

**Several species of Condylarthra from
the Paleocene of Jiangxi**

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Introduction

Several specimens representing the Condylarthra have recently been recovered from the Paleocene of Jiangxi Province. Although specimens are limited and preservation is poor, three families and two new genera are represented. Consequently, these descriptions provide a better understanding of the nature of Paleocene faunas and phylogenetic relationships among the condylarths.

Condylarthra Cope 1881

Mesonychidae Cope 1875

Mesonychinae Wortman 1901

Jiangxia chaotoensis gen. et sp. nov

(Plate I, Figure 1)

Type: A fragmentary left mandible with m2-3 and an isolated canine (V5037).

Locality and stratigraphic position: Late Paleocene Wanshi Mem., Upper Chijiang Fm., by the village of Qiaotoucun, Qinglong Commune, Dayu Co., Jiangxi Province (Loc. #73041.1).

Genus and species diagnosis: Moderate in size with a robust, flat, and thin mandible and an ascending ramus diverging from the ramus at a 130° angle. Coronoid process is relatively oblique and condylar process is located extremely low. Trigonid cusps are bluntly rounded with the protoconid posteriorly angled and is approximately one-half the height of the talonid basin. The talonid is lophate, lacks a cingulum, and length and breadth are generally equivalent.

Description: The anterior portion of the mandible is missing and only incomplete second and third lower molars are present. The ascending ramus diverges from the ramus at a 130° angle, is broad, and has an anterior margin that thickens slightly. The coronoid process is high, thin, flat, and relatively oblique. The condylar process is situated low, protrudes posterolaterally and is angled slightly ventral to the coronoid process. It is basically in alignment with the dental trough and has a hemispherical articular surface. The posterior mandibular notch is extremely broad and spacious, the angular process is extremely slight, the masseteric fossa is relatively shallow and broad, and the rostral and condylar crests are relatively well developed although the latter does not extend far anteriorly and terminates at the posterior margin of the m3.

The m2 is relatively complete although there is some slight damage to its trigonid, which is generally one-half the height of the talonid. The protoconid is posteriorly angled and the talonid is a crest that is nearly equivalent in length and breadth with a narrow seam dividing it from the trigonid. The m3 is smaller than the m2 with a trigonid that is slightly lower than the previous tooth and is not as posteriorly angled. The damaged crown still reveals a paraconid notch, but the talonid is missing.

In addition to the mandible, there is an isolated lower canine that has a moderate sized crown but a broken apex. It is oblate and slightly posteriorly curved with a length of 15.7 mm and breadth of 10 mm.

Table 1. Measurements of *Jiangxia chaotoensis* gen. et sp. nov. (mm).

Ramus height at m3	42.8	Condyle length	18.8
Ramus breadth at m3	9.3	Condyle breadth	17.1
Ascending ramus breadth	59.0	m2 length	15.4
Coronoid process height	85.0	m2 breadth	7.8
Condylar process from top of coronoid process	50.2	m2 protoconid height	12.5
Height of condyle	38.5	m3 protoconid height	9.6

Comparison: The Qiaotou specimen is comparable to *Hukoutherium ambigum* from the Shanghu Fm. of the Nanxiong Basin. Both have a relatively low condylar process and a similar divergence angle between the ramus and coronoid process. However, the Nanxiong specimen differs in its relatively flat and thin ramus and its condylar process is even lower and more laterally extended. Moreover, there are clear distinctions in molar morphology, such as a more robust dentition on the Nanxiong specimen. The Qiaotou specimen has a protoconid that differs in height and is more posteriorly inclined, cingula are absent, and there is a conspicuous groove between the trigonid and talonid.

Although talonid morphology of the new taxon resembles *Dissacus magushanensis* from Anwei Province, the latter has an extremely well developed metaconid, a conspicuous labial cingulum, and a smaller tooth crown. Moreover, the two taxa are distinctly diachronous.

The Late Eocene *Honanodon hebetis* from Lushi, Honan Province shares several lower molar characters with *J. chaotoensis* such as size, the posterior obliquity of the protoconid, and the narrow seam separating the talonid. However the Henan taxon has an ascending talonid that opens anteriorly. Further comparisons are not possible due to the limitation of specimens, but it appears appropriate and reasonable to assign the Jiangxi specimen to a new genus and species.

Hapalodectinae Szalay and Gould 1966

?*Hapalodectes* sp.

(Plate I, Figure 2)

Material: A fragmentary left mandible with ?p3 and roots of the p4 (V5038).

