Supplementary information for **'Ichthyosaurs from the Upper Triassic (Carnian–Norian) of the New Siberian Islands, Russian Arctic, and their implications for the evolution of the ichthyosaurian basicranium and vertebral column'** by Nikolay G. Zverkov, Dmitry V. Grigoriev, Andrzej S. Wolniewicz, Alexey G. Konstantinov & Evgeny S. Sobolev

Table S1. Measurements of selected vertebral centra (in mm).

Specimen No	Anteroposterior length (L)	Dorsoventral height (H)	Mediolateral width (W)	Neural canal floor max/min width
ZIN PH 1/250 (1) post.pres.	49.0	115.0	101.0	18/10
ZIN PH 1/250 (2) caudal	50.0	118.0	100.5	14/8
ZIN PH 3/250 ant.pres.	16	32	37	9/7
ZIN PH 3/250 ant.pres.	19	32	34	9/4
ZIN PH 3/250 ant.pres.	17	31	37	7/4
ZIN PH 3/250 post.pres.	15.5	33	inc	inc
ZIN PH 3/250 anterior caudal	16	35	32	8/2
ZIN PH 3/250 caudal	14	40	30	NA
ZIN PH 3/250 caudal	15	32	31	6/3
ZIN PH 5/250 (v1)	10	21.5	21.5	NA
ZIN PH 5/250 (v2)	NA	NA	NA	NA
ZIN PH 5/250 (v3)	12	NA	NA	NA
ZIN PH 5/250 (v4)	12.5	27.5	NA	7/2
ZIN PH 5/250 (v5)	13	NA	NA	7/2
ZIN PH 5/250 (v6)	13	24.5	28	7/3
ZIN PH 5/250 (v7)	15	25	NA	7/3
ZIN PH 5/250 (v8)	15	28	32	NA
ZIN PH 6/250 caudal	14	30	33	5/2
ZIN PH 6/250 caudal	14	32	31	Inc.
ZIN PH 7/250 ant.pres.	16.5	37	40	Inc.
ZIN PH 8/250 ant.pres.	16	31		Inc.
ZIN PH 8/250 ant.pres.	17	29	28	Inc.
ZIN PH 8/250 post.pres.	20	38	41.5	Inc.
ZIN PH 9/250	20	38	42	7/5
ZIN PH 10/250 caudal	50.5	Inc.	Inc.	Inc.
ZIN PH 11/250 ant.pres.	21.5	34	44	18/13
ZIN PH 12/250 caudal	17	51	50	13/9
ZIN PH 14/250 ant.pres.	22	50	50	10/5
ZIN PH 16/250 ant.pres.	17	32	36	9/3
ZIN PH 17/250 post.pres.	12	33	36,5	9/7
ZIN PH 18/250	15	Inc.	Inc.	Inc.
ZIN PH 20/250 ant.pres.	16	33	35	8.5/3
ZIN PH 20/250 ant.pres.	16	31	39	6/3
ZIN PH 20/250 ant.pres.	15	31.5	34	6/3
ZIN PH 20/250 caudal	15	34	31	inc

ZIN PH 22/250 caudal	19	49	46	9/4
ZIN PH 22/250 caudal	16,5	Inc.	Inc.	8.5/4.5
ZIN PH 23/250 ant.pres.	15	28	36	inc
ZIN PH 23/250 ant.pres.	17	30	Inc.	inc

*Abbreviations: ant.pres. = anterior presacral; inc. = incomplete; post. pres. = posterior presacral.

Additional measurements

ZIN PH 21/250

dorsal rib head: dorsoventral maximum height = 70 mm, preserved length = 25 mm.

tail rib head = 36x24 mm.

ZIN PH 3/250 elements of uncertain nature (rib heads or ?propodials)

1. Preserved proximodistal length = 30 mm; anteroposterior width of proximal end = 31 mm, dorsoventral width = 22 mm; diameter at diaphysis = 13 mm.

2. Preserved proximodistal length = 33 mm; anteroposterior width of proximal end = 27 mm, dorsoventral width = 20 mm; diameter at diaphysis = 13 mm.

