First record of Saurichthys (Actinopterygii: Saurichthyidae) from the Late Triassic of eastern Paleo-Tethys (postprint)

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Abstract

The saurichthyiform fishes, characterized by a pointed rostrum and a streamlined long and slender body plan, ranked among the top predators of the ichthyofauna in the Early Mesozoic oceanic ecosystem. In a cosmopolitan pattern, these fishes rapidly radiated after the end-Permian mass extinction (EPME) and diversified morphologically and ecologically during the Middle Triassic. Thereafter, they seemingly showed a notable shrinkage from a global distribution to an occurrence basically restricted to the western Paleo-Tethys realm since the Late Triassic. Specifically, there is no saurichthyiform fossil record so far from the marine Late Triassic of South China (eastern Paleo-Tethys), where contrastingly they were highly diversified in stratigraphically older Lagerstätten (Middle Triassic Panxian-Luoping and Xingyi biotas). Here we report the discovery of Saurichthys taotie sp. nov. from the Guanling biota of Guizhou and Yunnan provinces, southwestern China. This new species is a medium-sized Saurichthys featured by subtriangular subopercles ornamented with densely arranged vertical striae, faint ornamentation on the posterior part of the skull roof, and strong longitudinal ridges decorating the anterodorsal surface of the rostrum. By marking its own group' s first occurrence in the Late Triassic of eastern Paleo-Tethyan province, Saurichthys taotie suggests that the saurichthyiform fishes were actually much more widespread than previously thought during that geological stage when they showed a considerable decline in the diversity. By still possessing some features previously only seen in its Early Triassic congeners elsewhere, Saurichthys taotie sheds new light on the evolutionary and paleobiogeographical history of saurichthyiform fishes.

Full Text

Preamble

First Record of *Saurichthys* (Actinopterygii: Saurichthyidae) from the Late Triassic of Eastern Paleo-Tethys

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Abstract

The saurichthyiform fishes, characterized by a pointed rostrum and a streamlined, elongated body plan, ranked among the top predators of ichthyofauna in Early Mesozoic oceanic ecosystems. Following the end-Permian mass extinction (EPME), these fishes radiated rapidly across the globe and diversified morphologically and ecologically during the Middle Triassic. Thereafter, they seemingly exhibited a notable shrinkage from a worldwide distribution to an occurrence basically restricted to the western Paleo-Tethys realm since the Late Triassic. Specifically, no saurichthyiform fossil record has been documented thus far from the marine Late Triassic of South China (eastern Paleo-Tethys), where, in contrast, they were highly diversified in stratigraphically older Lagerstätten (Middle Triassic Panxian-Luoping and Xingyi biotas). Here we report the discovery of *Saurichthys taotie* sp. nov. from the Guanling biota of Guizhou and Yunnan provinces, southwestern China. This new species is a medium-sized *Saurichthys* featuring subtriangular subopercles ornamented with densely arranged vertical striae, faint ornamentation on the posterior part of the skull roof, and strong longitudinal ridges decorating the anterodorsal surface of the rostrum. By marking its group’ s first occurrence in the Late Triassic of the eastern Paleo-Tethyan province, *Saurichthys taotie* suggests that saurichthyiform fishes were actually much more widespread than previously thought during that geological stage when they showed a considerable decline in diversity. By still possessing some features previously seen only in its Early Triassic congeners elsewhere, *Saurichthys taotie* sheds new light on the evolutionary and paleobiogeographical history of saurichthyiform fishes.

Key words: Guanling biota, Guizhou, Yunnan, eastern Paleo-Tethys, Late Triassic, *Saurichthys*

