

山东山旺中新世蛇化石

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在我国爬行动物化石的研究方面,蛇类化石还是一个空白点。在此以前只有许洛塞 (Schlosser, M.) 和卡美年提到在内蒙古爱坦丁上新世和华北周口店更新世地层中发现过一些不能鉴定的零星蛇类骨骼。然而最近我们通过山东临朐山旺砂藻土矿一工人同志和北京地质学院古生物教研室获得了两块蛇类化石的标本。这两块标本均产自上中新统山旺组砂藻土,代表了我国第一次发现的中新世蛇类,因此有必要记述于下。

标 本 描 述

这两块标本均保存在十分松软和极易风化的砂藻土页岩中,因此搬动和存放时必须严加小心和妥管,否则很容易被破損掉。

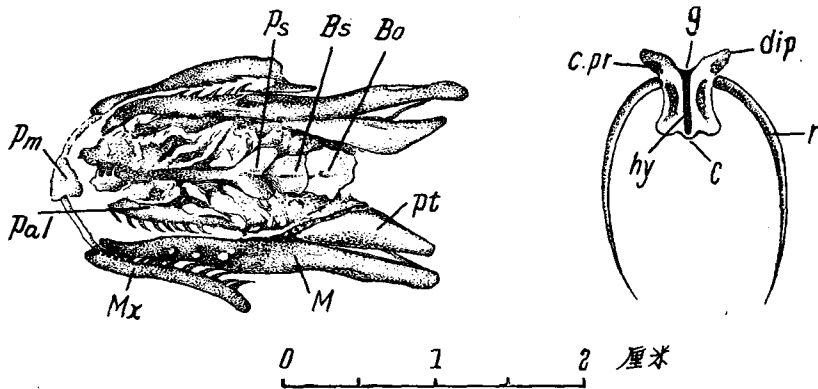


图 1 砂藻中新蛇,新属、新种: (*Mionatrix diatomus* gen. et sp. nov.) V. 993.

左,头骨(skull)腹侧印模 $\times 2$; 右,胸椎连同胸肋(thoracic vertebra with rib)腹侧印模 $\times 2$ 。

简字说明: 左, Bo, 基枕骨; Bs, 基蝶骨; M, 下颞; Mx, 上颞骨; Pal, 腭骨; Pm, 前颞骨; Ps, 副蝶骨; Pt, 翼骨; 右, C, 椎体后突(condyle); c. pr, 肋突(costal process); dip, 侧突起(diapophysis); g, 椎体前凹(glenoid); hy, 椎下突(hypapophysis); r, 肋骨(rib)。

两者所保存着的都只是一个骨骼的腹部印模,骨骼几乎全部缺失了;因此在描述和对比上受到了很大的限制。但尽管如此,除了有几段脊柱缺失以外,保存部分还是相当完全。砂藻土矿工人同志采得的一块(古脊椎动物与古人类研究所编号 V. 993)躯干交叉弯曲,前胸部和头部则远远地向前伸出。北京地质学院的标本(V. 994)个体稍大,躯干弯曲成环形,头部不幸正压在后胸部的一段脊柱下,尾部断失。

山旺化石代表的是一类中等大小的蛇类。V. 993 号估计全身长度为 65—70 厘米, V. 994 的保存部分长 57.5 厘米, 估计全长可超出一米。

头骨在 V. 994 号标本上, 因与躯干部分重迭压复以致模糊不清, 所能辨别的只是左侧向后伸出的下颞后支。但在 V. 993 上, 头骨腹部构造大致能分辨。

V. 993 号的头骨总长 2.5 厘米。在中线部位, 最后面的基枕骨成梯形, 前缘宽于后缘。前缘中部有一个小小的突起向前插入基蝶骨。基蝶骨为四方形, 稍小于基枕骨。副蝶骨由一宽短的后基部和一窄长的前突起组成。在基蝶骨和副蝶骨之间有一凹坑, 反过来说, 便是头骨在这一部位有一中央突起。副蝶骨前突起的前伸情况不知, 因为在那里被向内折复的腭骨前端盖住了。