ZIN PH 5/250, holotype of *Auroroborealia incogita* gen. et sp. nov., cranial measurements:

Parabasisphenoid

Preserved maximum mediolateral width (at the level of the basipterygoid process) = 30 (34 mm estimated when complete)

Preserved anteroposterior length = 34 mm

Mediolateral width posteriorly = 22 mm

Maximum height = 21 mm

Facet for the basioccipital mediolateral width = 21 mm; dorsoventral height = 20 mm

Basipterygoid process: anteroposterior length =17.5 mm; dorsoventral height = 10 mm

Diameter of the internal carotid foramen = 4 mm

Mandible

Preserved anteroposterior length = 65 mm

Posterior dorsoventral height =21 mm

Dorsoventral height at the region of the anterior breakage = 16 mm

Hyoid

Anteroposterior length =75 mm

Maximum thickness = 12.5 mm anteriorly and 7 mm at anteroposterior mid-length

Description of ambiguously identified elements associated with ZIN PH 3/250.

Two elements of uncertain nature are preserved in ZIN PH 3/250 (Fig. S1A–K). The shallow concavities present on the surfaces of these elements, giving them a slightly 8-shaped outline in proximal/distal view, suggests that they could represent rib heads from the posterior dorsal to anterior caudal region of a large ichthyosaur. However, the assumption that the association of bones belonging to a small individual(s) included two fragmentary rib heads of an incomparably larger ichthyosaur is counterintuitive, given that no other skeletal elements of any other large ichthyosaurian were collected from the locality of ZIN PH 3/250.

An alternative and more likely interpretation is that these elements represent proximal portions of propodial bones. If this interpretation is correct, the similar size and highly similar shape of the elements in question indicate that these are both either humeri, or femora, and both from the same side of the body, thus demonstrating that specimen ZIN PH 3/250 includes bones of at least two individuals. The outline of these propodials in proximal view is strikingly similar to what Motani (1999b) described as humeral 'Morphotype 3' present in parvipelvians. A small, but well-pronounced process originates close to what is likely the posterior part of the dorsoproximal surface of the bone and is obliquely oriented (Fig. S1A, G). In neoichthyosaurians, such a process, also originating close to the posterior surface and directed anterodistally, is termed the trochanter dorsalis (or dorsal process) (e.g. Johnson 1979). The dorsal process is considered non-homologous with any humeral structure present in more basal ichthyosaurians except toretocnemids, which also possess a dorsal process (Motani 1999b; Yang *et al.* 2013; Fig. S1L). A less pronounced process, located closer to the opposite side (likely the anterior part of the ventroroproximal surface) of the presumed propodials, in this regard, is consistent with the deltopectoral crest (Fig. S1B, C). In neoichthyosaurians, the deltopectoral crest, compared to the trochanter dorsalis, is similarly oriented parallel to the proximodistal axis, and located close to the anterior surface of the humerus (Motani 1999b). Both the anterior and posterior surfaces of the presumed propodials of ZIN PH 3/250 are gently convex and the proximal end is slightly 8-shaped in outline, resembling the humeri of e.g. *Stenopterygius* (e.g. Johnson 1979, fig. 14f) and *Ichthyosaurus* (e.g. Motani, 1999b, fig. 2C). In the majority of non-parvipelvian ichthyosaurians, as well as in some basal parvipelvians, the humeri have an anterior flange (Fig. 9L), and their posterior flanges are markedly dorsoventrally compressed, forming a sharp posterior margin (see e.g. Motani 1999b; McGowan & Motani 2003). Judging from the cross-sections, the shaft (Fig. S1F) of the likely propodial elements of ZIN PH 3/250 was very slender, unlike in any other Triassic ichthyosaurian, perhaps except *Hudsonelpidia*, but a direct comparison is difficult because the only known humeri of *Hudsonelpidia* are preserved as parasagittal sections (Fig. S1M; McGowan 1995). The irregularly pitted, likely proximal surface of the presumed propodials is demarcated by a well-developed ridge, extending along the entire circumference of the bones, similar to that present in some parvipelvians (Fig. S1N). Furthermore, the likely anterior portion of the proximal surface of the presumed propodial forms an obtuse angle with its posterior portion (Fig. S1A, C, G, I), a condition also present in parvipelvian humeri (e.g. *Ichthyosaurus* [Motani, 1999b, fig. 2F, I]; *Stenopterygius* [Johnson 1979, fig. 14a, b]). In contrast, Triassic ichthyosaurian rib heads form a gently convex or approximately flat articular surfaces, that are not demarcated from the rest of the bone by a well-developed ridge (Fig. 2Q–Z; *Shonisaurus sikanniensis*, TMP 94.378.2 [ASW pers. obs. April 2015]; *Besanosaurus leptorhynchus*, PIMUZ T 4376 [ASW pers. obs. March 2016]; *Macgowania janiceps*, TMP 2009.121.1 [ASW pers. obs. April 2015]).

