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Research Advances

New Discovery of Radiolarians in the Pomulong Mélange, Middle part of the Yarlung Zangbo Suture Zone, Tibet

SUN Qian[1, 2], JI Zhansheng[2, *], WU Guichun[3] and WAN Xiaoqiao[1]

[1] *School of Earth Sciences and Resources, China University of Geosciences, Beijing 100083, China*
[2] *Chinese Academy of Geological Sciences, Beijing 100037, China*
[3] *Institute of Geology, CAGS, Beijing 100037, China*

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Objective

The Pomulong mélange was established in the regional geological survey of Lhaze County at the scale of 1:250000 by the Geological Survey Institute of Hubei Province, and regarded as the Jurassic-Cretaceous representative strata in this area. It is distributed east-westward along the southern belt of Yarlung Zangbo Suture Zone in Lhaze area. Its matrix is composed of purplish red and variegated silicon argillaceous slate, clayey siltstone, siliceous rock, etc. The rock blocks are mainly limestone, basalt, greywacke and so on (Zhu et al., 2003). Five genera of radiolarian fossils were recovered by previous researchers from the matrix with a roughly defined age of Late Jurassic-Early Cretaceous. However, the fossils reported by previous researchers were relatively scarce with only genus-level taxonomic identification, and the biostratigraphy study was also very weak. A more detailed biostratigraphic study of the Pomulong mélange is significant to deepen the understanding of the sedimentary environment in the middle part of Yarlung Zangbo Suture Zone in the Late Jurassic-Early Cretaceous Period. In this paper, we report additional radiolarian fossils from the Kongkongma section (starting point N29°07'32.0", E87° 58'10.3") in the Resa Town of the Lhaze County.

Methods

The Kongkongma section consists of a set of sedimentary strata composed of rhythmic lithologic associations of intercalated thin-layer siliceous rocks, siliceous mudstones, shale and gray limestone, indicating an abyssal basin sedimentary environment (Fig.1, a–c). This section was measured in detail and sampled intensively with 284 radiolarian samples. After a micropaleontological analysis with the HF acid maceration technique (Pessagno and Newport, 1972), well-preserved radiolarians were obtained from 46 samples. Selected fossils were imaged on a SEM for subsequent taxonomic identification.

* Corresponding author. E-mail: jizhansheng@vip.sina.com

Results

Abundant and well-preserved radiolarians were obtained from the siliceous rocks, whereas radiolarian fossils from the shale and siliceous limestone were recrystallized or poorly preserved. A total of 27 species of 20 genera are recognized (Appendix 1) based on the detailed middle Cretaceous radiolarian taxonomic and biostratigraphic study in the West Tethys (O'Dogherty, 1994).

Samples XKX-138 and XKX-141 yield few genera and species which are characterized by the occurrence of *Acaenityle umbilicata* (Rüst), *Archaeodictyomitra*(?) *lacrimula* (Foreman), *Hexastulurus* (?) *magnificus* (Squinabol), *Hiscocapsa asseni* Tan, *Pseudodictyomitra lodogaensis* Pessagno, *Stichomitra communis* Squinabol and *Thanarla patricki* gr. (Kocher) (Fig.1, d). The lower boundary of this assemblage is marked by the co-occurrence of index taxa *Acaenityle umbilicata* (Rüst), *Hiscocapsa asseni* Tan, *Pseudodictyomitra lodogaensis* Pessagno and the upper boundary is marked by the last appearance of *Archaeodictyomitra* (?) *lacrimula* (Foreman). The subzonal index fossil *Turbocapsa costata* Wu is absent in this assemblage but the occurrence of *Acaenityle umbilicata* (Rüst) and other common species shows similarity to the *Turbocapsula costata* subzone in the West Tethys. This assemblage can be compared with the *Turbocapsula costata* subzone in *Turbocapsula* Zone introduced by O'Dogherty (1994) (Fig.2). Thus this assemblage can be assigned to Early Aptian-Early Albian in age.