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1. Introduction

The end-Permian mass extinction (EPME) profoundly impacted Earth' s ecosystem (Chen and Benton, 2012; Benton et al., 2013; Benton and Wu, 2022). Osteichthyes (bony fishes) experienced rapid diversification in the aftermath of this crisis and replaced Chondrichthyes to dominate ichthyofaunas thereafter (Romano et al., 2016). The Saurichthyiformes (Osteichthyes: Actinopterygii), the earliest 'pike-like predators' among actinopterygian fishes known thus far (Kogan et al., 2015, 2020; Tintori, 2019; Benton and Wu, 2022), comprise a group of specialized Mesozoic fishes with a tapered rostrum, a slender body, and symmetrically positioned median fins (Stensiö, 1925; Rieppel, 1985). This group originated in the Late Permian, radiated in the Early and Middle Triassic, and finally died out in the Middle Jurassic (Liu and Wei, 1988; Mutter et al., 2008; Romano et al., 2012; Maxwell, 2016). During the Early and Middle Triassic, saurichthyiform fishes exhibited global distribution and invaded both marine and freshwater environments (Romano et al., 2012). They also developed diverse swimming and feeding strategies during this period (Wu et al., 2009, 2011, 2013, 2015, 2018; Kogan et al., 2015). When it came to the Late Triassic, the diversity of these fishes was significantly reduced, and their distribution was basically restricted to the western Paleo-Tethys (Romano et al., 2012). Although *Saurichthys huanshenensis* was reportedly assigned to the Late Triassic of the non-marine Ordos Basin of North China (Chou and Liu, 1957), its age remains controversial (Ge et al., 2007; Chang et al., 2012; personal communications to Liu Jun of IVPP).

The South China basin of the eastern Paleo-Tethyan province documents continuous rock sequences from the Middle Permian to the Upper Triassic with various sedimentary settings (Tong et al., 2019). In the western part of this basin, four exceptional fossil Lagerstätten have been excavated from the border area between Yunnan and Guizhou Provinces: the Anisian Luoping and Panxian biotas, the Ladinian Xingyi biota, and the Carnian Guanling biota (Wang et al., 2008; Jiang et al., 2009; Benton et al., 2013). Abundant well-preserved marine fishes and reptiles have been reported and greatly expanded our knowledge of the recovery of marine ecosystems after the EPME and the paleobiogeographical history of relevant aquatic vertebrates (Chen and Benton, 2012; Benton et al., 2013; Benton and Wu, 2022). From those fossil Lagerstätten, increasing evidence suggests that saurichthyiform fishes, ranking among the top predators in local fossil communities, had successfully evolved during the Middle Triassic of South China. In the past decade, one new family, two new genera, and eight new species of Saurichthyiformes from the Middle Triassic Luoping and Panxian biotas have been established (Wu et al., 2009, 2011, 2013, 2015, 2018; Zhang et al., 2010). The younger Xingyi biota has yielded many undescribed saurichthyid specimens that show notable taxonomic diversity (Jin, 2006 and personal observations). However, saurichthyiform fishes have not yet been reported in either the Guanling biota or the Upper Triassic of the entire eastern Paleo-Tethys (Liu et al., 2006; Romano et al., 2012; Benton et al., 2013; Wu et al., 2018). This 'absence of evidence' was proposed to echo the restricted paleogeographic distribution of this group at that time (Romano et al., 2012). Here we report a new species of *Saurichthys* from the Guanling biota (Xiaowa Formation, Carnian) as the first record of this group in the Upper Triassic of the eastern Paleo-Tethys. This discovery brings new knowledge of the faunal composition of the Guanling biota and inspires us to reevaluate the paleobiogeographical history of saurichthyiform fishes during the Late Triassic when they were reportedly losing their diversity.

2. Materials and Methods

The studied material, curated in the Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences (IVPP), includes two specimens. The holotype specimen IVPP V31228 is a dorso-laterally compressed skull preserved with the ammonoid *Trachyceras* sp. and bivalves (e.g., *Halobia rugosoides*) in dark grey laminated marlstone. It was excavated from an undescribed outcrop in Longbozi (meaning Dragon' s neck in Chinese) Village, Fuyuan County, Qujing City, Yunnan Province, China [Figure 1: see original paper], about 1 km north of Jiyangshan Village. Due to farmland coverage, the stratum is exposed with only approximately 1.5 m thickness, consisting of thin- to medium-bedded grey to black laminated marlstone with some intercalations of black shale containing abundant ammonoids and bivalves. Several specimens of the ammonoid *Trachyceras multituberculatum* were unearthed during our fieldwork there [Figure 1: see original paper], which indicate that the fossiliferous layers belong to the Lower Member of the Xiaowa Formation (formerly called the Wayao Member of Falang Formation) and have an age of late early Carnian, Late Triassic (Xu et al., 2003; Sun et al., 2016). Large pseudoplanktonic crinoids, the iconic creatures of the Guanling biota (Wang et al., 2008), have also been found in the fossil-bearing stratum.