When compared to ichthyosaurian femora, the outline of these propodials in proximal view is markedly different from that in all hitherto described taxa (e.g. Merriam 1908; Camp 1980; Maxwell *et al.* 2012). However, the slenderness of the shaft in these propodials is similar to the condition observed in a number of ichthyosaurian femora from the Triassic (e.g. Merriam 1903, 1908; Camp 1980; Nicholls & Manabe 2001; Maxwell *et al.* 2012; Yang *et al.* 2013). In case the propodials of ZIN PH 3/250 actually represent femora, the more pronounced process should be interpreted as the ventral process, as the ventral process is commonly better developed than the dorsal process in femora of Triassic and Early Jurassic taxa (Maxwell *et al.* 2012). However, given the present state of knowledge of the anatomy of propodial elements in ichthyosaurians, humeral attribution of these propodials seems more plausible. Unfortunately, only the two-dimensional anatomy of the propodials of toretocnemids and early-diverging parvipelvians is currently known due to the lack of well-preserved, three-dimensional fossils, which hinders detailed comparisons. Because we were not able to confidently identify the elements in question as either rib heads or proximal parts of propodials, we exclude them from the hypodigm of *A. incognita*.

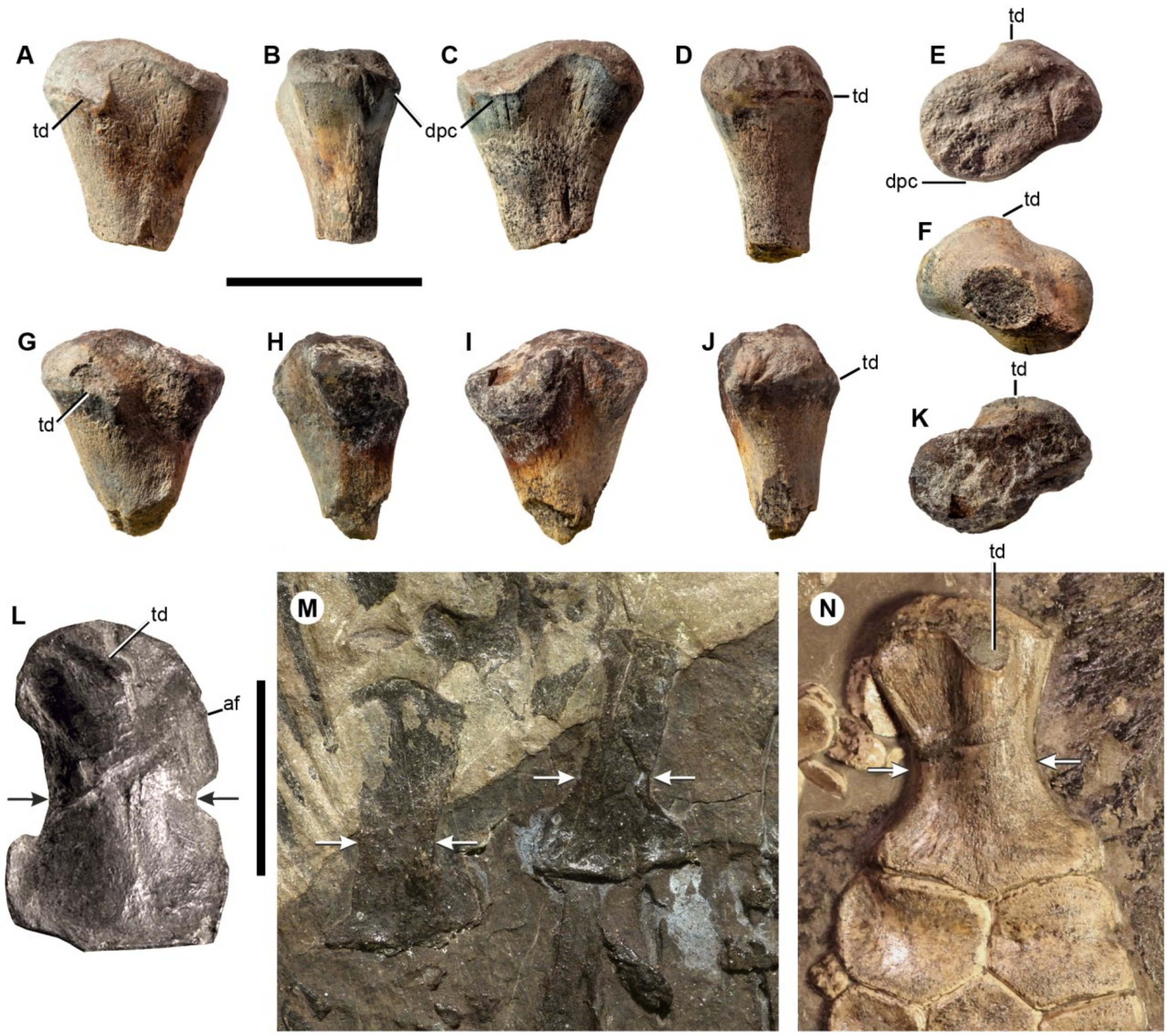

Fig. S1. Elements under question (A–K) interpreted as propodial bones in comparison with humeri of the toretocnemid *Qianichthyosaurus xingyiensis* (L), modified from Jiang *et al*. (2020), and parvipelvians *Hudsonelpidia brevirostris* (holotype ROM 41993) (M) and *Stenopterygius quadriscissus* (specimen MB R 4008) (N). Views are: dorsal (A, G, L, N), anterior (B, H), ventral (C, I), posterior (D, J), proximal (E, K) and distal (cross-sectional, F). Abbreviations: af, anterior flange; dpc, deltopectoral crest; td, trochanter dorsalis; MB, Museum für Naturkunde, Berlin, Germany. Arrows indicate the narrowest region of the humeral shaft. Scale bars represent 3 cm.

