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Supplementary Materials for

A tetrapod fauna from within the Devonian Antarctic Circle

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Materials and Methods

Shale was excavated and stockpiled by RWG during roadworks at Waterloo Farm in 1999 and 2007. Slabs were split by hand using knives and chisels; fine preparation of bones, involving the removal of minute flakes of shale, was undertaken with a porcupine (*Hystrix africaeaustralis*) quill. The specimens were photographed using an Olympus E-M10II camera with flash. Interpretative drawings were traced directly from the photographs in Adobe Photoshop, working at high magnification and cross-checking constantly with the specimen. All drawings were checked by both authors. No whitening agent or other contrast-enhancing treatment was applied to the specimens.

Systematic paleontology

Tetrapoda, Goodrich, 1930

Remark. We define Tetrapoda in the traditional sense as limbed vertebrates (5). Limbs are not preserved in the taxa described here, but both show derived characters of the shoulder girdle that are only known to occur in tetrapods. These characters are probably functional correlates of the distinctive stance and movement pattern of tetrapod limbs.

Tutusius, gen. nov.

Type species. *Tutusius umlambo* sp. nov.

Diagnosis. Derived characters of Tetrapoda: The cleithrum tapers to a point anteroventrally and carries a single attachment scar for the scapulocoracoid, which extends along the anteroventral process, forms a v-shaped dorsal peak, and ends posteriorly in a projecting buttress. The cleithrum lacks ornament and has a distinct flexure point demarcating the obliquely sloping ventral half of the bone from the more vertical dorsal half. Primitive characters within Tetrapoda: There is no scapular blade. The blade of the cleithrum is broad and thin. Autapomorphies: Differs from all other tetrapod cleithra in the presence of a projecting posterior flange, with striated texture and a jagged margin, on the middle part of the blade

Tutusius umlambo sp. nov.

Etymology. Generic name in honour of Archbishop Desmond Tutu, in recognition of his outstanding contribution to the political and social development of South Africa. Specific name from isiXhosa “umlambo”, meaning “river”, referring to the depositional environment.
Holotype. Albany Museum catalogue number AM7527, a left cleithrum in part and counterpart (Fig. 2, A and B, S1,A). Only known specimen. Housed at Albany Museum, Grahamstown, South Africa.

Locality. Waterloo Farm ('Upper Fish Lens'), near Grahamstown, South Africa. Uppermost part of the Witpoort Formation, Witteberg Group.
Age. Late Famennian, Late Devonian.
Diagnosis. As for genus.

Umzantsia, gen nov.

Type species. *Umzantsia amazana*, sp. nov.
Diagnosis. Derived characters of Tetrapoda: The cleithrum tapers to a point anteroventrally and carries a single attachment scar for the scapulocoracoid, which extends along the anteroventral process, forms a v-shaped dorsal peak, and ends posteriorly in a projecting buttress. The jugal extends anterior to the orbit and contacts the prefrontal. Primitive characters within Tetrapoda: The cleithrum is almost completely covered in ornament. There is no scapular blade. A preopercular is present. Autapomorphies: The blade of the cleithrum carries a semicircular posterodorsal extension. The dermal ornament consists of fine, parallel ripples. The jugal has a very short orbital margin and lacks a distinct dorsal postorbital process. The most anterior infradentary ("splenial") is much longer than the others in the series. Five infradentaries are present, but this character may be variable.

Umzantsia amazana, sp. nov.

Etymology. From isiXhosa "uMzantsi", meaning "south" (also "South Africa"), referring to its place of origin, and "amazana" meaning "water ripples", referring to its distinctive dermal ornament.
Holotype. Albany Museum catalogue number AM7528, a disarticulated individual represented by a right cleithrum, left jugal, right preopercular, left frontal, one near-complete and two partial infradentaries, a probable supratemporal, and some unidentified elements (Fig. 2, C to P, S1 B-I). Housed at Albany Museum, Grahamstown, South Africa.
Attributed specimens. Albany Museum catalogue number AM7529, a near-complete left lower jaw ramus and parts of the associated right ramus (Fig. 3, S2).
Locality and Age. Same as above.
Diagnosis. As for genus.
Remark. Both cleithra have diagnostic tetrapod features distinguishing them from the cleithra of all non-tetrapod osteichthyans. In actinopterygians and sarcopterygian fishes the cleithrum is broad ventrally and covers the entire scapulocoracoid; the only known exception is the Devonian sarcopterygian *Hongyu* (26), in which the scapulocoracoid is exposed ventrally but the cleithrum is nevertheless broad with a concave transverse ventral margin. A cleithrum that tapers anteroventrally to a point, and attaches exclusively to the anterior margin and dorsal process of the scaplocoracoid, is known to occur only in tetrapods (5-8, 14-17) and the elpistostegid *Tiktaalik* (9). In *Tiktaalik*, almost the whole of the external face of the cleithrum is covered with ornament, which ends ventrally in a well-defined curving rim. The dorsal end of the scapulocoracoid forms