The paratype specimen IVPP V31229 includes a dorso-laterally compressed skull and some anterior vertebral bones of the same individual preserved in laminated yellowish-grey marl with *Trachyceras* sp. and bivalves. It was collected from the Lower Member of the Xiaowa Formation at Xinpu Town, Guanling

County, Anshun City, Guizhou Province, which is a well-studied locality of the Guanling biota (Wang et al., 2008). The skull is slightly larger than the holotype and had been severely weathered, which may increase the color and texture contrast between the bones and the matrix (Li et al., 2013). Although the ornamentation on the external surface of the bones has been eroded, the bone sutures and sensory canals can be clearly observed. These two individuals are assigned to one species based on their shared features of the subopercle and the rostrum.

The fossils were mechanically prepared with sharp needles. Photographs were taken under a Nikon SMZ1500 binocular microscope and DJI drone, and line drawings were produced based on sketched outlines. For better contrast, the holotype specimen (IVPP V31228) and specimens of *Trachyceras multituberculatum* were dusted with ammonium chloride before photography. The rostrum of the holotype specimen was scanned by a micro-computed laminography system (CL) with a beam energy of 150 kV and a flux of 50 µA at a resolution of 12.93 µm per pixel in the Key Laboratory of Vertebrate Evolution and Human Origins of Chinese Academy of Sciences. The measurement conventions [Figure 2: see original paper] followed Wu et al. (2015). As dorsolateral compression hampers accurate restoration of skull depth, the estimated skull depth was measured by the distance from the posteroventral edge of the lower jaw to the midpoint of the width of the dermopterotic covering the cheek bones. The anatomical terminology used in this paper follows Stensiö (1925), Rieppel (1985), and Argyriou et al. (2018).

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3. Systematic Paleontology

Subclass Actinopterygii Cope, 1887
Order Saurichthyiformes Aldinger, 1937
Family Saurichthyidae sensu Stensiö, 1925
Genus *Saurichthys* Agassiz, 1834
***Saurichthys taotie* sp. nov.**

Etymology: *taotie* (饕餮 in Chinese Pinyin) is a gluttonous monster in ancient Chinese legends, whose head was often engraved on ancient bronzes as decoration. The specific epithet is derived from ‘TaoTie Fish,’ a fictional ferocious fish from the Chinese science fiction novel series *The Three-Body Problem* by Liu Cixin, as a metaphor for survival competition in the story (Liu, 2010).

Holotype: IVPP V31228, a dorso-laterally compressed skull preserved with the imprint of the right subopercle and the disarticulated left subopercle [Figure 3: see original paper] (for updated terminology of the opercular apparatus of saurichthyid fishes see Argyriou et al., 2018).

Paratype: IVPP V31229, a dorso-laterally compressed skull preserved with the disarticulated right subopercle and a series of articulated neural arches of the anterior abdominal region [Figure 3: see original paper].

Type locality: Longbozi outcrop (Village) (N25°7 3 , E104°41 29), Fuyuan County, Qujing City, Yunnan Province, China [Figure 1: see original paper].

Horizon: Lower Member of Xiaowa Formation, within *Trachyceras multituberculatum* ammonoid zone, Julian substage, Carnian stage, Upper Triassic.

Diagnosis: A medium-sized *Saurichthys* with a notably prolonged rostrum (rostrum/mandible length ratio > 0.71); subtriangular subopercle with distinct ornamentation of vertical striae; posterior skull roof decorated with faint ornamentation; and anterodorsal surface of the rostropremaxilla bearing strong longitudinal ridges.

4. Description

General Morphology. *Saurichthys taotie* sp. nov. is a medium-sized saurichthyid fish (for size classes see Tintori, 2013) [Figure 3: see original paper] that exhibits the typical tapering, pointed snout, high postorbital maxillary plate in the cheek region, and a large gill cover bone (subopercle). Based on skull length, the standard body length is estimated to be no less than 600 mm (the minimum estimate is based on a skull/standard body length ratio of *Saurichthys striolatus*, which has a fairly long skull (Griffith, 1977; Kogan et al., 2020)). The rostrum occupies 71.5%-76.1% of the mandible length . Additional skull measurements are provided in Table 1.

Snout. The anteriorly tapered snout of the studied specimens is depressed dorsoventrally, allowing clear observation of the dorsal parts of its constituent bones [Figure 3: see original paper]. The paired rostropremaxillae occupy most of the upper jaw. They are fused along the midline and separated by the frontals posteriorly. The triangular nasaloantorbital on each side has a pointed anterior tip that wedges between the anterior end of the frontal and the posterior part of the rostropremaxillae. It contains the openings of two external nares (en.1, 2) with the supraorbital sensory canal passing between them, of which the anterior one is larger than the posterior one. The anteriormost part of the rostropremaxillae is decorated with conspicuous longitudinal ridges [Figure 3: see original paper]. More posteriorly, these ridges are replaced by small tubercles that continue posteriorly and transform into stout vertical striae covering the lateral surface of the snout. Although the nasaloantorbital is badly damaged in IVPP V31228 and weathered in V31229, some tubercles could be observed on the residual surface of its anterior end.

