A new species of the rare neritopsid gastropod *Magnicapitatus* from the Guadalupian (Middle Permian) of East Thailand (the Indochina Terrane)

MASATOSHI SONE


A new species of the rare neritopsid gastropod genus *Magnicapitatus* is documented from a fusulinoid-rich limestone of the Khao Taa Ngog Formation (Capitanian, Middle Permian) at Khao Makha in East Thailand near the Cambodian border (in the Indochina Terrane). This represents the first record of this Permo-Triassic genus outside South China and from the Capitanian. *Magnicapitatus* is one of the typical molluscan Lazarus taxa that apparently disappeared at the end of the Permian but reappeared after the Early Triassic.

Masatoshi Sone [email: masatoshi.sone@gmail.com], School of Engineering and Science, Curtin University of Technology, Sarawak Campus, 98009 Miri, Malaysia. Received 18.9.2008, revised 22.3.2009, accepted 30.3.2009.

Key words: Gastropoda, Permian, Thailand, Indochina, South China.

THE NERITOPSID gastropod *Magnicapitatus* Wang in Wang & Xi, 1980 is a rare genus, since only four species have been recorded previously from the Permian–Triassic of South China. A relatively large form is described here from late Guadalupian (Capitanian) limestones at Khao Makha hill near the Cambodian border in East Thailand, and is assigned to a new species *Magnicapitatus huazhangae*. This discovery represents the first record of *Magnicapitatus* outside South China and the first Capitanian occurrence of the genus.

Regional geology and the fossil locality

The single gastropod specimen representing *Magnicapitatus huazhangae* sp. nov. was found near the summit (13°38.335′N, 102°06.718′E) of the small limestone hill, Khao Makha, which is about 22 km south of the Sra Kaeo city, East Thailand (Fig. 1). The study area is to the north of the Sra Kaeo ophiolitic suture, and belongs tectonically to the southern margin of the Indochina Terrane delineated by Sone & Metcalfe (2008). The limestone succession at Khao Makha belongs to the Khao Taa Ngog Formation of Chaodumrong (1992), and is well bedded with a general strike and dip of 170°/45°E. The new gastropod was preserved in a bed of recrystallized bioclastic packstone to wackestone. It co-occurs with fossil algae, ostracods and fusulinoids. This facies is interpreted to represent a relatively high-energy, shallow, warm-water marine palaeoenvironment.

Abundant fusulinoids, in association with smaller foraminifers, calcareous algae and corals, have been reported previously from Khao Makha (Charoentitirat 2002, Fontaine *et al*. 1997, Pitakpaivan & Ingavat 1980). The fusulinoids are represented by
Lepidolina multiseptata (Deprat, 1912), Metadoliolina douvillei (Gubler, 1935), Codonofusiella sp., Reichelina sp., Kahlerina sp. and Chusenella sp.; and the corals are represented by Sinopora asiatica Mansuy, 1913 (Tabulata), Waagenophyllum kueichowense Huang, 1932 (fasciculate Rugosa) and Multimurinus makkaensis Fontaine, Salapongse, Tanswan & Vachard, 1997 (massive Rugosa). Charoentitirat (2002) and Fontaine et al. (1997) concluded a Midian (=Capitanian, late Guadalupian) age for the Khao Makha fauna. The specimen studied here is the first gastropod recorded from this fauna.

The Khao Taa Ngok Formation is the Thai equivalent of the Sisophon Limestone of western Cambodia, and together they form a continuous Guadalupian carbonate platform over the Thai-Cambodia border. The strata at Khao Makha are correlative with Members C–D of the upper Sisophon Limestone, based on the occurrence of *L. multiseptata*. A moderately diverse gastropod fauna was described from the Sisophon Limestone by Delpey (1940, 1941, 1942) and Mansuy (1913, 1914), but no species referable to *Magnicapitatus* were recorded in that fauna. Recently, He et al. (2009) noted similarities in the brachiopod faunas between the Late Permian Tangula fauna of Tibet and the Middle Permian faunas of the Sibumasu and Indochina (East Malaya) terranes. Documentation of the fossil
gastropods from these areas, such as in this study, should aid resolution of the biogeographic relationships of the Tethyan invertebrate faunas during the Permian.

Systematic palaeontology
The supra-familial classification follows that of Bouchet & Rocroi (2005).

Superfamily NERITOPSIOIDEA Gray, 1847
Family NERITOPSIDAE Gray, 1847

Magnicapitatus Wang in Wang & Xi, 1980

Type species. Magnicapitatus angulus Wang in Wang & Xi, 1980; Longtan Formation (Wuchiapingian), Guizhou, South China.

Other species. Magnicapitatus latus Pan, 1983, Kungurian, Sichuan, South China; Magnicapitatus latocanaliculus Pan, 1983, Changhsingian, Sichuan, South China; Magnicapitatus huazhangae sp. nov., Capitanian, Thailand; Magnicapitatus baqinensis Pan, 1980, Anisian, Heilongjiang, South China.

Discussion. Magnicapitatus is characterized by rounded, broad and low spires with shallow sutures. It has a high whorl expansion rate, that is, the last whorl is sharply expanded and is commonly loosely coiled in the youngest part. In some species, the aperture is expanded in a direction oblique to the axis of coiling.