Table S2. Global record of Carnian and Norian ichthyosaurs

Locality	**Locality No**	**Litostratigraphic unit, age**	**Taxa**	**Reference**
Shasta County, California, USA	1	Hosselkus Limestone, Carnian	***Toretocnemus californicus*; *T. zitteli*; *Californosaurus perrini*; *Shastasaurus pacificus;* *Shonisaurus* sp.**	Merriam 1895, 1902, 1903, 1908; Motani 1999a
Shoshone Mts. and Pilot Mt., Nevada, USA	2	Luning Formation, shaly limestone member, late Carnian	***Shonisaurus popularis***	Camp 1976, 1980; McGowan & Motani 1999
El Antimonio district, Sonora, Mexico	3	upper Carnian interval of the Antimonio Formation	***Toretocnemus* sp.; *Shonisaurus* sp.**	Callaway & Massare 1989b; Lucas & González-León 1995; Lucas 2002; Motani 1999a
Hopen, Svalbard	4	? De Geerdalen Formation, Carnian–early Norian	"remains of a large ichthyosaur"	Cox & Smith 1973
Mt. Potts, mid-Canterbury, New Zealand	5	Tories se Supergroup, Daonella Zone; early Carnian	Ichthyosauria indet. including a gigantic ?shastasaurid	Fordyce 1982; Fleming et al. 1971; Campbell 1965; Zammit 2010
Otamita Stream, Hokonui Hills, Southland, New Zealand	6	Mandeville Sandstone, upper Carnian	?Shastasauridae	Fordyce 1982; Fleming et al. 1971; Campbell 1965
Kiritehere coast, New Zealand	7	upper Carnian to lower Norian	Ichthyosauria indet.	Sachs & Grant-Mackie 2003
Roaring Bay, South Otago, New Zealand	8	Carnian	Ichthyosauria indet.	Zammit 2010
Omolon Massif, Russian Far East	9	Carnian	indeterminate large and gigantic ?shastasaurids	Ochev & Polubotko, 1964; Polubotko & Ochev 1972
Carinthia, Austria	10	*Cardita*-Schichten, Carnian	large shastasaurid "*Shastasaurus carinthiacus*"	Huene 1925
Rifugio Dibona, Tofane, Veneto Region, Italy	11	Dürrenstein Fm, earliest Tuvalian base of the late Carnian	large shastasaurid cf. *Shonisaurus*	Dalla Vecchia & Avanzini 2002
Sicily, Italy	12	Mufara Fm, upper Carnian, Tuvalian substage	small Ichthyosauria indet.	Dal Sasso et al. 2014

