Vol. 3 No. 2 page 55-58
DOI: 10.14456/randk.2017.27

RESEARCH & KNOWLEDGE

Research Article

A new specimen of *Birgeria liui* (Osteichthyes, Actinopterygii) from the Longobardian (Ladinian, Middle Triassic) of Xingyi, Guizhou Province, South China

Ni Peigang[1,*], Andrea Tintori [1,2], Sun Zuoyu[1,3], Jiang Dayong[1,3]

[1]Laboratory of Orogenic Belt and Crustal Evolution, Ministry of Education, and Department of Geology and Geological Museum, Peking University, Yiheyuan Street 5, Beijing 100871, China
[2]TRIASSICA, Institute for Triassic Fossil Lagerstätten, Perledo 23828, Italy
[3]State Key Laboratory of Palaeobiology and Stratigraphy (Nanjing Institute of Geology and Palaeontology, Chinese Academy of Science), Nanjing 210008, China

(Received 5 June 2017; accepted 9 June 2017)

Abstract - *Birgeria* was one of the largest carnivorous fishes from the Triassic, spanning almost the entire period and, with an almost cosmopolitan distribution. *Birgeria liui* was originally described based on the incomplete holotype from the Middle Triassic marine Falang Formation of Changdi, Yunnan province, South China, which lacks the skull and anterior part of the body. Herein, we describe a new well preserved specimen of *B. liui* from the early Late Ladinian of South China. The description of the new material presents previously unknown anatomical information, which substantially enhances our understanding of *B. liui*.

Keywords: *Birgeria liui*, Actinopterygii, Middle Triassic, South China

1. Introduction

Birgeria was one of the largest carnivorous fishes from the Triassic, spanning almost the entire period and with an almost cosmopolitan distribution. This genus was erected by Stensiö (1919) on material from the Middle Triassic Muschelkalk of Bayreuth (Germany) that was previously known as *Saurichthys mougeoti* (Agassiz, 1843). In 1921, Stensiö gave a detailed description of birgeriids from the Lower Triassic of Spitsbergen and referred them to *Birgeria mougeoti*, the type species of *Birgeria*. Besides, Stensiö (1921) also referred two little known species of *Saurichthys*, both from Europe and previously described as *S. acuminata* (Agassiz, 1844) and *S. annulata* (Winkler, 1880) to this genus. Subsequently, Aldinger (1931) described a new species, *B. stensiöi*, from the Middle Triassic of Switzerland. Stensiö (1932) added a further species, *B. groenlandica*, from the Lower Triassic of East Greenland and placed *Xenestes velox* (Jordan, 1907) in *Birgeria*. Lehman (1948) erected *B. nielseni* from the Lower Triassic of Madagascar. The *Birgeria* specimens from Spitsbergen were reclassified as *B. aldingeri* by Schwarz (1970). Jin (2001) named *B. liui* from the Middle Triassic of South China and then Liu *et al*. (2006) identified *B. guizhouensis* from the Late Triassic of South China.

In addition, remnants of *Birgeria* sp. were also reported from the Lower Triassic of Madagascar (Beltan, 1977, 1980, 1996; Guffroy, 1956), Siberia (Berg *et al*., 1967), British Columbia (Schaeffer and Mangus, 1976); Middle Triassic of Poland (Chrzastek, 2008), South China (Jiang *et al*., 2016); Late Triassic of Bolivia (Beltan *et al*., 1987), Italy (Boni, 1937; Gozzi, 2006), Slovenia (Jurkovsek *and Kolar-Jurkovsek*,1986; Kolar-Jurkovsek, 1991).

Birgeria liui was originaly described based on the incomplete holotype from the Middle Triassic marine Falang Formation of Changdi, Yunnan province, South China, which lacks the skull and anterior part of the body. Herein, we describe a new well preserved specimen of *B. liui* from the early Late Ladinian of South China. Unfortunately, the preservation of the skull is too poor to provide valuable information, so we neglect the skull in this description. The description of the new material presents previously unknown anatomical information in detail, which substantially enhances our understanding of *B. liui*.

Institutional Abbreviations

IVPP, Institute of Vertebrate Paleontology and Paleoanthropology

XNGM, Xingyi National Geopark Museum, Guizhou, China.

2. Materials and methods

The specimen of *Birgeria liui* described herein was collected from the excavation site in the Zhuganpo Member of the Falang Formation, around Nimaigu village of Wusha District, Xingyi City, Guizhou Province, South China (Fig. 1). It is stored in the Xingyi National Geopark Museum, Guizhou, China. It was prepared mechanically by fine steel needles under binocular microscopes Nikon SMZ645.

