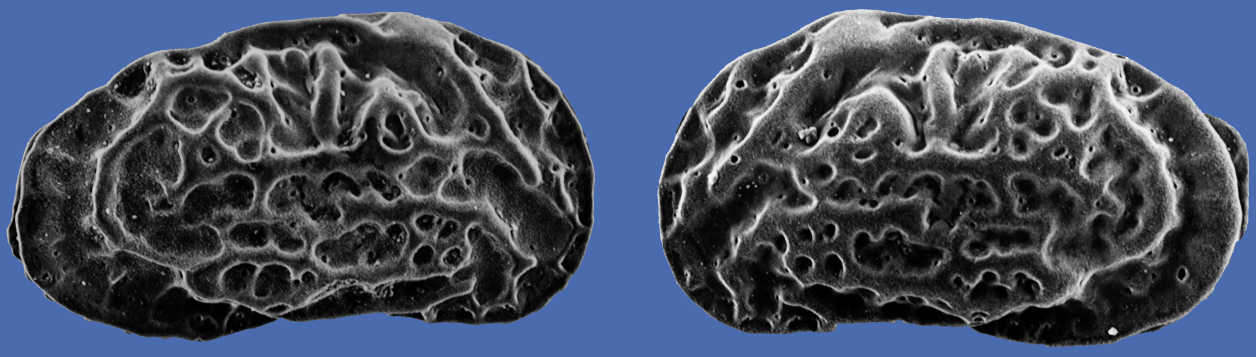
Zitteliana

An International Journal
of Palaeontology and Geobiology

Series A/Reihe A
Mitteilungen der Bayerischen Staatssammlung
für Paläontologie und Geologie

45



München 2005

Zitteliana

An International Journal of Palaeontology and Geobiology

Series A/Reihe A

Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Geologie

45

CONTENTS/INHALT

Zitteliana	A 45	218 Seiten	München, 30.12.2005	ISSN 1612-412X

Bayerische Staatssammlung für Paläontologie und Geologie
Richard-Wagner-Str. 10, D-80333 München, Deutschland
http://www.palaeo.de/zitteliana
email: zitteliana@lrz.uni-muenchen.de

ISSN 1612-412X
Druck: Gebr. Geiselberger GmbH, Altötting

Cover illustration: Ostracod *Callistocythere intricatoides* (Ruggieri, 1953) from the Thyrrenian of Altinova (Turkey). Left: Right valve, external view, BSPG 1980 X 1313 (length 0.640 mm). Right: Left valve, external view, BSPG 1980 X 1314 (length 0.646 mm). SEM Photograph: R. Matzke-Karasz (LMU München, Department für Geo- und Umweltwissenschaften, Sektion Paläontologie)

Umschlagbild: Ostrakode *Callistocythere intricatoides* (Ruggieri, 1953) aus dem Thyrrenium von Altinova (Türkei). Links: Rechte Klappe, Außenansicht, BSPG 1980 X 1313 (Länge 0,640 mm). Rechts: Linke Klappe, Außenansicht, BSPG 1980 X 1314 (Länge 0,646 mm). REM-Foto: R. Matzke-Karasz (LMU München, Department für Geo- und Umweltwissenschaften, Sektion Paläontologie)

Zitteliana	A45	211-213	1 Fig.	München, 30.12.2005	ISSN 1612-412X

Short Communication

Phylogenetic relationships of the Thalattosuchia

By
Inken Juliane Mueller-Töwe*

Institut für Geowissenschaften der Johannes-Gutenberg Universität Mainz, Saarstrasse 21, 55124 Mainz, Germany

Manuscript received June 10, 2005; accepted June 15, 2005.

Key words: Thalattosuchia, relationships, phylogeny

Schlüsselwörter: Thalattosuchia, Verwandschaft, Phylogenese

The Thalattosuchia is a basal clade within the Crocodyliformes, consisting of *Pelagosaurus typus*, the Metriorhynchidea and the Teleosauridea (Benton & Clark 1988; Clark 1994). In this note, the phylogenetic in-group relationships of metriorynchids and teleosaurids as well as their relation to the taxon *Pelagosaurus typus* are presented. Previously, these relationships have only rarely been investigated (Buffetaut 1980, 1982; Vignaud 1995; Westphal 1962), and the present study also provides the first phylogenetic in-group analysis.

