑，sna-上頸区。

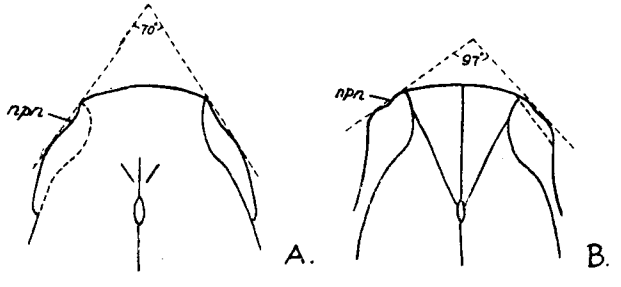

图 2 沟鳞鱼后頸刻边緣延綫夹角的比較

A. 云南沟鳞鱼 *B. yunnanensis* B. 中华沟鳞鱼 *B. sinensis* Chi

从比例上看，后中背片属于比前中背片略小或相当大小的个体，由于其側突以前的部分寬度一致，故属于前部寬的类型。

云南沟鳞鱼与中华沟鳞鱼的前中背片的比較：(測量单位：毫米)

特征 / 种别	甲片长	甲片寬	寬/长	前緣寬	后緣寬	前緣寬/后緣寬
云南沟鳞鱼	45.4	37.1	81.7%	19.5	20.5	95%
中华沟鳞鱼	43.0	30.0	70%	14.9	13.5	110%

在中国自从計荣森先生首次記述了湖南跳馬澗的沟鳞鱼后，曾有不少关于泥盆紀鱼化石的报导，一些作者对含沟鳞鱼层的地質时代提出了不同看法，最早由計荣森 (1940，1942)把沟鳞鱼层定为晚泥盆世，王鴻楨(1942)則認为該含鱼层当为爱非尔期，其后边兆祥(1947)支持計氏的看法，把沟鳞鱼层仍列为晚泥盆世。但是对所发現化石的古生物学

描述方面的报告則很少。这样，由于古生物学本身研究的缺乏，防碍了这一复杂問題的进一步說明：在中国沟鱗魚层究竟是有数个时期不同的层位，还是仅有一层。这里記述的云南标本与湖南种既不相同，因此，在获得更充分的証据前，把湖南与云南这两个地理上相距甚远的含沟鱗魚层作密切对比的尝試是有必要小心从事的。

据統計目前世界上所发現的沟鱗魚至少有 29 个种（其中包括 4 个未定种），它們在地質时代上的分布，絕大多数的种属于晚泥盆世，只有少数种可能属于中泥盆世。因此在中国沟鱗魚是否較早地出現在中泥盆世，倒是一个很有意义的問題。

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A NEW SPECIES OF *BOTHRIOLEPIS* FROM YUNNAN

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(Summary)

In 1961 the writer collected some *Bothriolepis*-remains from a locality 1 km. north of the city of Chanyi, Yunnan. The fossils were preserved in yellowish green sandstones. A few well preserved plates are described in this note.

DESCRIPTION OF SPECIMEN

Order Asterolepiformes

Family Bothriolepidae

Genus *Bothriolepis* Eichwald 1840

Bothriolepis yunnanensis sp. nov.

Material: An internal mould of anterior median dorsal plate with a few dermal plate and an external mould of the same plate, Cat. No. V. 2462.1, 2462.2; an internal mould of posterior median dorsal plate and an external mould of the same, V. 2462.3, 2462.4.

Horizon and Locality: Upper or Middle Devonian; 1 km. north of the city Chanyi, Yunnan.

Diagnosis: A rather small species of *Bothriolepis*. Breadth of anterior median dorsal plate in proportion to its length 82%. External postlevator process not very much produced and without distinct notch behind it; levator fossa broad and short; postlevator crista not very developed, represented only by much short ridge in front of anterior ventral pit. Ornamentation fairly delicate and reticular. Posterior median dorsal plate of narrow type, with somewhat uniform width throughout its extent. Breadth and length ratio 85%. Ventral median groove well developed.

Description: Anterior median dorsal plat (Amd) (V. 2462.1, 2462.2) hexagonal. Anterior margin 19.5 mm and posterior margin 20.5 mm long. Its dorsal length 45.4 mm, breadth (transversely from the lateral corners (lc)) 37.1 mm; breadth and length ratio 37.1/45.4=82%. Tergal angle 18 mm behind the anterior margin.

Dorsal median ridge well developed and extends from tergal angle to the posterior margin. Anterior margin is convex. Anterior lateral corner (a) rather pronounced. Postnuchal notch (npn) distinct, but less concave. The lines drawn along the postnuchal notch meet in front of the plate, forming an angle of 70°. The external postlevator process (pr. pl) is not very much produced and posteriorly confluent with the anterior part of the anterior division of the lateral margin in a straight line. The anterior part of the lateral margin is slightly convex, but at two third of it there is a notch, from which the margin of this part becomes straight and runs inward. While the posterior part of the lateral margin is comparatively straight. The posterior margin of the plate is straight

and without posterior median process. The posterior abdominal pit-line grooves are well developed.