Dermal Skull Roof. Several bone sutures on the dermal skull roof were recognized in the studied specimens [Figure 3: see original paper]. An oval parietal is enclosed by the paired frontals anteriorly and dermopterotics posterolaterally. The frontals extend and narrow anteriorly, but their anteromedial boundaries cannot be recognized in the current material. The paired supraorbital sensory canals are discerned as two parallel dotted lines embedded in grooves that flank the midline suture of the frontals. The dermopterotic is of an irregular trapezoid shape and meets its counterpart along a relatively short, straight suture behind the parietal. The anterior and posterior edges of the dermopterotic are slightly concave to accommodate the parietal and extrascapulars (not preserved in current material), respectively. The infraorbital sensory canal bends in the flared anterolateral corner of the dermopterotic before entering the dorsal side of the latter. More posteriorly, it runs along the lateral margin of the dermopterotic and exits at the pointed lateral tip of the bone. Some small tubercles are seen on the anterior half of the frontals, whereas the ornamentation is much fainter on the parietal and the dermopterotics, where short, shallow pits and grooves are developed.

Cheek Bones. The cleaver-shaped maxilla greatly narrows below the orbit and extends anteriorly at least to the level of the anterior rim of the orbit [Figure 3: see original paper]. It expands considerably in the postorbital region, occupying the largest part of the cheek. The preopercles were badly damaged in the current material, so their suture with the maxilla cannot be clearly restored. An unornamented bony plate is preserved in the position of the damaged preopercle, which is tentatively assigned as the exposed part of the entopterygoid. The ventral ankle of the endochondral quadrate is preserved in articulation with the articular of the lower jaw in IVPP V31229, but the remainder of this bone was weathered away. The maxilla is decorated with fine vertical striae in the postorbital part and faint pits in the suborbital part.

Lower Jaw. The lower jaw protrudes forward; however, it cannot be determined whether it is strictly as long as the upper jaw based on current materials. The dentary is the largest dermal bone of the lower jaw, covering the anterior and most of the lateral external surface of the mandible. Like the rostropremaxilla, the dentary also tapers anteriorly to form a beak-like bone. At the rear, in a posterodorsally slanted line, the dentary sutures with the angular, which occupies the posteroventral corner of the mandible. The angular takes the shape of an obtuse triangle and extends forward to the level of the posterior rim of the orbit. The surangular cannot be discerned due to coverage by the displaced maxilla. The articular is observed in V31229 where the posterior part of the angular was not preserved. It is a triangular bone situated at the posterodorsal corner of the mandible and bears the glenoid fossa that receives the ankle of the quadrate. The dentary is decorated with posteriorly inclined striae in the posterior part, whereas the anterior one-third length of this bone is ornamented with some short longitudinal ridges, just like those on the corresponding length of the upper jaw. The angular bears a cluster of striae that radiate from its posteroventral corner. No details of the mandibular sensory canal can be detected in the current material.

Opercular Apparatus. The subopercle is an iconic bone lying behind the jaw joint [Figure 3: see original paper]. *Saurichthys taotie* sp. nov. has a subtriangular subopercle whose length-depth ratio is approximately 1 . According to the imprint, the vertical anterior margin of this bone bears a small projection roughly at the midpoint. The posteroventral margin of the subopercle is much more convex than the dorsal margin [Figure 4: see original paper]. The internal surface bears some radiating grooves at the anterior part and several concentric wrinkles paralleling the dorsal and posteroventral margins [Figure 4: see original paper]. Similar wrinkles were interpreted as growth marks (Griffith, 1959; Rieppel, 1985), though this interpretation was later challenged by histological evidence (Scheyer et al., 2014). Although all subopercles in the studied material show their medial view or imprint of the internal surface, conspicuous vertical striae are observed from the breach of this bone in the holotype [Figure 4: see original paper].