The phylogenetic analysis was performed using PAUP 4.0 b10 (Swofford 2003). In total, the matrix consists of the following 29 taxa including two outgroups: *Dakosaurus maximus* (Plieninger, 1846), *Geosaurus giganteus* (Soemmering, 1816), *Geosaurus gracilis* (Meyer, 1830), *Geosaurus suevecicus* (Fraas, 1902), *Geosaurus vignaudi* Frey et al., 2002, *Machimosaurus hugii* Meyer, 1837, *Metriorhynchus superciliosus* (Blainville, 1853), *Metriorhynchus hastifer* (Deslongchamps, 1868), *Metriorhynchus leedsi* Andrews, 1913, *Pelagosaurus typus* Bronn, 1841, *Platysuchus multiscrobiculatus* Berckhemer, 1929, *Steneosaurus baroni* Newton, 1893, *Steneosaurus bollensis* (Jaeger, 1828), *Steneosaurus boutilieri* (Deslongchamps, 1868), *Steneosaurus brevior* (Blake, 1876), *Steneosaurus edwardsi* (Deslongchamps, 1868), *Steneosaurus gracilirostris* Westphal, 1961, *Steneosaurus heberti* Morel de Glasville, 1876, *Steneosaurus leedsi* Andrews, 1909 (including *Myceterosaurus natus* after Vignaud 1995), *Steneosaurus megarhinus* (Hulke, 1871), *Steneosaurus pictaviensis* Vignaud, 1998, *Steneosaurus priscus* (Soemmering, 1814), *Teleidosaurus calvadosi* Deslomgchamps, 1866, *Teleidosaurus gaudryi* Collot, 1905, *Teleosaurus cadomensis* Lamouroux, 1820, *Pholidosaurus* and *Dyrosaurus*. *Protosuchus* and *Gracilisuchus* were entered as outgroups.

In total 189 characters were used in the analysis. The first 136 characters and codings were taken from Clark (1994), Tykoski et al. (2002), and Pol & Norell (2004) but were modified if necessary. Additionally, 53 new, personally defined characters were added. The character states for 21 taxa were determined by personal examination of original material and by data from the literature, whereas the character states for the remaining taxa were derived exclusively from the literature. Due to the large size of the data matrix, the heuristic search option with random stepwise addition and tree-bisection-reconnection (TBR) was used. The strict consensus tree presented here was derived from 37 equally parsimonious trees with a consistency index (CI) of 0.6291 (Fig. 1). All characters were unordered and not weighted, multi-state characters were treated as polymorphism. 37 characters proved to be constant during the analysis, and additionally 37 characters were parsimony-uninformative.

The teleosaurids and the metriorhynchids turned out to be monophyletic sister groups as expected (Benton & Clark 1988; Clark 1994). However, the *Steneosaurus*-taxa within the Teleosauridae turned out to be paraphyletic. *Steneosaurus pictaviensis* repeatedly occurs in a sister-group relationship with *Teleosaurus cadomensis* and partly also with *Steneosaurus megarhinus*. Together with these taxa, it forms a sister group to most other *Steneosaurus* taxa. *Platysuchus multiscrobiculatus* falls mostly with *Teleosaurus cadomensis* and occurs as a sister to the remaining *Steneosaurus* taxa and *Machimosaurus hugii*. The suggestion by Vignaud (1995) that *Platysuchus multiscrobiculatus* should be put in a close relationship with the *Teleosaurus* taxa is therefore partly confirmed in the present investigation. The Liassic taxa *Steneosaurus brevior* and *Steneosaurus gracilirostris* repeatedly occur in a sister-group relationship, which fits well with the stratigraphic background (Yorkshire Lias). *Steneosaurus bollensis* shows variable relationships with the other Liassic *Steneosaurus* taxa, *Steneosaurus brevior* und *Steneosaurus gracilirostris*, but it mostly falls as a sister taxon to *Steneosaurus priscus* from the Tithonian of the Swabian Alb and *Steneosaurus edwardsi* from the French Callovian and Oxfordian. The Late Jurassic taxa *Steneosaurus leedsi* from England and *Steneosaurus heberti* from France constantly occur as sister groups, which again fits well with the stratigraphic background. Within the Teleosauridae, *Machimosaurus hugii* proves to be consistently the sister taxon of all *Steneosaurus* taxa, excluding S*teneosaurus megarhinus* and S*teneosaurus pictaviensis*, which fall with *Teleosaurus cadomensis*.