吻端, 三角形的前颞骨尚能辨别, 但没有前颞齿的痕迹。左右上颞骨被压到了头骨的最外两侧。从保存情况可以知道上颞骨与头骨其余部分的接触关系并不是十分紧密的。在标本上, 前颞骨的侧端和上颞骨的前端之间相距有 3 毫米, 两者之间有一很浅的条状印痕, 推测在生活时此处可能由软骨韧带相连接。

左侧上颞骨保存长度为 11.5 毫米, 从印模上看来, 末端并无断裂痕迹, 因此这也就是它原来的总长度。上颞骨构造原始, 呈细长条状, 没有缩短增高等特化现象。上面分布着细小的牙齿, 牙齿分布较密且很均匀, 由第 6、7 个起, 向后逐渐增大增长, 并稍有反弯曲, 和 *Natrix* 者相似, 但增大并不很显著。最后两个牙齿没有突出的增大现象, 和前面牙齿之间也没有齿隙相间隔。从印痕计数, 上颞骨上的牙齿有 14—15 枚。

腭骨也是一对细长的骨头, 左右腭骨之间距离较宽, 为 6.5 毫米, 两者互相平行排列。左侧前端折向内侧, 已如上述。腭骨齿有 11 个左右, 大小和上颞齿相若, 后面的牙齿也稍呈反弯曲形状。颞骨后面的翼骨增宽成三角形, 尖端指向内侧。翼骨末端直伸及方骨部位, 方骨虽未见保存, 但两者肯定是有接触的。翼骨内侧沿着边缘也有细小的牙齿分布着, 数目大概和腭骨齿差不多, 但大小上要小些。

下颞被保存在腭骨和上颞骨之间, 左侧是下颞底缘的印痕, 右侧则是其外侧印痕。左侧印痕上有几个很小的突起, 可知下颞底缘有小孔。右侧可见到牙齿痕迹, 下颞齿也很细小, 数目则不得而知。

V. 993 所保存的躯干脊柱部分可以分成三段(见图版 I)。A-B 保存了 76 个脊椎, C-D 54 个, E-F 22 个。在三个缺失段, 估计 B-C 缺失脊椎 10—15 个, D-E 20 个左右, 根据尾椎的缩小程度, 估计 F 以后还有 20—30 个尾椎。总计保存的脊椎共有 152 个, 其中颈胸部的 130, 尾部的 22。胸部和尾部的分界处, 也就是荐部, 应该在 D-E 段内, 可能即在 D 点后不远处。尾椎估计有 60 个上下。这样, 脊椎的估计总数为 200 个上下, 其中颈胸椎约 140 个。如果这个估计是正确的话, 那末胸椎数和尾椎数之比应该是 2:1。

V. 994 的脊柱也分成三段保存着, 保存的脊椎共有 74 个, 尾部脊柱断失。

由于保存的仅是腹侧印痕, 因此很多在脊椎上借以分类的特征在此不能应用。

V. 993 最前面的环椎和枢椎还很清楚, 椎体均较后面的为短小, 没有肋骨附着。前胸部的椎体较短, 后胸部的则逐渐细长。前者长 2.5 毫米, 宽(左右前关节突之间宽度) 4 毫米; 后者长 3.6 毫米, 宽 6 毫米。尾椎椎体则小, 呈矩形, 但长度超过宽度(长 3 毫米, 宽 2.5 毫米)。

椎体前凹后突的关节面的印痕在每一节上都很清楚。侧突起(diapophysis)向前侧方伸出。稍靠内,有一个与侧突起互相重压但印痕较深的凹陷,此即位于侧突起下面的肋突(costal process)。椎体中部,椎下突(hypapophysis)刻下的纵沟也十分清晰。椎下突分布遍及整个脊柱,不仅前胸部,在后胸部也有,到尾部便相当于尾椎腹侧的髓棘(chevron)。椎下突形成的沟并不很深,也没有明显的前浅后深或向后延伸等现象,说明椎下突较短,也不象有的属类那样向后伸展成三角形的骨片。而且在整个脊柱上,椎下突的发育情况都很一致,没有在前胸部长后胸部短的现象。在椎下突的两侧还有一对平行的纵沟,可能为椎体两侧的下突部分。

肋骨细长,始自第三脊椎。最前面的较微弱,细而短。自第七,八对开始,向后则逐渐增长增粗。前胸部的仍稍弱,后胸部的则最为发育。肋骨头很好地连接在椎体上。在尾椎上仍能见到向侧伸出约3毫米长的固着尾肋的印痕。