Magnicapitatus was originally included in the Neritidae Rafinesque, 1815 by Wang & Xi (1980), and this was followed by Pan (1983) and Pan & Erwin (1994). However, the family-level classification of the genus is still greatly uncertain, due to a lack of

---

Fig. 2. Magnicapitatus huazhangae sp. nov., holotype NIGP 139380, from a limestone bed at Khao Makha (Capitanian, Middle Permian), East Thailand. A–D, apertural, ventral, apical and basal views respectively.
essential information to confirm inner whorl resorption, which distinguishes the Neritidae from the Neritopsidae.

*Magnicapitatus* is here placed tentatively within the Neritopsidae, based on the observation that *Magnicapitatus* is particularly similar to *Neritopsis* Gratioloup, 1832, the genotype of the Neritopsidae, and *Naticopsis* M'Coy, 1844, the most representative late Palaeozoic neritopsid genus, in shell profile and in having an expanded aperture. Nevertheless, *Magnicapitatus* clearly differs from those two genera in that the former has more swollen, rounded-convex spires with shallower sutures and a last whorl that tends to be more obliquely expanded and more loosely coiled.

**Magnicapitatus huazhangae** sp. nov. (Fig. 2A–D)

*Description.* Naticiform with large shell, wider than high, with shell total height of 36.4 mm and total width (greatest diameter) of 42.1 mm; apical angle near 95°; spire whorls tightly coiled, rounded and weakly convex in profile; last whorl rounded-convex, sharply swollen and expanded initially in horizontal direction and ultimately in oblique direction, slightly looser coil in the youngest part; aperture expanded elliptically to oblique direction (Fig. 2A–D). Suture shallow and indistinct. Umbilical area distinctly depressed, umbilicus narrow, spiral carina roundly angulated around umbilical margin, umbilical wall inclined. Surface ornament with fine growth lines.

**Discussion.** *Magnicapitatus huazhangae* sp. nov. is characterized by its relatively large shell with a sharply expanded last whorl. The species is readily distinguishable from the other known congeneric species on the basis of its shell coiling form. Among all the known species, *Magnicapitatus latus* Pan, 1983 from the Kungurian (late Early Permian) of South China is perhaps most similar to *M. huazhangae*, on the basis of its shape and profile of the spire whors. *Magnicapitatus latus* is the largest and oldest species of the genus. It can be distinguished from *M. latus* by having a more obliquely expanded aperture. The Chinese form has a total height of 68 mm and width of 76 mm (see Pan 1983), larger than the Thai form, and it is more globular.

The two Late Permian forms, the type species *Magnicapitatus angulus* of Wuchiapingian age (Wang 1982, Wang & Xi 1980) and *Magnicapitatus latocanaliculus* of Changhsingian age (Pan 1983), are known from South China. The new species differs from these younger species most obviously in having a larger shell with a more swollen ultimate whorl and an obliquely expanded aperture.

**Etymology.** Dedicated to Dr Pan Huazhang, a renowned malacologist.

**Holotype.** NIGP 139380, housed in the Nanjing Institute of Geology and Palaeontology. No paratype is available.

**Material and methods.** The specimen is preserved as a steinkern. It was whitened with ammonium chloride for photography (Fig. 2). The ornament can be seen on the face near the aperture.

**Occurrence.** The limestone bed of the Khao Taa Ngog Formation near the summit of Khao Makha, East Thailand; Capitanian (late Guadalupian).

**Diagnosis.** Large-sized *Magnicapitatus* with an aperture expanded elliptically in oblique direction to axis; wider than high; spire whorls tightly coiled, rounded and weakly convex in profile; last whorl expanded and swollen, loosely coiled in the youngest part.
Biostratigraphic implications

_Magnicapitatus_ ranges from the Kungurian (late Early Permian) to the Anisian (early Middle Triassic; Fig. 3). However, the genus has not been confirmed from the Early Triassic and is, therefore, one of the typical molluscan Lazarus taxa that apparently disappeared at the end of the Permian but reappeared after the Early Triassic, as also noted by Pan & Erwin (1994) and Wheeley & Twitchett (2005). Note that Wheeley & Twitchett (2005, fig. 4) presented the stratigraphic occurrences of _Magnicapitatus_ based on their Gastrobase database (http://earth.cf.ac.uk/people/summaries/GASTROBASEdoc.htm), but it was in some error as the Early and Late Permian occurrences were misinterpreted. The phylogenetic relationships between the Permian and Triassic species remain unclear due to a lack of Early Triassic records and a dearth of informative morphological characters.

Acknowledgements

The author is most indebted to Dr Pan Huazhang (Nanjing Institute of Geology and Palaeontology), who originally acted as a senior author but regrettably withdrew from this study because of poor health. Mr Sirot Salyapongse (then of the Geological Survey of Thailand) assisted with the fieldwork. Prof. Ian Metcalfe (University of New England) financially supported the fieldwork from his ARC grant. Dr Alan Beu (GNS Science), Dr Alexander Nüttel (Universität München) and Dr Stephen McLoughlin (Swedish Museum of Natural History) are thanked for carefully reviewing the manuscript and giving constructive comments.

References