The monophyly of the genus *Metriorhynchus* within the

*E-mail: muellert@uni-mainz.de

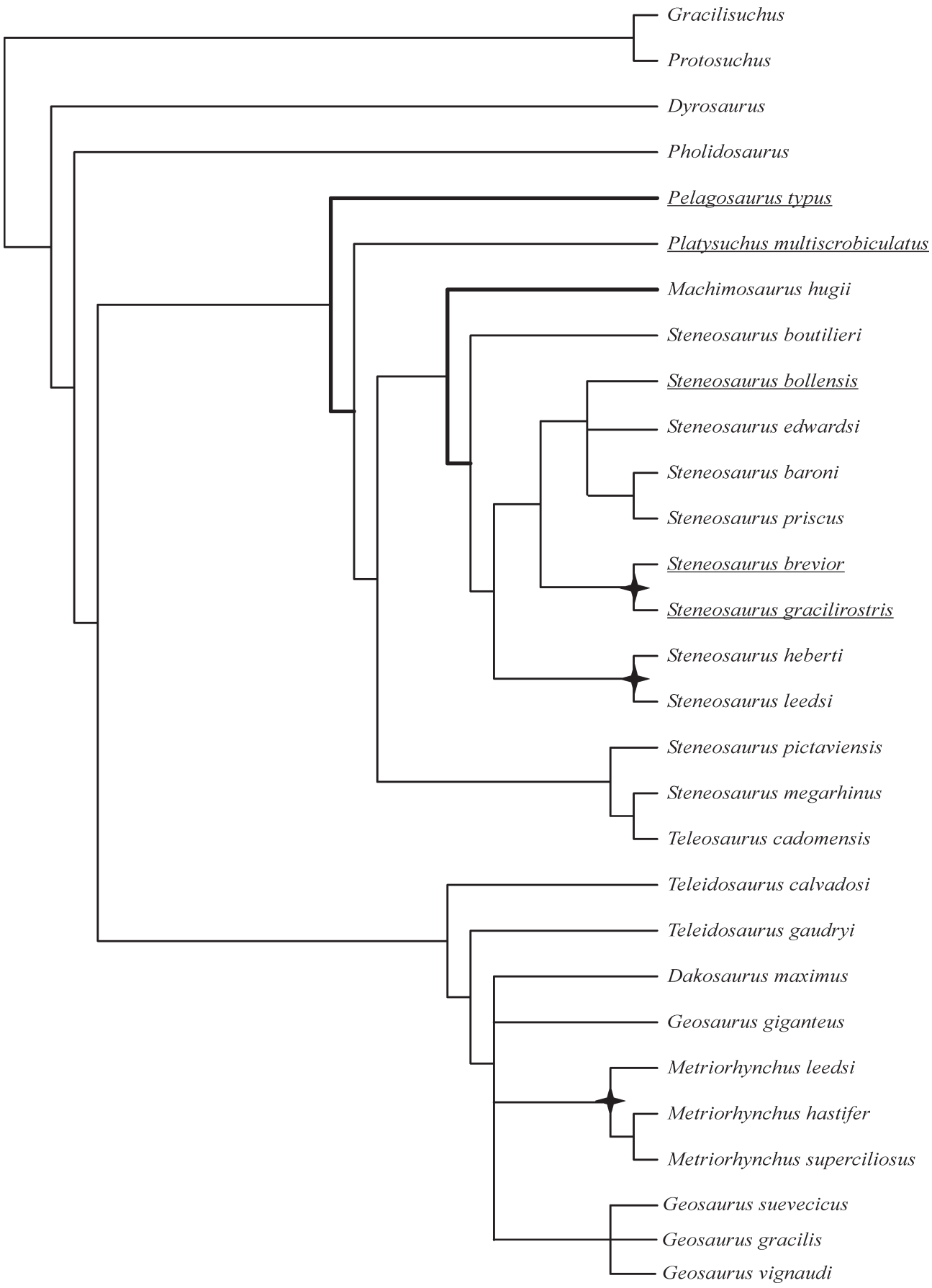


Figure 1: Strict consensus tree of 37 equally parsimonious trees (CI 0.6291). The matrix consists of 29 taxa. In total 189 characters were used in the analysis of which 115 are parsimony-informative. The Liassic taxa are underlined and well-supported relationships are marked either with thickened branches or with an asterisk.

Metriorhynchidae is also confirmed. However, the genus *Geosaurus* turns out to be paraphyletic within the Metriorhynchidae. *Geosaurus giganteus* shows a closer relationship with *Metriorhynchus* and *Dakosaurus* than with *Geosaurus gracilis*, which occurs, together with *Geosaurus giganteus,* in the Kimmeridgian of the Swabian Alb. *Geosaurus gracilis* often turns out as a sister to all remaining *Geosaurus* and *Metriorhynchus* taxa. However, it seems to be more closely related to *Geosaurus vignaudi* and *Geosaurus suevecicus* than to *Geosaurus giganteus*. It never occurs in a sister-group relationship with *Geosaurus giganteus*.

Pelagosaurus typus, which is thought to be basal to the Teleosauridae and the Metriorhynchidae (Benton & Clark 1988; Clark 1994; Buckley et al. 2000), occupies a basal position within the teleosaurids. The assumption by Buffetaut (1980) that *Pelagosaurus typus* is either a close relative of metriorhynchids or a very primitive metriorhynchid itself cannot be confirmed in the present analysis.