V. 994 脊椎的构造和 V. 993 者完全相同,唯椎体较大,前胸部的长5毫米,宽7毫米;后胸部的长6毫米,宽8毫米。

在两块标本上,都没有见到后肢残存的痕迹。当然,也有可能是正巧都缺失了。在 V. 994 号标本上在体躯弯曲的内侧倒可以很清楚地看到鳞片压复在页岩上的痕迹(图版 II),动物身体的宽度也因此而可以测知为35毫米。V. 993 上也有鳞片的印痕,但不如 V. 994 者那样清楚,身体宽度约为26毫米。

比较与鉴定

根据罗美尔(A. S. Romer, 1956)的分类,蛇亚目可分为三个超科——盲蛇超科(Typhlopoidea)、蟒蛇超科(Booidea)和游蛇超科(Colubroidea)。

从保存部分看来,我们的标本显然不属于盲蛇类。后者由于特化于挖掘生活,因此头骨构造较为坚固,有一个结实的吻部作为挖掘器官,上下颌大为缩短,牙齿也大为退化,椎体没有椎下突,后肢残迹通常存在,尾很短。这些特征与山东标本都是不符合的。

蟒蛇类是蛇类中较原始的一个类群,除了一般的有后肢残余痕迹以外,前颌骨上通常具有前颌齿。山东标本与蟒蛇类相同之处在于上下颌(前颌骨除外)上均有发育完好的齿列,翼骨向后直伸及方骨。但不同之处则较多,除了上述的后肢残迹和前颌齿而外,蟒蛇类的尾部较短,胸尾之比为4—6:1,我们的标本则尾较长,几为2:1。蟒蛇类头部各骨互相间的连接或多或少地较为坚实,椎下突的分布只限于身体前部的脊柱,而山东标本从保存情况来看,头部各骨的连接则较为疏松,椎下突遍及全身。

与上述两个超科所不同的特征恰恰都是较进步的游蛇超科的特征,这两块标本毫无疑问是属于蛇亚目中种类和数目最为繁多的游蛇科(Colubridae)的。与之相符合的不仅有无后肢残余痕迹,无前颌齿,上下颌齿列发育,翼骨直达方骨等;而且有前颌骨与上颌骨不直接相接,椎下突有时遍及全身,胸尾之比为2:1。此外,上颌骨仍为细长的,没有缩短增高,齿列仍较全,牙齿大小较均匀,没有齿列退化,和增大了的沟牙(毒牙)等构造。这些都是游蛇超科中较不特化的游蛇科的特征。

在游蛇科中,仍有一些亚科显示出了某些特化性质,如齿式退化,在前胸部的椎下突特别长,有的直接穿入食道等等。我们的标本没有这些特性,因此归入于游蛇亚科(Colu-

brinae)。

游蛇科是蛇类中最大的一个科,分布也最广。它几乎包括了所有的无毒蛇和热带的一些毒性较小的蛇类,而游蛇亚科又是游蛇科中最大的一个亚科。这一科的化石记录始自中新世,有欧洲的 *Elaphe*, *Thamnophis*, *Coluber* 等,这些属类也都是现生属,因此主要要与现生属类来比较。

要与这样繁多的现生种属进行对比,自然是比较困难的。加之现生种属的分类主要根据的是外部形态,内骨骼解剖的很少。但近年来有不少学者根据椎下突之存在或不存在于身体后部脊柱、上颌齿的分布情况以及生殖器官的构造等企图将游蛇科或其中的某亚科或某属进行进一步的组合与划分。比较一致的意见是将椎下突存在于后胸部的归入 *Natrix* 这一类,仅存在于前胸部的归入 *Coluber* 这一类。我们的标本显然是属于前者,而且从上颌齿的排列方式上也证明与 *Natrix* 相近。

除了 *Natrix* 属外, *Thamnophis* 也属于这一类。在北美,这两属的关系甚为密切。我们的标本之区别于它们在于上面说过的椎下突的构造较不特化,没有向后向下伸展现象,椎体突 (parapophysis) 也没有极度向下弯曲成钩状。 *Thamnophis* 在中新世时便存在了,而 *Natrix* 的可靠记录直到更新世才有。现生的 *Natrix* 则在我国华南分布很广,个别的种也生存在华北、东北等地。