Manzanera, Teruel, Spain	13	Keuper levels, Carnian	Ichthyosauria indet.	de Miguel Chaves et al. 2015
Guanling area, Guizhou Province, People's Republic of China	14	Xiaowa Formation (also known as the Wayao Member of the Falang Fm. or as the Wayao Fm.), lower Carnian	***Qianichthyosaurus zhoui*; '*Callawayia*' *wolonggangense*; *Ghuizhouichthyosaurus tangae*; *Typicusichthyosaurus tsaihuae*** (species inquirenda); ***Guanlingsaurus liangae***	e.g. Li 1999; Yin et al. 2000; Wang et al. 2006; Chen et al., 2007; Ji et al. 2016
New Siberian Islands		lower Carnian	**Euichthyosauria indet.** (small); **Ichthyosauria indet**. (medium); **Shastasauridae indet.** (large)	herein
Xixabangma Feng, Dingri district and Qomolangma Feng (Mt. Everest) region, Nyanang, Xizang (Tibet), China	15	Langjiexue Group, Norian	*Himalayasaurus tibetensis*; *Tibetosaurus tingjiensis* (possible synonym of the former)	Dong 1972, 1980; Yang et al. 1982; Motani et al. 1999; Li 2006
New Caledonia	16	Ouamoui Formation and Leprédour Shellbeds (early Norian)	Ichthyosauria indet.; ? cf. *Shonisaurus* sp.	Campbell 1984; Mazin 1985; Zammit 2010
Igandzhi River basin (Arman' River tributary), Russian Far East	17	Norian	Ichthyosauria indet.	Riabinin 1946
Burgagchan River, (Korkodon River tributary), Russian Far East	18	lower Norian	Ichthyosauria indet.	Ochev & Polubotko 1964
Omolon River basin, Russian Far East	19	upper Norian–Rhaetian	Ichthyosauria indet.	Ochev & Polubotko 1964
Hidden Creek, Wrangell Mts., Alaska, USA	20	Nizina Limestone, Norian	Indet. small ichthyosaur	Callaway & Massare 1989a
Western Brooks Range of Alaska, USA	21	Otuk limestone member, late Norian	Large ?shastasaurid	Tailleur et al. 1983; Druckenmiller et al., 2014
Wallowa Mountains of	22	Martin Bridge Limestone, Norian	*Shastasaurus* sp.	Orr & Katsura 1985; Orr 1986

north-eastern Oregon, USA				
Varney Bay area, Rupert Inlet, Vancouver Is., British Columbia, Canada	23	Quatsino Formation, Norian	Ichthyosauria indet.	Callaway & Massare 1989a with a ref. to W. Orr & G. Stanley pers. comm. 1988
Several localities in northeastern British Columbia, Canada	24	Pardonet Formation, Norian	***Hudsonelpidia brevirostris***; ***Macgowania janiceps***; ***Callawayia neoscapularis***; ***Shonisaurus sikanniensis***	McGowan 1994, 1995, 1996, 1997; Nicholls & Manabe 2001, 2004; Henderson 2015
Lahnewiesgraben near Garmisch-Partenkirchen, Bavaria, Germany	25	Kössen Formation, Hochalm Member, upper Norian	Large shastasaurid	Karl et al. 2014
Graubünden Canton and National Park region, Switzerland	26	Kössen Formation, Norian to Rhaetian	Large shastasaurid	Callaway & Massare 1989a
Hound Island, southeastern Alaska, USA	27	Hound Island Volcanics, *Epigondolella postera* Conodont Zone, middle Norian	*Shonisaurus* sp. cf. *Macgowania* cf. *Hudsonelpidia*	Adams 2009
New Siberian Islands		Lower and ?middle Norian	***Auroraborealia incognita gen. et sp. nov.*** (small); Euichthyosauria indet. (medium); Ichthyosauria indet (medium); **Shastasauridae indet.** (large)	herein

Additional references

Adams, T.L. 2009. Deposition and taphonomy of the Hound Island Late Triassic vertebrate fauna: Fossil preservation within subaqueous gravity flows. *Palaios* **24**, 603–15.

