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REDESCRIPTION OF THE EARLY CAMBRIAN TRILOBITE *ARTHRICOCEPHALUS CHAUVEAUI* BERGERON, 1899

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Summary

The type series of *Arthricocephalus chauveaui* Bergeron, 1899 is redescribed and figured, and a lectotype selected. The genus is referable to the Oryctocephalidae.

Arthricocephalus was described by Bergeron (1899, p. 514) from a small number of specimens on a slab of shale collected, and presented to Bergeron, by M. Chauveau. The provenance of the slab was said to be the mountain chain to the north of Toung-yen-Fou, i.e. in Tongren County which is located in northeastern Guizhou, southwestern China (Text-figure 1; Zhang & Jell, 1987, Text-figure 23). The originally designated type species was named in honour of the collector. Although the age of the specimens was not known, on the general aspect of the form Bergeron thought it to be 'ancient' and probably Cambrian.

The Cambrian rocks are extensively distributed in the Tongren area, northeastern Guizhou. The Cambrian sequence conformably overlies the Sinian dolomite, and underlies the Lower Ordovician and has been studied by Lin *et al.* (1966). The sequence is as follows:

Lower Ordovician (Tungtzu Formation) (Tremadoc)

——conformity——

Upper and Middle Cambrian

Loushankuan Group (853 m)

12. Greyish white or pink massive dolomite and dolomitic limestone 853 m

Kaotai Formation (97 m)

11. Greyish white thin-bedded argillaceous dolomite intercalated with dolomitic limestone (this formation may change lithology into argillaceous limestone, shale and limestone toward the northeast and southwest of the Tongren area, yielding *Kaotaia magna* (Lu), *Pagetia* and *Oryctocephalus*) 97 m

Lower Cambrian

Tsinghsutung Formation (381 m)

10. Dark grey massive limestone, yielding *Redlichia, Panxinella xiunaoensis* Qian & Lin 247 m

9. Greyish black limestone with intercalations of argillaceous bands, containing *Redlichia chinensis* Walcott and *Yuehsienszella szechuanensis* (Sun) 134 m

Balang Formation (368 m)

8. Greyish yellow and yellowish green calcareous shale and sandy shale, intercalated with thin-bedded argillaceous limestone in the upper part, containing *Redlichia murkamii* Resser& Endo, *Arthricocephalus chauveaui* Bergeron in the upper part, and *Changaspis elongata* Lee, *Arthricocephalus chauveaui* Bergeron, *Duyunaspis laevigatus* Qian and *Duyunaspis songtaoensis* Qian & Lin in the lower part 257 m

7. Greyish green and yellowish green sandy and micaceous calcareous shale, yielding *Redlichia, Arthricocephalus chauveaui* Bergeron and *Changaspis micropyge* Qian 111 m

Muchang Formation (489 m)

6. Black and greyish yellow sandy shale 114m

5. Black carbonaceous shale, sandy shale and fine sandstone, containing sponge spicules 42 m

4. Greyish gren and greyish black quartz sandstone and sandy shale, yielding *Kootenia* and *Redlichia* 96 m

3. Black carbonaceous shale and sandy shale 15 m

2. Black carbonaceous shale, yielding *Hunanocephalus ovalis* Lee 221 m

1. Black shale 221 m

——— conformity ———

Late Precambrian (Sinian) dolomite or Argillaceous limestone

Judging from the Cambrian sequence in the Tongren area mentioned above, Bergeron's specimens were collected from the Balang Formation north of Tongren, which is green shale formation and is widely distributed in the border between northeastern Guizhou and western Hunan. The Tsinghsutung Formation of this area, is approximately correlated with the late Early Cambrian Lungwangmiao Stage, the Balang Formation (late Tsanglangpu Stage), while the Muchang Formation may represents the medial and early Tsanglangpu, Chiungchussu and probably the oldest Meishucun Stages.

In spite of the accurate although somewhat idealized and restored line-drawing of what we now select as lectotype (Bergeron 1899, fig. 9), Rasetti(1959, p. 0524) considered the genus unrecognizable. The reason for this opinion is particularly puzzling, since Rasetti was, in that work, responsible for the Oryctocephalidae, the family to which *Arthricocephalus* is readily assigned (Zhang, 1979, 1980a).