基于脊椎上的这些较原始的性质,我们将山东发现的化石订名为 *Mionatrix diatomus* (砂藻中新蛇),代表在第三纪时与 *Natrix* 关系较近的属类。其特征可归纳如下:

身体中等大小,体长半米到一米。牙齿细小,分布紧密。上颌齿数 15 左右,牙齿向后稍增大,最后两齿无特殊增大现象,与前面牙齿之间也无齿隙。颌骨齿 11 上下。翼骨齿极细小,沿内侧边缘分布。翼骨呈扁的三角形。椎下突遍及全身,突起较短,但前后高度相若,无向后增高现象。

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NOTES ON FOSSIL SNAKES FROM SHANWANG, SHANTUNG

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Fossil snakes has hardly been recorded in China except several isolated bones noted by Schlosser (1924) and Bien (1934). Recently, however, two rather completely preserved specimens were discovered from the Miocene diatomaceous beds of Shanwang, Shantung, representing the first determinable fossil snake known in China.

The two specimens are from the same kinds of matrix and of same mode of occurrence, they were preserved in the very soft and fragile white shale ("paper shale"), both had lost all the bones and only the imprints from the ventral side of the skeleton were left for description and comparison.

V. 993 is more complete in preservation. The trunk was curled up crossed, and the skull and anterior thoracic region extend far forward. That of V. 994 is larger in size with vertebral column forms a ring, but the skull is pressed under the posterior thoracic region, and the caudal part is broken off.

The fossils of Shantung represent a group of snakes medium in size. The estimated total length of V.993 is 65—70 cm. and that of V.994 over one meter.

The skull is entirely damaged in V.994 due to compression except the posterior ramus of the left lower jaw which had protruded outward. In V.993, according to the imprint the main structure of the skull base is rather distinct.

The skull is 25 mm. in length. The posterior basioccipital is quadrangular with broader anterior and narrower posterior borders. A small median process projects anteriorly into the basisphenoid. The basisphenoid is also quadrangular in shape, somewhat smaller than basioccipital. Forwardly, the parasphenoid is constituted of a broad, short base and a long, narrow anterior process. A notch lies between the basisphenoid and parasphenoid which means there was located a median process from the braincase. The anterior extension of parasphenoid is unknown because this place is covered by the anterior part of the palatine.

At the tip of snout, the triangular premaxillary is discriminable though with some obscurity. No premaxillary teeth is present. Maxillaries are isolated from the braincase, separated each other and squeezed to the outmost border of the skull. So it could be known that the maxillaries are

not closely connected with the other skull elements. The premaxillary and maxillary are separated from each other by a distance of 3 mm. however, a slender shallow groove lies between them, this probably indicates that these two bones were linked through a cartilaginous ligament.

The preserved length of left maxillary is 11.5 mm. Viewed from the imprint, no broken mark at the posterior end is seen, therefore, this may represents its original length. The maxillary is primitive in structure, it is a slender bar, without shortening and thickening. The teeth are small and evenly spreaded along the margin. They are almost equal in size, slightly enlarged and recurved posteriorly. No anterior or posterior fang. Also the last two teeth are not enlarged abruptly and without diastema with its anterior ones. There are 14—15 maxillary teeth on each side.

The palatine is a slender bone. The distance between the right and left ones is relatively wide (6.5 mm). Both palatines lie parallelly. The anterior part of the left ramus is broken and faces inward as mentioned above. The palatinal teeth are similar in size to those of maxillary, the number of palatinal teeth is approximately 11. The posterior ones are somewhat recurved as well.

The pterygoid is a triangular plate, with angle points to the median. It extends far backward to the rear quadrate region to be in contact with quadrate. The imprints of the teeth could be observed, they are spread along the inner margin; it is near that on the palatine in number but much smaller in size.

The lower jaw lies between the maxillary and palatine-ptyerygoid bar. The print marks of the left one shows its lower border; and that of the right, its outer lateral side. The mandible teeth are also weak and small as could be rather clearly but incompletely seen from the right side. The exact number of the teeth is unknown.