Callaway, J. & Massare, J. 1989a. Geographic and stratigraphic distribution of the Triassic Ichthyosauria (Reptilia: Diapsida). *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen* **178**, 37–58.

Callaway, J. & Massare, J. 1989b. *Shastasaurus altispinus* (Ichthyosauria, Shastasauridae) from the Upper Triassic of the El Antimonio district, Northwestern Sonora, Mexico. *Journal of Paleontology* **63,** 930–39.

Camp, C. L. 1976. Vorlaufige Mitteilung über große Ichthyosaurier aus der oberen Trias von Nevada. *Österreichische Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Klasse, Sitzungsberichte, Abteilung I* **185**, 125–34.

Camp, C. L. 1980. Large ichthyosaurs from the Upper Triassic of Nevada. *Palaeontographica* **170**, 139–200.

Campbell, J. 1965. New Zealand Triassic saurians. *New Zealand Journal of Geology and Geophysics* **8**, 505–9.

Campbell, H. J. 1984. New records and taxa of Permian and Triassic fossils from New Caledonia and New Zealand. *Alcheringa* **8**, 151–67.

Chen, X., Cheng, L. & Sander, P. M. 2007. A new species of *Callawayia* (Reptilia: Ichthyosauria) from the Late Triassic in Guanling, Guizhou. *Geology in China* **34,** 974–82.

Cox, C. B. & Smith, D. G. 1973. A review of the Triassic vertebrate faunas of Svalbard. *Geological Magazine* **110**, 405–18.

Dal Sasso, C., Insacco, G., Chiarenza, A.A., di Franco, D., Reitano, A. 2014. First record of ichthyosaurs in Sicily (Upper Triassic of Monte Scalpello, Catania Province). *Rivista Italiana di Paleontolgia e Stratigraphia* **120**, 71–82.

Dalla Vecchia, F. M. & Avanzini, M. 2002 New findings of isolated remains of Triassic reptiles from Northeastern Italy. *Bollettino della Societa Paleontologica Italiana* **41**(2-3), 215–35.

de Miguel Chaves, C., Pérez-García, A, Cobos, A, Royo-Torres, R, Ortega, F., Alcalá, L. 2015. A diverse Late Triassic tetrapod fauna from Manzanera (Teruel, Spain). *Geobios* 48, 479–90.

Dong, Z. M. 1972. [An ichthyosaur fossil from the Qomolangma Feng region]. *In* Yang, Z.-J. & Dong, Z.-M. (eds) [*Aquatic reptiles from the Triassic of China*]. 7–10. Peking: Academia Sinica, Institute of Vertebrate Paleontology and Paleoanthropology. [in Chinese].

Dong, Z. M. 1980. The distribution of Triassic marine reptiles in China. *In* Gaetani, M. (ed) *Contributions to the Triassic stratigraphy.* Rivista Italiana di Paleontologia e Stratigrafia **85,** 1231–8.

Druckenmiller,P. S., Kelley, N., Whalen, M. T., Mcroberts, C. & Carter, J.G. 2014. An Upper Triassic (Norian) ichthyosaur (Reptilia, Ichthyopterygia) from northern Alaska and dietary insight based on gut contents. *Journal of Vertebrate Paleontology* **34**(6), 1460–65.

Fleming, C. A., Gregg, D. R. & Welles, S. P. 1971. New Zealand ichthyosaurs - a summary, including new records from the Cretaceous. . *New Zealand Journal of Geology and Geophysics* **14**, 734–41.

Fordyce, R. E. 1982. The fossil vertebrate record of New Zealand. *New Zealand Journal of Geology and Geophysics* **14**, 630–98.