Locality and stratigraphic position: Late Paleocene Lannikeng Mem. of the Chijiang Fm., by the village of Tianxinli, Qinglong Commune, Jiangxi Province.

Diagnosis and comparison: Representing the smallest species in the genus, the specimen is fragmentary and preserves only two premolars, but the p3 is very laterally compressed, maintains a posteriorly angled protoconid with an acute apex, and an anterior and posterior fine crest that extend ventrally from its apex. There is a distinct paraconid and the talonid is lophate. An anteroposterior oblique ridge connects to the posterior crest of the protoconid (measurements: L-7.0, W-2.8 mm).

This specimen is smaller than all known species of *Hapalodectes*. From the limited characters present, there are resemblances to both *Lestes* and *Dissacus*, such as the posteriorly angled protoconid, well developed paraconid, and particularly the morphology of the talonid. However, the latter two genera are distinct in that they do not have such a laterally compressed

tooth and the cusps are bluntly conical. Hence, the Jiangxi specimen very probably cannot be assigned to the Mesonichinae and more closely approaches the Hapalodectinae. Compared to *Hapalodectes* the Jiangxi specimen shares a small size and an extremely laterally compressed lower premolar that has a relatively sharp cusp. But more detailed comparison is impossible due to the extremely limited data and consequently, its assignment is provisional.

Hyopsodontidae gen. et sp. indet.

(Plate I, Figure 3)

Material: A fragmentary right mandible with an incomplete m3 (V5040).

Locality and stratigraphic position: Late Paleocene Lannikeng Member of the Chijiang Formation. Southwest of Shulinshan, Dayu Co., Jiangxi Province.

Diagnosis and comparison: The specimen is small and brachydont with conical cusps, the posterior ramus is relatively robust with a shallow masseteric fossa, and the m3 is slightly triangular and approximately 4.8 mm in length and 3.2 mm in breadth. The trigonid is relatively low and anteroposteriorly compressed. The talonid is relatively long and basin-shaped with a well developed hypoconid that is separated from the hypoconulid by a groove that bears a small tuberosity within it. The hypoconulid is extremely well developed and trifoliate. The entoconid has been broken, and only a weak anterior cingulum is present.

Specimen V5040 has tooth morphology that resembles several genera within the Hyopsodontidae. It is comparable to the European Paleocene *Louisina* in its trigonid morphology but its talonid morphology is much different as the European genus has a weaker trifoliate hypoconulid. It resembles the North American *Hyopsodus* in its anteroposteriorly compressed trigonid, relatively long talonid, brachydont dentition with conical cusps, and a trifoliate hypoconulid, and as such should be assigned to the family. The fragmentary nature, however, prohibits a precise assignment until more complete material is recovered.

Periptychidae Cope 1882

?Anisonchinae Osborn and Early 1895

***Pseudanisonchus antelios* gen. et sp. nov.**

(Plate 1, Figure 4)

Type: A single right M2 (V5041).

Locality and stratigraphic position: Late Paleocene Lannikeng Member of the Chijiang Fm., one-half kilometer southwest from Laolingbei, Dayu Co., Jiangxi Province.

Genus and species diagnosis: The molar is extremely transversely broadened, triangular, large, robust, and higher crowned on one side. Two labial cusps are bluntly conical and twinned. The protocone is v-shaped, located on the crown mediolingually, and there is a small rounded cuspule anterior to its base. Styler cusps are well developed and there is a broad styler shelf with a relatively narrow cingulum that bears a small tuberosity at the center of the shelf. Anterior and posterior cingula are distinct and basically symmetrical.

Description: This is the largest species of periptychid known to date. It is represented by a large and robust triangular molar that displays a slightly rounded and extremely transversely broadened labial crown. The tooth is relatively high crowned with its labial side lower than lingual

side. Two labial cusps are bluntly conical and positioned approximately half-way between the labial cingulum and protocone. The paracone is robust, twinned with the metacone, which is nearly equivalent in height, and is situated slightly more lingually. The protocone is v-shaped, lies labially oblique, and an ectocone lies proximal to it. Its anterior wing connects to the labial cingulum and posterior wing extends to the base of the metastyle. A hypocone and metaconule are absent and conules are extremely weak. A parastyle is robust, conical, nearly as large as the metacone, is located slightly anterior to the labial side of the paracone, and possesses two short crests lingually and labially. The metastyle is smaller and lower than the parastyle, is located posterior on the labial cingulum, and displays crests in the same manner as the parastyle. A stylar shelf is extremely broad with a small tuberosity at its center (perhaps equivalent to a mesostyle). Anterior and posterior cingula are large and symmetrical. The anterior cingulum extends lingually beginning at a point one-third along the anterior crown as does the posterior cingulum, but they do not connect lingually and are separated from the anterior and posterior base of the protocone by deep grooves. The labial cingulum is narrow and short, a pericone is weak, located slightly anterior to the lingual side of the protocone and at the lingual end of the anterior cingulum.