a thin but quite extensive lamina on the internal face of the cleithrum (9). By contrast, the most primitive Devonian tetrapod cleithra, (as represented by *Ichthyostega* (7), *Acanthostega* (13), *Ventastega* (8), *Hynerpeton* (14), *Elginerpeton* (16) and *Jakubsonia* (6) all lack ornament, and the dorsal end of the scapulocoracoid is a blunt V-shaped process. *Tulerpeton* is more derived, similar to post-Devonian tetrapods (15). The cleithra of the most primitive tetrapods also carry a short posteroventrally directed buttress that bears the posteriormost part of the scapulocoracoid attachment (Fig. 4, grey arrows); no such buttress is present in *Tiktaalik*. The cleithra of *Tutusius* and *Umzantsia* both have scapulocoracoid attachment scars indicating a scapulocoracoid of characteristic tetrapod form, and carry posteroventrally directed buttresses. *Tutusius* also lacks dermal ornament and has a distinct flexure point where the blade changes orientation, similar to *Ichthyostega* and *Jakubsonia* (Fig. 4).

Provenance

All specimens were collected by Dr Robert W. Gess from a single lens of black shale at Waterloo Farm outside Grahamstown, South Africa, located at 33°19'24.24"S, 26°32'13.39"E. A large volume of fossil rich shale blocks was removed by hand from the locality by Dr Gess and a team of laborers, ahead of roadworks in 1999. These were stored at the Albany Museum in Grahamstown and in a shed in the nearby village of Bathurst. Tetrapod specimens have subsequently been recovered during gradual ongoing excavation and preparation of this material by Dr Gess. Material is accessioned in the paleontology collection of the Albany Museum and is housed at the Albany Museum's Devonian laboratory in Beaufort Street, Grahamstown where they may be viewed by prior arrangement with Dr Gess. The shale lens is situated near the upper boundary of the Witpoort Formation (Witteberg Group, Cape Supergroup). The Witpoort Formation has been dated to the Famennian age through correlation of Cape Supergroup strata with Laurussian sea-level curves. This dating is confirmed by vertebrate biostratigraphy. Pertinently abundant placoderms are recorded from the upper Witpoort Formation at Waterloo Farm indicating an undoubted Devonian age, but are absent from all stratigraphically overlying strata, indicating that these later strata postdate the End Devonian Mass Extinction Event.