Henderson, D. M. 2015. A new, nearly three-dimensional specimen of the skull and anterior body of the Late Triassic ichthyosaur *Macgowania janiceps* (McGowan 1996) from northeastern British Columbia, Canada. *In* Bininda-Emonds, O. R. P., Powell, G. L., Jamniczky, H. A., Bauer, A. M. & Theodor, J. (eds) *All Animals are Interesting: A Festschrift in Honour of Anthony P. Russell*. 121–49. Oldenburg, Germany: BIS Verlag.

Huene, F. von. 1925. *Shastasaurus*- Reste in der alpinen Trias. Centralblatt für Mineralogie, Geologie und Paläontologie (B) 1925, 412–17.

Ji, C., Jiang, D.-Y., Motani, R., Rieppel, O., Hao, W. & Sun, Z.-Y. 2016. Phylogeny of the Ichthyopterygia incorporating recent discoveries from South China. *Journal of Vertebrate Paleontology* **36**, e1025956.

Johnson, R. 1979. The osteology of the pectoral complex of *Stenopterygius* Jaekel (Reptilia: Ichthyosauria). *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen* **159**, 41–86.

Karl H.-V., Arp G. Siedersbeck E & Reitner J. 2014. A large ichthyosaur vertebra from the lower Kössen Formation (Upper Norian) of the Lahnewiesgraben near Garmisch-Partenkirchen, Germany. *Göttingen Contributions to Geosciences* **77**, 191–7.

Li, C. 1999. Ichthyosaur from Guizhou, China. *China Science Bulletin* **44**(14), 1329–33.

Li, J.-L. 2006. A brief summary of the Triassic marine reptiles of China. *Vertebrata PalAsiatica* **1**, 99–108.

Lucas, S. G. 2002. *Toretocnemus*, a Late Triassic ichthyosaur from California, U.S.A. and Sonora, Mexico. *New Mexico Museum of Natural History and Science Bulletin* **21**, 275–8.

Lucas, S. G. & González-León, C. M. 1995. Ichthyosaurs from the Upper Triassic of Sonora and the biochronology of Triassic ichthyosaurs. *Geological Society of America, Special Paper* **301**, 17–20.

Maxwell, E. E., Zammit, M. & Druckenmiller, P. S. 2012. Morphology and orientation of the ichthyosaurian femur. *Journal of Vertebrate Paleontology* **32**(5), 1207–11.

Mazin, J. M. 1985. Les Ichthyopterygia du Trias superieur de Nouvelle Caledonie. Implications paleobiogeographiques. Revue de Paléobiologie **4**(2), 177–82.

McGowan, C. 1994. A new species of *Shastasaurus* (Reptilia: Ichthyosauria) from the Triassic of British Columbia. The most complete exemplar of the genus. *Journal of Vertebrate Paleontology* **14**, 168–79.

McGowan, C. 1995. A remarkable small ichthyosaur from the Upper Triassic of British Columbia, representing a new genus and species. *Canadian Journal of Earth Sciences* **32**, 292–303.

McGowan, C. 1996. A new and typically Jurassic ichthyosaur from the Upper Triassic of British Columbia. *Canadian Journal of Earth Sciences* **33**, 24–32.

McGowan, C. 1997. Chapter 3 - A Transitional Ichthyosaur Fauna. *In* Callaway, J. M. & Nicholls E. L. (eds) *Ancient Marine Reptiles*, 61–80. San Diego, California: Academic Press.

McGowan, C. & Motani, R. 1999. A reinterpretation of the Upper Triassic ichthyosaur *Shonisaurus*. *Journal of Vertebrate Paleontology* **19**, 42–9.

Merriam, J. C. 1895. On some Reptilian Remains from the Triassic of Northern California. *American Journal of Science, 2d series* **50**, 55–7.

Merriam, J. C. 1902. Triassic Ichthyopterygia from California and Nevada. *University of California Publications, Bulletin of the Department of Geology* **3**, 63–108.

Merriam, J. C. 1903. New Ichthyosauria from the Upper Triassic of California. *University of California Publications, Bulletin of the Department of Geology* **3**, 249–63.

Merriam, J. C. 1908. Triassic Ichthyosauria, with special reference to the American forms. *Memoirs of the University of California* **1**, 1–196.

Motani, R. 1999a. Phylogeny of the Ichthyopterygia. *Journal of Vertebrate Paleontology* **19**, 473–96.