The sutural connection of Amd with Ald is of anomalous *Bothriolepis* type; Amd overlaps Ald for two thirds distance anteriorly, but overlapped by this plate further posteriorly on both sides in front of its lateral corner. Overlapping area cv_1 distinctly displayed in V. 2462.2, it is comparatively narrow and not extending to the lateral corner. Cd_2 and cd_3 represented by a narrow area, while cd_4 is wide and convex anteriorly.

Ornamentations of the dorsal surface of the plate composed of faint tubercles, those on the outer part arranged in lines parallel to the lateral margin.

The ventral surface of the plate is well preserved in V. 2462.1. Its ventral median ridge (mvr) is represented by a groove issuing in back of the anterior ventral pit (pt_1) and posteriorly stopping in a prominent process and beside, anteriorly also far forwards into the levator fossa. Following mvr the ventral median groove (grm) runs down to the posterior margin. The anterior ventral process (prv_1) and the anterior ventral pit observed on the same specimen is of normal *Bothriolepis* type. The postlevator crista (cr. pl) is only represented by a very short ridge. In the mould specimen the postlevator thicking (arl) represented by a shallow depression run in an antero-lateral direction to lateral margin. The levator fossa is marked off by the postlevator thicking into a short and broad triangular area.

Posterior median dorsal plate (Pmd) (V. 2462.3, 2462.4) comparatively broad in its anterior. Length along the dorsal axis about 33 mm, breadth between the lateral corners about 28 mm; breadth and length ratio 28/33=85%. Anterior margin of the plate is not completely preserved. Its impression shows that it produces anteriorly, but the anterior angle is unknown, lateral process (pr. l) not much produced. The part of the lateral margin of the plate situated in front of the lateral process is rather straight. The posterior margin not produced into a prominent median posterior process. Ventral surface of the plate is not well preserved. V. 2462.3 indicates that the crista transversalis internal posterior is not present. The ventral tuberosity, usually found in *Bothriolepis*, is not found in this specimen. The ventral groove is distinctly displayed.

The overlapping areas are of normal *Bothriolepis* type without mixilateral notch.

Comparison: The general characters of the anterior median dorsal plate of this fish is quite like that of *B. sinensis* Chi (1940) from Hunnan. But our specimen differs from *B. sinensis* in several respects. The described plate is broader in proportion than that of *B. sinensis*. In *B. yunnanensis* length of posterior margin of Amd is larger than its anterior margin, while in *B. sinensis* anterior margin is longer than the posterior margin. The external postlevator process of the described species is less produced than that in *B. sinensis*, and therefore the notch behind the external postlevator process is not so pronounced as that of *B. sinensis*. In the new species lines drawn along the both external margins of the postnuchal notch meet in front of the plate, forming an internal angle of about 70°, while in *B. sinensis* it is about 100°. Since the levator fossa in the new species is much wider than that of *B. sinensis*, the overlapping area cv_1 in V. 2462.1 is comparatively narrower.

All these anatomical characteristics differ from those of *B. sinensis* distinctly and can hardly be considered as ontogenetic variations.

图 版 I 說 明
(Explanation of plate I)

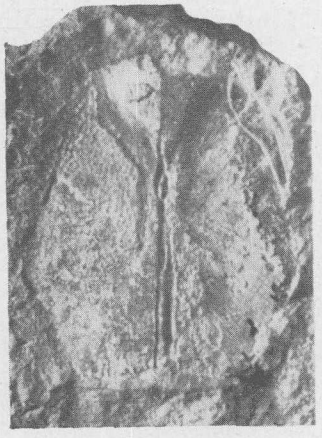
图 1. 云南沟鱗魚 (*Bothriolepis yunnanensis*) (新种), 前中背片內模 (internal mould of anterior median dorsal plate), V. 2462.1, × 1。

图 2. 同上, 前中背片外模 (external mould of anterior median dorsal plate), V. 2462.2, × 1。

图 3. 同上, 后中背片內模 (internal mould of posterior median dorsal plate), V. 2462.3, × 1。

图 4. 同上, 后中背片外模 (external mould of posterior median dorsal plate), V. 2462.4, × 1。

图 5. 中华沟鱗魚 (*Bothriolepis sinensis* Chi), 前中背片內模 (internal mould of anterior median dorsal plate), × 1。



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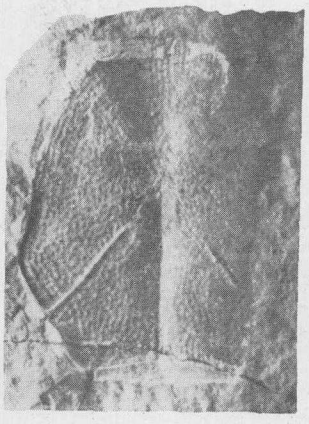

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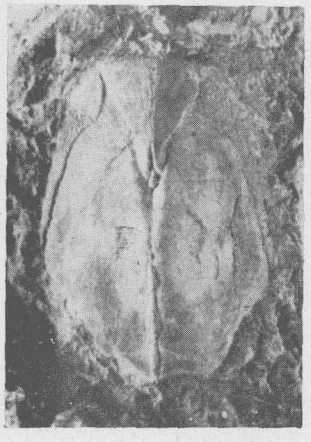

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