To the authors' knowledge the syntype series has not been figured since the original paper. However, several species have been assigned to the genus (all those unquestionably assigned have Chinese authorship) and two further subgenera (*Arthricocephalites* Chien & Lin, 1974 and *Euarthricocephalus* Ju, 1983) erected. *Arthricocephalites* is characterized by its short (tr.) and oblique ocular ridges, narrow (tr.) palpebral area of fixigena and longer (exsag.) palpebral lobes. In *Euarthricocephalus*, the preoccipital lobe is longitudinally trisected into a median preoccipital and two lateral preoccipital lobes. It should be pointed out that the stratigraphical position of both *Arthricocephalites* and *Euarthricocephalus* is the same as that of *Arthricocephalus* in northeastern Guizhou.

Recently *Arthricocephalus* was reported from the Henson Gletscher Formation (early Cambrian) of Freuchen Land, central North Greenland (Blake, 1986). This constitutes the first record of the genus from outside China. As a result of this work it becomes apparent that all of the assignments to the genus after Bergeron (1899) had proceeded without reference to the type material which has never been fully described or illustrated.

The material is now housed (as apparently it has been since 1899) in the Geology Department, l'Universite Claude Bernard-Lyon, I-O.N.C.P., France, where it belongs to the collection l'Ecole Nationale Superieure des Mines de Paris. For the first time *Arthricocephalus chauveaui* is herein illustrated photographically and is redescribed.

Family Oryctocephalidae Beecher, 1897
Subfamily Oryctocarinae Hupe, 1955
Genus *Arthricocephalus* Bergeron, 1899

Type species: By original designation: *Arthricocephalus chauveaui* Bergeron, 1899 from the Early Cambrian of northeastern Guizhou, southwestern China.

Diagnosis: Glabella subrectangular, with 4 pairs of lateral pits; S1—S3 normally connected across sagittal line by shallow furrows; reaches anterior border furrow. Anterior border very short (sag.). Palpebral lobes anteriorly situated. Occipital ring short (sag.). Free cheeks narrow (tr.). Thorax with 8 segments; pleurae with narrow and deep furrows; terminations rounded. Pygidium semicircular with complete narrow border; narrow axis with 5 rings, not reaching posterior border.

Arthricocephalus chauveaui Bergeron, 1899

(Pl. I, figs. 1—6)

1899 *Arthricocephalus chauveaui* Bergeron, p. 514, fig. 9.

1961 *Arthricocephalus duyunensis* Chien, p. 97, pl. 1, figs. 19, 20; pl. 2, figs. 5—10.

1963 *Arthricocephalus chauveaui*, Lu *et al.*, p. 64, pl. 7, figs. 7a—c.

1964 *Arthricocephalus chauveaui*, Lu *et al.*, p. 26, pl. 1, fig. 5.

1965 *Arthricocephalus duyunensis*, Lu *et al.*, p. 108, pl. 17, figs. 2—5.

1974 *Arthricocephalus duyunensis*, Lu *et al.*, p. 95, pl. 36, fig. 9.

1977 *Arthricocephalus chauveaui*, Zhou *et al.*, p. 130, pl. 42, fig. 3.

1977 *Arthricocephalus granulus* Chien & Lin, in Zhou *et al.*, p. 130, pl. 42, figs. 1, 2.

1978 *Arthricocephalus* (*Arthricocephalites*) *granulus*, Yin *et al.*, p. 441, pl. 157, fig. 2.

1980b *Arthricocephalus chauveaui*, Zhang *et al.*, p. 275, pl. 92, figs. 1, 2.

1980b *Arthricocephalus horridus* Qian & Lin, in Zhang *et al.*, p. 275, pl. 92, figs. 7—9.

1980b *Arthricocephalus* (*Arthricocephalites*) *granulus* Qian & Lin, in Zhang *et al.*, p. 277, pl. 90, fig. 8; pl. 93, fig. 4; pl. 94, figs. 1, 2.

1986 *Arthricocephalus duyunensis* Chien, 1961; Blaker, p. 68.

Diagnosis: Thorax with only minimal decrease in width (tr.); axis narrow, only about one-sixth total width. Pygidial axis about two-thirds pygidial length; 5 pairs of pleural furrows. Sculpture of closely-spaced coarse granules on fixed cheeks, more scattered on glabella. In thorax and pygidium, axis with subdued granules and pleural portions with small to medium granules.

Lectotype: Cranidium (herein Pl. I, fig. 2). Num. EM90001b, EM90001c.