Dentition. Only some disarticulated or broken teeth can be directly observed in IVPP V31228. We used CL scanning to detect the dentition in situ in the jaws [Figure 3: see original paper]. The teeth are conical in shape and can be divided into two size categories. The larger ones, about 2 mm in height in the scanned area, are arranged at regular intervals filled by several smaller teeth (less than 1 mm in height). No "Inzisivlücken" (teeth crypts) along the labial edges are developed. All exposed teeth are not well preserved, and nothing can be said about the arrangement of the ornamentation and the relative height of the enamel cap of the teeth.

Axial Skeleton. Several articulated neural arches are preserved showing their ventral and medial sides in IVPP V31229 [Figure 3: see original paper]. The exposed part of the neural arch is roughly 'T' -shaped, with its vertical axis stout and anterior and posterior edges constricted below the level of the pre- and postzygapophysis. On the medial surface, at least one small foramen is detected, for which analogues are present in every other neural arch in other saurichthyid fishes (Wu et al., 2009, 2011, 2015; Maxwell et al., 2016). The sucker-like ventral part with a rough texture is the 'base' of the neural arch that was originally attached to the notochord in vivo.

5.1 Comparison

As morphological information of the new species is mostly derived from the skull and gill cover, comparison is confined to its congeners and, more broadly, to other saurichthyiform fishes whose cranial and opercular features are well known. During the Triassic, South China (eastern Paleo-Tethys) was an evolutionary hotspot of saurichthyiform fishes (Wu et al., 2009, 2011, 2013, 2015, 2018; Zhang et al., 2010; Benton and Wu, 2022). Those species from the Anisian (Middle Triassic) of Yunnan and Guizhou Provinces of China can be easily distinguished from *Saurichthys taotie* sp. nov. in cranial morphology. The most distinct feature of the new species is the shape of the subopercle. The subopercle in the new species is subtriangular, whereas in all named saurichthyiform fishes from the Luoping and Panxian biotas it is generally elliptical and usually deeper than long [Figure 5: see original paper].

Yelangichthys macrocephalus, excavated from the Panxian biota, constitutes the monotypic Yelangichthyidae, the sister group of Saurichthyidae (Wu et al., 2013; Argyriou et al., 2018; Ren and Xu, 2021). It departs from *Saurichthys taotie* sp. nov. in having small screwdriver-like teeth, a roughly long-oval subopercle, and strong, tubercular ornamentation on the dermal skull roof (Wu et al., 2013). According to observations on our large collection of undescribed material of *Saurichthys* from the Ladinian Xingyi biota, none exhibits a similar subopercle [Figure 5: see original paper].

Apart from configurational differences in the gill cover, the rostrum length and jaw (tooth) features, as well as the extent of bony ornamentation of the new species, also bear taxonomic significance. Regarding forms from the eastern Paleo-Tethyan realm, *Saurichthys dawaziensis* and *S. yangjuanensis* possess relatively shorter rostra but are equipped with larger teeth accommodated in labial crypts and lack longitudinal ridges at the pointed end of the rostropremaxilla (Wu et al., 2009, 2015). *Saurichthys yangjuanensis* also differs from the new species in having stronger ornamentation on the dermal skull roof (Wu et al., 2015). *Saurichthys yunnanensis* differs from the new species in possessing a proportionally shorter rostrum (Lro/Lmand 65%) and deeper skull (Dsk/Lsk 25%) (Zhang et al., 2010). The skull features of *S. spinosa* are more distinctive, and this species has a much smaller size, a very narrow interorbital region, and a strongly decorated dermal skull roof (Wu et al., 2018).

The *Sinosaurichthys* species exhibit a similarly prolonged rostrum; for example, the rostrum makes up 73%-76% of mandible length in *Sinosaurichthys longipectoralis*. However, this species differs from *S. taotie* sp. nov. in having a deeper skull, proportionally smaller teeth, dense tubercles on the dermal skull roof, and a weakly decorated rostrum tip (Wu et al., 2011).

Among Late Triassic *Saurichthys* with well-preserved skull and gill cover, three species from the western Paleo-Tethys have been known based on relatively complete skeletons (Romano et al., 2012). *Saurichthys striolatus* resembles the new species in having a prolonged rostrum with a Lro/Lmand ratio of approximately 75% (personal observations of SMNS 96342, curated in the Stuttgart State Museum of Natural History, Germany). However, its body size is much smaller than the new species, and it possesses a subquadratic subopercle (Griffith, 1959; Kogan et al., 2020). *S. calcaratus* also has a prolonged rostrum and medium body size. Its subopercle is ornamented with dense vertical striae like that of *S. taotie* sp. nov., but this bone differs from the latter in being slightly longer than high and having a convex posterior margin. Additionally, compared to the size of the postorbital maxilla-preopercular plate and lower jaw, the subopercle of *S. calcaratus* appears smaller than that of *S. taotie* sp. nov. (Kogan et al., 2020 and personal communications to Ilja Kogan). Furthermore, *S. calcaratus* shows a fairly large nasaloantorbital (Griffith, 1977). Distinct from the new species, *S. deperditus* (= *S.* "*krambergeri*") has oval-shaped subopercles, larger teeth (3.3-5.2 mm high), and teeth crypts along the labial edge of the jaws (Griffith, 1962).