Samples XKX-148 to XKX-250 consist of abundant and well-preserved radiolarians including *Archaeodictyomitra simplex* Pessagno, *Dictyomitra gracilis* (Squinabol), *D. montisserei* (Squinabol), *Dorypyle communis* (Squinabol), *Hemicryptocapsa polyhedra* Dumitrica, *Hiscocapsa asseni* Tan, *Holocryptocanium barbui* Dumitrica, *Novixitus mclaughlini* Pessagno, *Pseudodictyomitra Pseudomacrocephala* (Squinabol), *Squinabollum asseni* (Tan), *Stichomitra communis* Squinabol, *S. simplex* (Smirnova & Aliev) and *Torculum coronatum* (Squinabol) (Fig.1–d). This assemblage is represented by the index taxa *Dictyomitra gracilis* (Squinabol) , *Dorypyle*

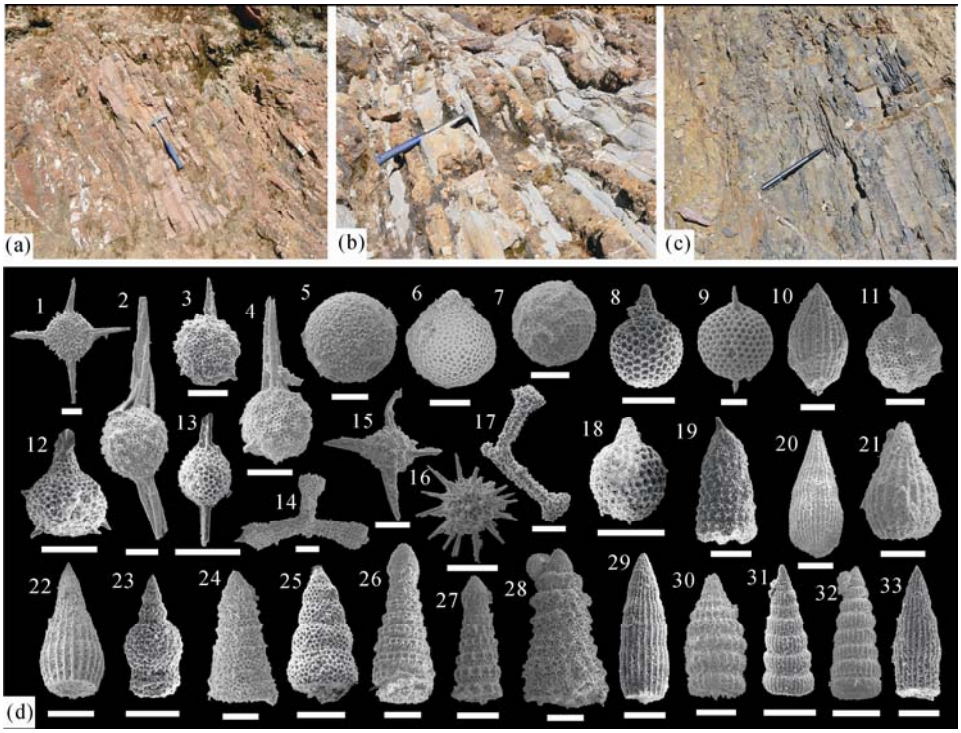

Fig. 1 Lithologic characteristics photos and radiolarians plates of the Kongkongma section.
a: thin-layer siliceous rock; b: thin-layer intercalated siliceous rock and limestone; c: thin-layer siliceous argillaceous siltstone; d: scanning electronmicrographs of radiolarian fossils (scale bar =100μm). 1, *Staurosphaera fresnoensis* Foreman, XKX-190; 2, *Acaenityle umbilicata* (Rüst), XKX-223; 3，*Acaenityle umbilicata* (Rüst), XKX-250; 4，*Acaenityle umbilicata* (Rüst), XKX-223; 5, *Holocryptocanium barbui* Dumitrica, XKX-230; 6, *Cryptamphorella* sp., XKX-223; 7, *Hemicryptocapsa polyhedra* Dumitrica, XKX-187; 8, *Hiscocapsa asseni* Tan, XKX-250; 9，*Dorypyle communis* (Squinabol), XKX-233; 10, *Archaeodictyomitra*(?) *lacrimula* (Foreman), XKX-141; 11, *Acaenityle* sp., XKX-227; 12, *Sethocapsa congduensis* Li and Wu, XKX-250; 13, *Archaeospongoprunum tehamaensis* Pessagno, XKX-250; 14, *Homoeoparonaella peteri* Jud, XKX-148; 15, *Hexastulurus* (?) *magnificus* (Squinabol), XKX-138; 16, *Patellula* sp., XKX-138; 17, *Tritrabs ewingi* s.l. (Pessagno), XKX-250; 18, *Squinabollum asseni*(Tan), XKX-223; 19, *Xitus antelopensis* Pessagno, XKX-250; 20, *Dictyomitra gracilis* (Squinabol), XKX-226; 21, *Thanarla conica* Aliev, XKX-224; 22, *Thanarla patricki* gr. (Kocher), XKX-223; 23, *Stichomitra simplex* (Smirnova & Aliev), XKX-250; 24, *Torculum coronatum* (Squinabol), XKX-223, XKX-250; 25, *Stichomitra communis* Squinabol, XKX-250; 26, *Pseudodictyomitra Pseudomacrocephala* (Squinabol), XKX-224; 27, *Pseudodictyomitra Pseudomacrocephala* (Squinabol), XKX-148; 28, *Novixitus mclaughlini* Pessagno, XKX-138; 29, *Archaeodictyomitra simplex* Pessagno, XKX-250; 30, *Dictyomitra formosa* Squinabol, XKX-224; 31, *Pseudodictyomitra lodogaensis* Pessagno, XKX-250; 32, *Pseudodictyomitra lodogaensis* Pessagno, XKX-229; 33, *Dictyomitra montisserei* (Squinabol), XKX-250.