Paralectotypes: Pl. 1, figs. 1, 3—5. Num. EM90001a, EM90001d, EM90001e, EM90001f, EM90001g.

Description: Gently convex (tr. & sag.) cranidium with elongate, subrectangular glabella. Lateral margins of glabella subparallel; anterior very gently rounded and reaching to anterior border furrow. Four pairs of deep glabellar pits, S1—S3 reaching to axial furrows and also connected across glabella by shallow transverse furrows. S4 not joined across glabella but reaches axial furrows. The occipital furrow (S0) is straight and formed of deep pits distally with those connected by a shallower furrow. Occipital ring gently convex (tr.) and short (sag.), with sagittal length approximately one-seventh that of glabella. Anterior border very short sagittally, widening slightly adaxially, gently curved with forwards deflection in front of glabella. Border defined by narrow furrow of moderate depth, with reduction in both width and depth in front of glabella. Width (tr.) of palpebral areas approximately equal to basal glabellar width. Palpebral lobes short (exsag.) and situated anteriorly, centred at about midlength of L3. Ocular ridges short and low. Posterior border widens distally, straight posterior margin and rounded terminations. Border defined by narrow furrow that is faintly sigmoidal in outline. Course of anterior sections of facial suture runs forwards in gentle curve. Posterior sections initially strongly divergent, then curved backwards over posterior border.

The hypostome is fused to the doublure, is subquadrate in outline and reaches back as far as S2.

Thorax formed of eight segments with only gradual decrease in width posterior to the fourth segment. Axis defined by narrow furrows, with transverse width of axial ring about one-sixth that of corresponding segment. Pleurae with weak geniculation at about two-thirds length, and rounded tips. Each pleura has a deep and narrow (exsag.) furrow.

Pygidium semicircular in outline, with sagittal length slightly less than one-half maximum transverse width. Axis laterally defined by narrow furrow that is continuous around the posterior. Axis tapers gently backwards and does not reach to the pygidial border, formed of five complete rings. Sagittal length of axis about two-thirds that of pygidium. The connective band has an inflated appearance. Inter-ring furrows straight and of moderate depth. Pleural regions crossed by five pairs of narrow pleural furrows that reach to the border furrow. Interpleural furrows on all pleurae extend to the border furrow. Very narrow pygidial border defined by narrow, shallow furrow.

Sculpture on the cranidial fixed cheeks consists of closely-spaced granules. There are indications of granular sculpture on the thorax and pygidium although preservation is not sufficiently good to be certain.

Remarks: Blaker (1986) reported *Arthricocephalus duyunensis* Chien, 1961 from North Greenland; from the subsequent examination of this type material of the genus this assignment is now revised and the specimens are placed in *Arthricocephalus chauveaui* Bergeron, 1899; an arti-

culated late stage meraspid specimen from North Greenland is figured for purpose of comparison (Pl. I, fig. 6).

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图 版 说 明

除注明者外，标本均保存在法国里昂大学地质系。

图 版 I

1—6. *Arthricocephalus chauveaui* Bergeron, 1899

1.头盖与胸、尾部脱离的背壳 (Paralectotype disarticulated dorsal exoskeleton), ×10。登记号: EM90001a。

2.头盖与胸、尾部脱离的背壳 (Lectotype disarticulated dorsal exoskeleton)。头盖 (lectotype), ×10, 登记号: EM90001b; 胸部及尾部, ×10, 登记号: EM90001c。

3.背壳, ×10, (Paralectotype dorsal exoskeleton)。登记号: EM90001d (大), EM90001e (小)。

4.中甲期第5(或6)生长阶段 (Paralectotype possible degree 5 (or 6) meraspid), ×10。登记号: EM90001f。

5.尾部 (Paralectotype pygidium), ×10。登记号: EM 90001 g。贵州铜仁县北部早寒武世杷榔组 [All from the Balang Formation (upper medial Lower Cambrian) north of Tongren, northeastern Guizhou, southwestern China]。

6.完整背壳 (Complete exoskeleton), ×8。登记号: 哥本哈根矿物博物馆 (Mineralogisk Museum Copenhagen) MGUH 18.225。格陵兰北部 Freuchen Land 地区早寒武世 Henson Gletscher 组 [Henson Gletscher Formation (Lower Cambrian), Freuchen Land (Lat. 82°N, Long. 43°W approx), central North Greenland]。

Redescription of the Early Cambrian Trilobite *Arthricocephalus chauvcaui* Bergeron, 1899

Plate I