*Author for correspondence: nipeigang@pku.edu.cn

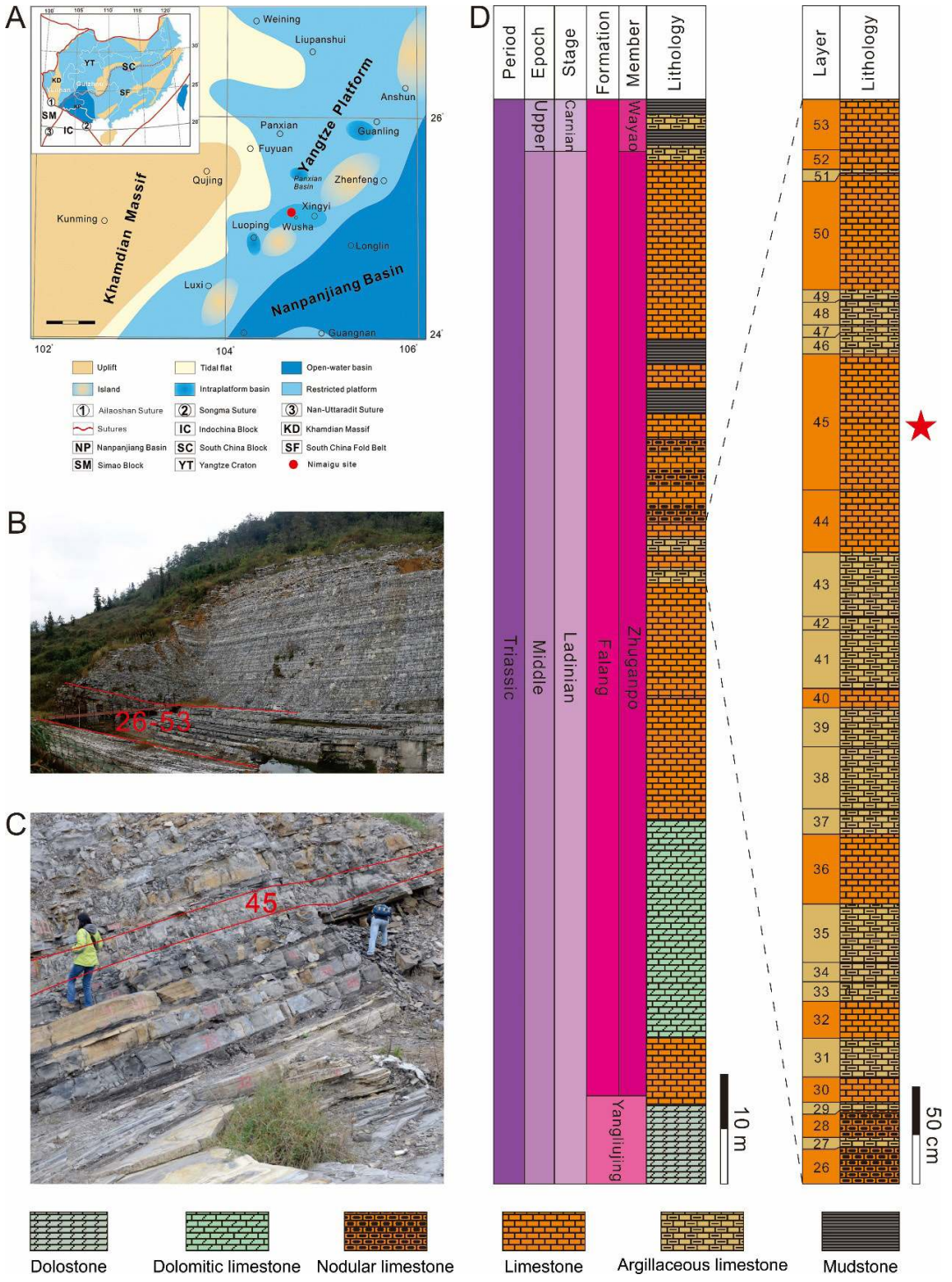

Figure 1. Geological location and stratigraphic section of Xingyi Fauna. A, paleogeographic map of southern China during the Middle Triassic (modified after Liu *et al*., 2013). B, photograph of the Nimaigu section, with the fossil layer 26-53 marked by red lines. C, photograph of the fossil layer, with the bed 45, where *Birgeria liui* has been found, marked by red lines. D, stratigraphic column of Nimaigu section and the fossil layer, with red star indicating bed 45, where *Birgeria liui* was found.