Acknowledgments

Thanks for very helpful advice, discussions, and corrections to J. Boy, J. Müller, and M. Fastnacht. Financial support was provided by the Deutsche Forschungsgemeinschaft (DFG project BO 553/13-1).

References

Andrews, C. W. (1909): On some steneosaurs from the Oxford Clay of Peterborough. – Annals and Magazine of Natural History, London **3:** 299-308.

Andrews, C. W. (1913): A Descriptive Catalogue of the Marine Reptiles of the Oxford Clay. Part II; London (British Museum of Natural History), 206 pp.

Benton, M. J. & Clark, J. M. (1988): Archosaur phylogeny and the relationships of the Crocodylia. – In: Benton, M. J. (Ed.), The Phylogeny and Classification of the Tetrapods. Volume 1, Amphibians, Reptiles, Birds. The Systematic Association, Oxford, Special Volume **35A:** 295-338.

Berckhemer, F. (1929): Beitrag zur Kenntnis der Krokodilier des schwäbischen oberen Lias. – Neues Jahrbuch für Mineralogie, Geologie und Paläontologie, Beilagenband **64B:** 1-60.

Bronn, H. G. & Kaupp, J. J. (1841-1843): Abhandlungen über die gavialartigen Formen der Liasformation; Stuttgart (Schweizerbart), 47 pp.

Buckley, G. A., Brochu, C. A., Krause, D. W. & Pol, D. (2000): A pug-nosed crocodyliform from the Late Cretaceous of Madagascar. – Nature, **405:** 941-944.

Buffetaut, E. (1980): Position systématique et phylogénétique du genre *Pelagosaurus* Bronn, 1841 (Crocodylia, Mesosuchia), du Toarcien d'Europe. – Geobios, **13:** 783-786.