Distinct from all congeners from other regions of the world (see Wilson et al., 2013; Werneburg et al., 2014; Maxwell et al., 2015, 2016), *S. taotie* sp. nov. shares the subtriangular subopercle with three *Saurichthys* species: from the Early Triassic of Madagascar (Kogan and Romano, 2016) and the Boreal sea (Stensiö, 1925), and from the Middle to Late Triassic of central Asia (Kogan et al., 2009, 2020). However, the subopercle of *S. madagascariensis* (late Induan) displays a posteroventrally inclined anterodorsal margin. It also differs from *S. taotie* sp. nov. in having coarse ornamentation on the dermal skull roof and a relatively short rostrum (Kogan and Romano, 2016). *Saurichthys elongatus* more closely resembles the new species in cranial and subopercular morphology and faint ornamentation on the dermal skull roof, but it is distinct from the new species in the pattern of ornamentation on the subopercle (Stensiö, 1925). *Saurichthys orientalis* from the Middle-Upper Triassic lacustrine deposits in central Asia has a similarly subtriangular subopercle, but the convexity of the dorsal and posteroventral margins and the extension of the anterior border of the subopercle differ from the new species described here (Kogan et al., 2009, 2020).

5.2 Paleobiogeographical Implications

The absence of saurichthyiform fishes in former fossil records from the Late Triassic of the eastern Paleo-Tethys was regarded as an indicator of the shrinking paleogeographical distribution and declining diversity of these fishes at that stage (Romano et al., 2012). Since then, their distribution seems to have been mainly restricted to the western Paleo-Tethys and Euramerican Realm (Romano et al., 2012). The discovery of *Saurichthys taotie* sp. nov. in the Guanling biota, South China, clearly indicates that some representatives of this fish group still lived in the eastern Paleo-Tethyan region at least by the early Late Triassic [Figure 6: see original paper]. Moreover, the resultant updated temporal and spatial distribution of some morphological features of taxonomic significance in *Saurichthys* suggests that their paleobiogeographical history might be more complex than previously thought (Romano et al., 2012).

The subopercle shape (the traditionally termed 'opercle' ; see Argyriou et al., 2018 for definition) has been extensively treated as a taxonomic character in *Saurichthys* (Rieppel, 1992; Wilson et al., 2013; Maxwell et al., 2015; Kogan and Romano, 2016; Wu et al., 2018) and is one of the key features distinguishing basal species, such as *S. madagascariensis* from the Early Triassic of Madagascar (Kogan and Romano, 2016) and *S. orientalis* from the Late Triassic of Central Asia (Kogan et al., 2009; Maxwell et al., 2015), from other more derived congeners including those from the eastern Paleo-Tethyan region (Wu et al., 2018). Regarding subopercle general morphology, *Saurichthys taotie* sp. nov. closely resembles the abovementioned basal congeneric species (Kogan et al., 2009; Kogan and Romano, 2016) and *S. elongatus* from the Early Triassic of Spitsbergen (Stensiö, 1925), but notably diverges from all stratigraphically older saurichthyid fishes from the eastern Paleo-Tethys whose subopercles were well-preserved (Liu and Wei, 1988; Wu et al., 2009, 2011, 2013, 2015, 2018; Zhang et al., 2010). In this sense, albeit the unfeasibility of a phylogenetic analysis for the new fish due to the incompleteness of the fossil material, it is tempting to infer that *Saurichthys taotie* sp. nov. might be derived from a certain immigrant from elsewhere, taking into account the hypothesized repeated trans-oceanic dispersals among Middle Triassic saurichthyid fishes between eastern and western Paleo-Tethys (Maxwell et al., 2015). Admittedly, such a hypothesis should be tested in a strong phylogenetic framework incorporating sufficient fish taxa and morphological details of the new species. However, this is beyond the scope of this paper given the quality of the data at hand.

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