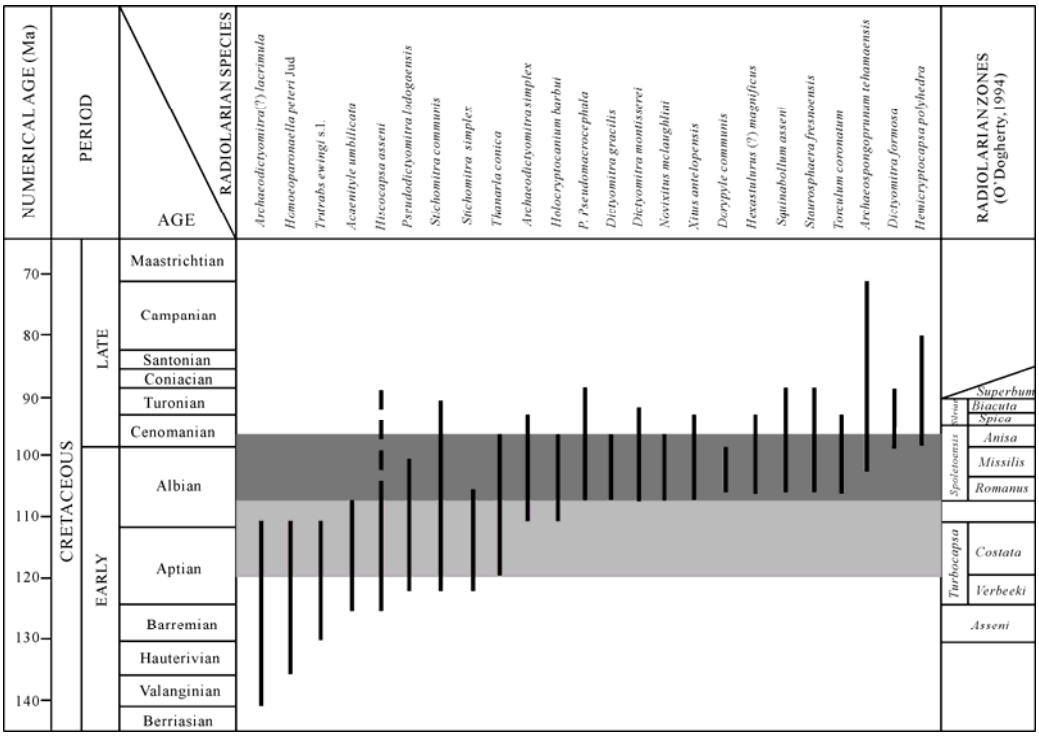

Fig. 2. Age ranges of selected radiolarians from the Kongkongma section

communis (Squinabol) and *Novixitus mclaughlini* Pessagno. The lower boundary is indicated by the first occurrence of *Pseudodictyomitra Pseudomacrocephala* (Squinabol), *Dictyomitra gracilis* (Squinabol), *Dictyomitra montisserei* (Squinabol) and its upper boundary is defined by the last occurrence of *Dictyomitra gracilis* (Squinabol) and *Thanarla conica* Aliev. This assemblage has the same upper zonal index taxon *Thanarla conica* Aliev and other common species with the *Thanarla spoleoensis* zone in the West Tethys (O'Dogherty, 1994) despite the absence of index fossil *Thanarla spoleoensis* O'Dogherty. Therefore, this assemblage is indicative of Early Albian to Early Cenomanian in age.

These radiolarian assemblages indicate that the stratigraphic age of the Kongkongma section is from Early Aptian to Early Cenomanian, which is different from the previously reported age of the Pomulong mélange. The Kongkongma section is mainly a set of rhythmic interbedded sedimentary sequence composed of thin-layer siliceous rock, siliceous mudstone, shale and thin-layer limestone which is obviously different from the Pomulong mélange composed of rock blocks and matrix (Fig.1, a-c). These paleontological and stratigraphic characteristics suggest the essential distinction between the kongkongma section and the Pomulong mélange, and this section should not be classified as the Pomulong mélange but disintegrated from it. Both sedimentary association and paleontological assemblages in the Kongkongma section can be well correlated to the Lower Cretaceous Gyabula Formation in other areas of southern Tibet according to the relevant data. The age and internal stratigraphic units of the Pomulong mélange still need further study.

Conclusions