Fig. S1

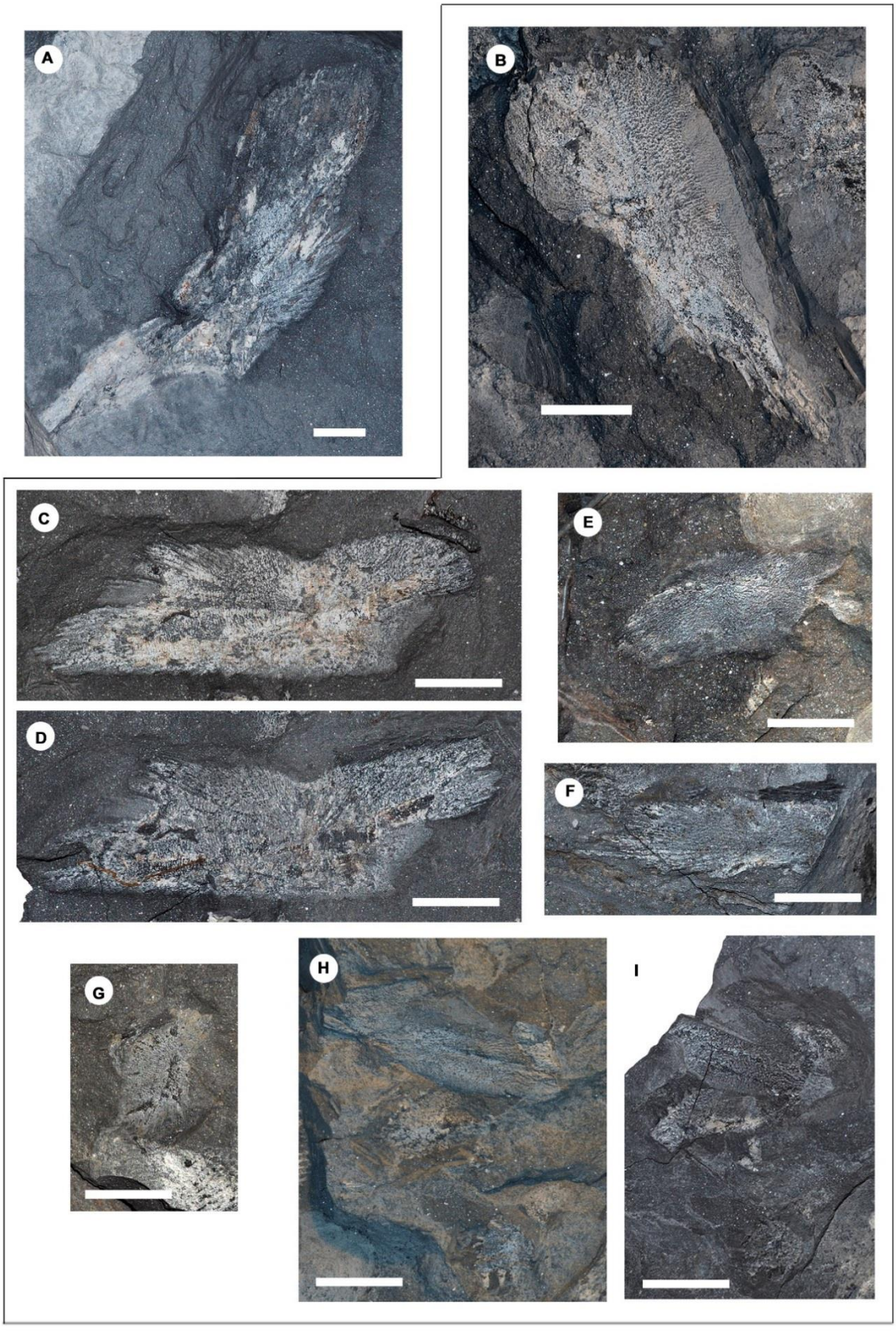

Fig. S1. Material of *Tutusius* and *Umzantsia*. (**A**) Photograph of AM7527, a left cleithrum, holotype and only known specimen of *Tutusius umlambo*. (**B-I**) AM7528a-f, bones of holotype of *Umzantsia amazana*, believed to represent one individual (indicated by box). (**B**) AM7528a, right cleithrum; (**C-D**) AM7528b, left jugal, shown in part, counterpart; (**E**) AM7528c, right preopercular; (**F**) AM7528d, incomplete left frontal; (**G**) probable left supratemporal; (**H-I**) AM7528e, bone assemblage comprising a chain of two partial and one near-complete infradentary, a probable premaxilla and an unidentified tooth-bearing ossicle (see also Fig. S2). Anterior is to the left in (**A**), (**C-D**), and (**F**); to the right in (**B**), and (**E**). All scale bars, 10mm. (**B-I**) are shown to the same scale.

Fig. S2

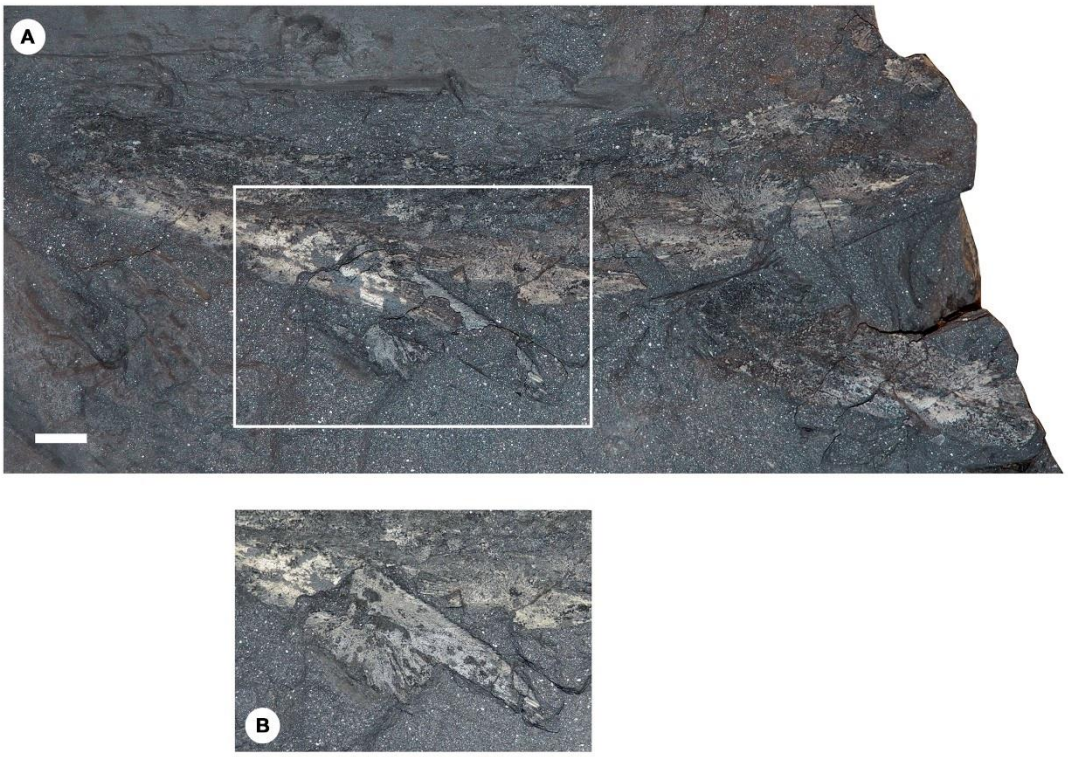

Fig. S2. The lower jaw of *Umzantsia*. (**A**-**B**) AM7529, left mandibular ramus plus infradentaries of right mandibular ramus of *Umzantsia amazana*. (**A**) photograph of specimen. The splenial of the left ramus partly overlies an infradentary of the right ramus; the area within the white box is shown in (A), with the splenial in place and (**B**), as an exerpt box, with the splenial removed to reveal the underlying infradentary.

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