The preserved trunk of V.993 was divided into three parts (Pl. 1). There are 76 vertebrae preserved in part A-B, 54 in C-D and 22 in E-F. It is estimated that about 10—15 vertebra were lost in part B-C, about 20 in D-E. To sum up, 152 vertebrae were preserved, in which, 130 belong to the thoracic and 22 to the caudal region. The division of thoracic to caudal must be located in the blank D-E, probably not far from the point D. Judged from the tendency of decreasing of the vertebral centrum, it is probable that the number of caudal vertebrae is about 60. Thus the estimated total number of trunk vertebrae would amount to about 200, in which, about 140 are thoracic. If this estimation be approximate, then the proportion of thoracic to caudal is near 2:1.

The column of V.994 is cut into three parts, the total number of preserved vertebrae is 74. The caudal region is not preserved on the specimen.

In V.993, the atlas and axis are distinguishable. Their centra are smaller and shorter than those of the following ones, no rib is attached. The centra of the anterior thoracic region are shorter, with a length of 2.5 and greatest width of 4 mm, while those of the posterior thoracic are slender, 3.6 in length and 6 in width. The caudal vertebrae is much smaller and rectangular in shape, with length exceeds width; the former is 3 and latter is 2.5 mm.

The prints of articular surfaces of the procoelous centrum are clearly shown in every segment. The diapophysis projects antero-laterally. Costal process which lies below the transverse process is represented by a deeper notch overlapping with the latter. The hypapophyses, represented by the median grooves in the centra, is clearly seen, it extends throughout the whole column. The groove on each centrum is not very deep, and has an equal depth at the anterior and posterior parts of the centrum. This means that the hypapophysis is not very long or extending backward and downward into a triangular plate as in certain other genera. Not only in one centrum, but in all the centra the structure of hypapophyses is rather uniform, not lengthened anteriorly and shor-

tened posteriorly.

The rib is slender. It starts from the third vertebra. Those anterior ones are weak and short, but gradually increased in size backwards, those of posterior thoracic are in full development. The rib head is well attached to the centrum. In the caudal region, the fused caudal ribs are visible, they are 3 mm. in length.

The centra of V.994 are similar in structure to those of V.993, but larger in size. The anterior thoracic has a length of 5 and width of 7 mm, posterior ones has a length of 6 and width 8 mm.

No pelvic vestiges are observed in both specimens, but scale prints are distinct on V.994 (Pl. II).

Comparison and Determination

It is evident that our two specimens belong to the largest family of Ophidia—Colubridae. The features common with the colubrids are shown in the premaxillary-maxillary relation, pterygoid extending backwards and reaching quadrate, premaxillary toothless, well developed dentition on both jaws, developed hypapophyses, and the proportion of thoracic to caudal. Their slender maxillary and without the structure of enlarged fangs rendered them to have a position in the rather generalized forms.

In Colubridae, those genera in which hypapophyses persists throughout the whole vertebral column are *Natrix* and *Thamnophis*. Fossils from Shantung differ, however, from these genera in having an unspecialized hypapophysis which does not expand posteriorly into a triangular longitudinal plate and also without the downward hook-like structure as in *Thamnophis*. Therefore, we proposed a new generic and specific names—*Mionatrix diatomus*—for the Shantung fossils. It is related to the living *Natrix* widely distributed in China as well as in other continents.

The diagnosis may be summarized as follows:

Shakes of median size, with length about 1 meter. Teeth small and closely spaced. Maxillary teeth about 15 in number, slightly enlarged and recurved posteriorly, last two teeth not enlarged abruptly, also without distance with their anterior ones. Palatinal teeth about 11. Pterygoid teeth small, spreading along the inner margin. Pterygoid triangular. Hypapophyses extends throughout the whole vertebral column, with shorter process and without posterior extension.

图 版 说 明

图版 I. *Mionatrix diatomus* gen. et sp. nov. (矽藻中新蛇, 新属、新种), V. 993 骨骼腹侧印模, $\times 2/3$. (ventral imprint of V. 993, $\times 2/3$).

图版 II. *Mionatrix diatomus* gen. et sp. nov. (矽藻中新蛇, 新属、新种), 上, V. 993 头骨, $\times 2$; 下, V. 994 骨骼腹侧印模, $\times 2/3$. (above. skull of V. 993, $\times 2$; below. ventral imprint of V. 994, $\times 2/3$). sc, 鳞片印痕 (scale imprints).