A total of 27 species of 20 genera middle Cretaceous radiolarians are reported from the Pomulong mélange of the Lhaze County in the middle part of the Yarlung Zangbo Suture Zone and two assemblages are established which can be correlated to the *Turbocapsa costata* subzone and *Thanarla spoleoensis* zone of the middle Cretaceous radiolarian assemblages in the West Tethys respectively, indicating an age of Early Aptian to Early Cenomanian. The Kongkongma section is disintegrated from the Pomulong mélange and correlated to the Lower Cretaceous Gyabula Formation based on the radiolarians and stratigraphic characteristics in this paper. This discovery not only enriches the radiolarian fauna data in the middle part of the Yarlung Zangbo Suture Zone, but also provides new stratigraphic paleontological evidence for the age and stratigraphic sequence study of the Pomulong mélange.

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Appendix 1 Occurrence of radiolarians from the Kongkongma section

Radiolarian species	Sample number(XKX-)											
	138	141	148	187	190	223	224	226	229	230	233	250
Acaenityle umbilicata						●						
Archaeodictyomitra simplex												●
Archaeodictyomitra(?) lacrimula		●										
Archaeospongoprunum tehamaensis												●
Cryptamphorella sp.						●						
Dictyomitra formosa							●					
Dictyomitra gracilis								●				
Dictyomitra montisserei											●	●
Dorypyle communis											●	
Hemicryptocapsa polyhedra				●								
Hexastulurus (?) magnificus	●											
Hiscocapsa asseni												●
Holocryptocanium barbui										●		
Homoeoparonaella peteri			●									
Novixitus mclaughlini	●											
Pseudodictyomitra lodogaensis	●								●			●
P. Pseudomacrocephala			●				●					
Squinabollum asseni						●						
Staurosphaera fresnoensis					●							
Stichomitra communis												●
Stichomitra simplex												●
Thanarla conica							●					
Thanarla patricki						●		●				
Torculum coronatum						●						●
Tritrabs ewingi												●
Xitus antelopensis												●
Radiolarian zones	*Turbocapsula costata* subzone		*Thanarla spoleoensis* zone									