3. Systematic palaeontology

Class Actinopterygii Cope, 1887
(sensu Rosen *et al*., 1981)
Superorder Chondrostei Müller, 1844
(sensu Patterson, 1982)
Order Birgeriiformes Jin, 2001
Family Birgeriidae Aldinger, 1937
Genus *Birgeria* Stensiö, 1919
Species *Birgeria liui* Jin, 2001

Holotype. IVPP V 12569.
Material. XNGM WS-45-F21.
Specimen XNGM WS-45-F21 is a well-preserved fish of 76 cm in standard length (SL) and 94 cm in total length

(TL), fairly complete except for the most posterodorsal part of the skull and the middle of the abdominal region that was lost during the collecting. Unfortunately, the preservation of the skull is too poor to provide valuable information.

Locality

Nimaigu village, Wusha District, Xingyi City, Guizhou Province, South China.

Horizon

Fossiliferous layers of upper assemblages, Zhuganpo Member of the Falang Formation.

Age

Early Longobardian, Ladinian, Middle Triassic.

4. Result and discussion

Both the new specimen and the holotype of *Birgeria liui* came from the Zhuganpo Member, Falang Formation, they were found in Xingyi, Guizhou and in Luoping, Yunnan, respectively, both sites located within the scope of the Xingyi Fauna. In addition to coming from the same horizon, the new specimen of *Birgeria* shares similar features with the holotype in the postcranial skeleton. Hence, we affirm that this new specimen belongs to the species *Birgeria liui*.

5. Conclusions

The description of the new material presents previously unknown anatomical information, which substantially enhances our understanding of *B. liui*. New anatomical information concerns: osteology of paired fins and their supports; neural and haemal arches and their changes along the body length (orientation, proportions, paired or not, kind of contact relationship between the neighbouring arches, correspondence between the neural and the haemal arch, and so on); presence of pectoral ribs; osteology of medial fins and their support; scales and their changes along the orientation.

Acknowledgements

We thank Guanghui Xu (IVPP) for access to the original material of *Birgeria liui* under his care. Tetsuya Sato prepared the specimen. We sincerely thank the editors who have handled this manuscript, Gilles Cuny and Lionel Cavin for their helpful revisions of this work. This study was financially supported by Academic Fund of the Peking University Team of Wenbo Scientific Research and Engineering.

References

Agassiz, L. 1833-1844. Recherches sur les poissons fossiles, Tome I-V. Imprimerie de Petitpierre, Neuchâtel, pp. 1420.

Aldinger, H. 1931. Über Reste von *Birgeria* (Pisces, Palaeoniscidae) aus der alpinen Trias. Neues Jahrbuch für Mineralogie, Geologie und Paläontologie, BeilageBand, (B) 66, 167-181.

Aldinger, H. 1937. Permische Ganoidfische aus Ostgrönland. Meddelelser om Grønland 102(3), 1-392.

Beltan, L. 1977. La parturition d‘un actinoptérygian de 1‘Eotrias du nord-ouest de Madagascar. Comptes rendus hebdomadaires des séances de 1›Académie des Sciences, Paris 284, 2223-2225.

Beltan, L. 1980. Eotrias du nord-ouest de Madagascar: Etude de quelques poissons, dont un est en parturition. Annales de la Société Géologique du Nord 99, 453-464.

Beltan, L. 1996. Overview of systematics, paleobiology, and paleoecology of Triassic fishes of northwestern Madagascar. In: Arratia G. and Viohl G. (Eds.), Mesozoic Fishes - Systematics and Paleoecology. Verlag Dr. Friedrich Pfeil, München, Germany, pp. 479-500.

Beltan, L., Freneix, S., Janvier, P. and López-Paulsen, O. 1987. La faune triasique de la formation de Vitiacua dans la région de Villamontes (Département de Chuquisaca, Bolivie). Neues Jahrbuch für Geologie und Paläontogie, Monatshefte 1987, 99-115.

Berg, L. S., Kazantseva, A. A. and Obruchev, D. V. 1967. Superorder Palaeonisci (Archistia). In: Obruchev D. V. (Eds.), Fundamentals of Paleontology, 11, Agnatha, Pisces. Israel Program for Scientific Translation, Jerusalem, pp. 528–573. [Translated from Russian, published in Russian 1964: Osnovy paleontologii].