Motani, R. 1999b. On the evolution and homology of ichthyosaurian forefins. *Journal of Vertebrate Paleontology* **19**, 42–9.

Motani, R., Manabe, M., & Dong, Z.-M. 1999. The status of *Himalayasaurus tibetensis* (Ichthyopterygia). *Paludicola* **2**, 174–81.

Nicholls, E. L. & Manabe, M. 2001. A new genus of ichthyosaur from the Late Triassic Pardonet Formation of British Columbia: Bridging the Triassic-Jurassic gap. *Canadian Journal of Earth Sciences* **38**, 983–1002.

Nicholls, E. L. & Manabe, M. 2004. Giant ichthyosaurs from the Triassic – a new species of Shonisaurus from the Pardonet Formation (Norian: Late Triassic) of British Columbia. *Journal of Vertebrate Palaeontology* **24**, 838–49.

Ochev, V. G. & Polubotko, I. V. 1964. New finds of ichthyosaurs in the northwestern USSR [Novye nakhodki ikhtiozavrov na severo-vostoke SSSR]. Proceedings of higher educational establishments Geology and Exploration **7**, 50–5. [In Russian]

Orr, W. N. 1986. A Norian (Late Triassic) ichthyosaur from the Martin Bridge Limestone, Wallowa Mountains, Oregon. *In* Vallier, T. L. & Brooks, H. C. (eds) *Geology of the Blue Mountains region of Oregon, Idaho, and Washington. U.S. Geological Survey professional paper 1435*. 41–51. Washington: United States Government Printing Office.

Orr, W. N. & Katsura, K. T. 1985. Oregon's oldest vertebrates [Ichthyosauria (Reptilia)]. *Oregon Geology* **47**(7), 75–7.

Polubotko, I. V. & Ochev, V. G. 1972. New finds of ichthyosaurs in the Triassic of the northwestern USSR and some remarks on the conditions of their burial [Novye nakhodki ikhtiozavrov v triase severo-vostoka SSSR i nekotorye zamechaniya ob usloviyakh ikh zakhoroneniya]. *Proceedings of higher educational establishments Geology and Exploration* **3**, 36–42. [In Russian]

Riabinin, A. N. 1946. Pozvonok ikhtiozavra iz verkhnego triasa Kolymskogo kraya. *Priroda* **9**, 57–8.

Sachs, S. & Grant-Mackie, J. A. 2003. An ichthyosaur fragment from the Cretaceous of Northland, New Zealand. *Journal of the Royal Society of New Zealand* **33**, 307–14.

Tailleur, I. L., C. G. Mull, & H. A. Tourtelot. 1973. A skeleton in Triassic rocks in the Brooks Range foothills. *Arctic* **26**, 79–81.

Wang, X., G. H. Bachmann, H. Hagdorn, P. M. Sander, G. Cuny, X. Chen, C. Wang, L. Chen, L. Cheng, F. Meng, and G. Xu. 2008. The Late Triassic black shales of the Guanling area, Guizhou Province, southwest China: a unique marine reptile and pelagic crinoid fossil Lagerst€atte. *Palaeontology* **51**, 27–61.

Yang, C. C., Lru, D. S. & Zhang, M. L. 1982. [Ichthyosauria from Xizang zhong]. *In* [*Monograph on the Mount Xixia Bangma Scientific Expedition, 1964*]. 350–5. Peking: Science Press. [in Chinese]

Yang, P., Ji, C., Jiang, D., Motani, R., Tintori, A., Sun, Y. & Sun, Z. 2013. A new species of *Qianichthyosaurus* (Reptilia: Ichthyosauria) from Xingyi Fauna (Ladinian, Middle Triassic) of Guizhou. *Acta Scientiarum Naturalium Universitatis Pekinensis* **49**, 1002–8.

Yin, G.-Z., Zhou, X.-G., Cao, Z.-T., Yu, Y.-Y. & Luo, Y.-M. 2000. A preliminary study on the early Late Triassic marine reptiles from Guanling, Guizhou Province, China. *Geology-Geochemistry* **28**, 1–25. [in Chinese with English summary]

Zammit, M., 2010. A review of Australasian ichthyosaurs. *Alcheringa* **34**, 281–92.