Table 2. Comparison of *Pseudanisonchus antelios* gen. et sp. nov. to other periptychids (mm).

M2	Length	Breadth	L:B
<i>Pseudanisonchus antelios</i> gen. et sp. nov.	9.3	17.1	183.9
<i>Anisonchus dracus</i> Gazin	4.8	7.8	162.5
<i>Conacodon entoconus</i> (Cope)	5.0	8.0	160.0
	4.8	10.0	208.3
<i>Haploconus angustus</i> (Cope)	4.2	6.1	145.2
	4.1	5.8	141.5
<i>Hemithleus kowalevskianus</i> Cope*	4.8	8.4	175.0

*Measurements derived from estimations of text figures.

Discussion: This specimen resembles the Periptychidae in its v-shaped oblique protocone, blunt conical and twinned labial cusps, and presence of a pericone. The family is a commonly found member of the Early to Middle Paleocene faunas of North America, among which two genera, *Anisonchus* and *Periptychus*, persist into the Late Paleocene. In Asia, the only potential occurrence of the family is in the Nanxiong Basin, Guangdong Province, and hence the extreme interest of this identification at Jiangxi.

Osborn and Earle, 1895, recognized two subfamilies of periptychids: the Anisonchinae, which are diagnosed as being small with relatively simplified tooth morphology and slightly high crowned with conules weak or lost and a paraconid that is reduced or lost. The Periptychinae are diagnosed as being large with extreme enamel plication, a tuberosus cusped crown morphology, and a well developed paraconid.

The Jiangxi specimen is relatively simple in morphology, lacks enamel plication, is relatively high crowned, and has weakly developed conules, which resemble the anisonchine genera *Anisonchus*, *Haploconus*, and *Hemithleus*. But the Jiangxi specimen differs radically in autapomorphic characters including one side exceeding the other in height, absence of a hypocone, well developed styles, a broad stylar shelf with a tuberosity on it, and anterior and posterior cingula unlinked lingually. These characters support the erection of a new genus. Whether these autapomorphies justify an assignment to the anisonchines or the erection of a higher rank cannot currently be determined by the restricted data at hand, and hence the specimen is provisionally referred to the Anisonchinae.

In summary, though the Jiangxi Paleocene condylarths are relatively poorly preserved and are not taxonomically diverse, the data provides more of an understanding about the phylogeny and taxonomy of the Condylarthra. Several points may be summarized as follows:

1. To date, a sizable collection of relatively small and primitive, or larger primitive, mesonichids has been recovered from the Paleocene of South China including *Dissacus* and *Lestes*. *Jiangxia chaotoensis* sp. nov. differs markedly from these taxa, particularly in its mandibular morphology and degree of protoconid and metaconid development. This undoubtedly reflects an independent branch of mesonychid. Several dental characters of *J. chaotoensis* resemble those of the Eocene *Honanodon* which suggest a definite phylogenetic relationship between the two.

2. Prior to the discovery of the Paleocene Jiangxi specimens, the first occurrence of hapalodectids was from the Early Eocene and consequently the Jiangxi specimens are now the oldest representatives of the subfamily. The contemporaneous occurrence of primitive hapalodectines and mesonichines in the Early Paleocene of Asia at very least indicates that the Mesonichidae had achieved a certain level of radiation in the Paleocene and that the presence of an earlier common ancestor is apparent.

3. Peripitychids are a paraphyletic family with extremely complex affinities. To date, there are 14 recorded species within five families, among which the vast majority are from North America. Some genera represent distinct phylogenetic lineages while others represent various evolutionary stages within a single lineage. Although the Jiangxi specimen resembles North American anisonchines in dental morphology, it is still markedly distinct by its absence of a hypocone, projected styler cusps, main cusps linked by relatively well developed laminar ridges, and an unconnected cingulum. These characters indicate autapomorphic development within the family and that the Jiangxi specimen may represent a member outside of the subfamily. Furthermore, the morphology of the Jiangxi specimen, including its bluntly conical cusps, twinned labial cusps, simple v-shaped protocone, extremely broad styler shelf and relatively well developed cingulum are characters resembling several primitive arctocyonids and consequently, whether or not a common ancestor unites these two families is worthy of future attention.

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