Boni, A. 1937. Vertebrati retici italiani. Memorie della Royale Accademia Nazionale dei Lincei, 6, 6(10), 521-719.

Cope, E. D. 1887. Zittel‘s manual of palaeontology. American Naturalist 21, 1014-1019.

Chrzastek, A. 2008. Vertebrate remains from the Lower Muschelkalk of Raciborowice Górne (North-Sudetic Basin, SW Poland). Geological Quarterly 52(3), 225-238.

Gozzi, E. 2006. Analisi tassonomica e morfo–funzionale di *Saurichthys* e *Birgeria* (Osteichthyes, Actinopterygii). Unpublished PhD Thesis, Università degli Studi di Milano.

Guffroy, S. 1956. Notes paléoichthyologiques. Bulletins de la Société Géologique de France, 6, 847–854.

Jiang, L., Ni, P. G., Sun, Z. Y. and Jiang, D. Y. 2016. Discovery and its significance of *Birgeria* sp. from the Middle Triassic Panxian Fauna, Guizhou Province, China. Acta Scientiarum Naturalium Universitatis Pekinensis 52(3), 437-443.

Jin, F. 2001. Notes on the discovery of *Birgeria* in China. Vertebrata PalAsiatica 39(3), 168-176.

Jordan, D. 1907. The fossil fishes of califormia; with supplementary notes on other species of extinct fishes. University of California Publications, Bulletin of the Department of Geology 5(7), 95-145.

Jurkovsek, B. and Kolar-Jurkovsek, T. 1986. A Late Triassic (Carnian) fish skeleton (family Birgeriidae) from Slovenia, NW Yugoslavia. Neues Jahrbuch für Geologie und Paläontogie, Monatshefte 1986(8), 475-478.

Kolar-Jurkovsek, T. 1991. Microfauna of Middle and Upper Triassic in Slovenia and its biostratigraphic significance. Geologija 33, 21-170.

Lehman, J. P. 1948. Sur la Présence du genre *Birgeria* (Paléoniscoïdé) dans 1'Eotrias de Madagascar. Comptes rendus hebdomadaires des séances de 1›Académie des Sciences, Paris 226(5), 426-428.

Liu, G. B., Yin, G. Z., Luo, Y. M., Wang, X. H., and Wang, S. Y. 2006. Preliminary examination of fish fossils from Upper Triassic Wayao Member of Falang Formation in Guanling of Guizhou. Acta Palaeontologica Sinica 45(1), 1-20.

Liu, J., Motani, R., Jiang, D. Y., Hu, S. X., Aitchison, J. C., Rieppel, O., Benton, M. J., Zhang, Q. Y. and Zhou, C. Y. 2013. The first specimen of the Middle Triassic Phalarodon atavus (Ichthyosauria: Mixosauridae) from South China, showing postcranial anatomy and peri-tethyan distribution. Palaeontology 56(4), 849-866.

Müller, J. 1844. Über den Bau und die Grenzen der Ganoiden und über das natürliche System der Fische. Gelesen in der Druckerei der Königlichen Akademie der Wissenschaften 1846, 117-216.

Patterson, C. 1982. Morphology and interrelationships of primitive actinopterygian fishes. American Zoologist 22(2), 241-259.

Rosen, D. E., Forey, P. L., Gardiner, B. G. and Patterson, C. 1981. Lungfishes, tetrapods, paleontology, and plesiomorphy. Bulletin of the American Museum of Natural History 169, 159-276.

Schaeffer, B. and Mangus, M. 1976. An Early Triassic fish assemblage from British Columbia. Bulletin of the American Museum of Natural History 156(5), 515-564.

Schwarz, W. 1970. Die Triasfauna der Tessiner Kalkalpen XX. *Birgeria stensiöi* Aldinger. Schweizerische Paläontologische Abhandlungen 89, 1-93.

Stensiö, E. A. 1919. Einige Bemerkungen über die systematische Stellung von *Saurichthys mougeoti* Agassiz. Senckenbergiana 1(6), 177-181.

Stensiö, E. A. 1921. Triassic fishes from Sptizbergen, Part 1. Holzhausen, Wien, pp. 307.

Stensiö, E. A. 1932. Triassic fishes from East Greenland, Part 1. Meddelelser om Grønland 83(3), 1-305.

Winkler, T. C. 1880. Description de quelques restes de poisons fossils des terrains triasiques des environs de Wurzbourg. Archives du Musée Teyler, Haarlem 5, 109-149.