Buffetaut, E. (1982): Radiation évolutive, paléoécologie et biogéographie des crocodiliens mésosuchiens. - Mémoires de la Société Géologique de France, **142:** 1-87.

Clark, J. M. (1994): Patterns of evolution in Mesozoic Crocodyliformes. – In: Fraser, N. C. & Sues, H. D. (Eds), In the Shadow of the Dinosaurs; Cambridge (Cambridge University Press), 84-97.

Collot, L. (1905): Reptile jurassique (*Teleidosaurus gaudryi*) trouvé à St-Seine-l'Abbaye (Côte-d'Or). – Mémoires de l'Académie des Sciences, Arts et Belles-Lettres de Dijon, **10:** 41-45.

Eudes-Deslongchamps, J. A. (1866): Description d'une espèce inédite de Téléosaure des environs de Caen, le *Teleosaurus calvadosii*. – Bulletin de la Société Linnéenne de Normandie (Années 1864-65), **10:** 193-223.

Eudes-Deslongchamps, J. A. (1868): Note sur un groupe de Vertèbres et d'écailles rapportées au *Teleosaurus hastifer* et provenant des argiles kimméridgiennes du Cap de la Hève. – Bulletin de la Société Linneene de Normandie (Année 1866), **2:** 146-155.

Eudes-Deslongchamps, J. A. (1864): Mémoire sur les Téléosauriens de l'époque Jurassique du Calvados. – Mémoires de la Société Linnéenne de Normandie, **13:** 1-138.

Eudes-Delongchamps, J. A. & Blainville, H. D. de (1853): Lettres sur les Crocodiles vivants et fossiles. – Mémoires de la Société Linnéenne de Normandie (Années 1849-53), **9:** 103-138.

Fraas, E. (1902): Die Meer-Crocodilier (Thalattosuchia) des oberen Jura unter specieller Berücksichtigung von *Dacosaurus* und *Geosaurus*. – Palaeontographica, **49:** 1-71.

Frey, E., Buchy, M. C., Stinnesbeck, W. & Jose Guadalupe, L. O. (2002): *Geosaurus vignaudi* n. sp. (Crocodiliformes: Thalattosuchia), first evidence of metriorhynchid crocodilians in the Late Jurassic (Tithonian) of central-east Mexico. – Canadian Journal of Earth Science, **39:** 1467-1483.

Hulke, J. W. (1871): Note on a fragment of a teleosaurian snout from Kimmeridge Bay, Dorset. – Quarterly Journal of the Geological Society, **27:** 442-443.

Jaeger, G. F. (1828): Über die Fossile Reptilien, welche in Württemberg aufgefunden worden sind; Stuttgart (Metzler), 43 pp.

Lamouroux, J. V. (1820): Sur le Crocodilien fossile trouvé dans la carrière de Bourg. – Annales Général de la Science de Physique, **3:** 160-163.

Meyer, H. von (1830): Achte Versammlung der Naturforscher und Aerzte zu Heidelberg im September 1829, B, Mineralogische Abteilung, **15:** 517-519.

Morel de Glasville, M. (1876): Sur la cavité crânienne et la position du trou optique dans le *Steneosaurus heberti*. – Bulletin de la Société Géologique de France, sér. 3, **4:** 342-348.

Plieninger, T. (1846): Über ein neues Sauriergenus und die Einreihung der Saurier mit flachen, schneidenden Zähnen in eine Familie. – Jahreshefte des Vereins für Naturkunde Württemberg, **2:** 148-154.

Pol, D. & Norell M. A. (2004): A new crocodyliform from Zos Canyon, Mongolia. – American Museum Novitates, **3445:** 1-36.

Soemmering, S. T. (1814): Über den *Crocodilus priscus* oder über ein in Baiern versteint gefundenes Krokodil, Gavial der Vorwelt. – Denkschriften der Kaiserlichen Akademie der Wissenschaften München, **5:** 9-82.

Swofford, D. L. (2003): Phylogenetic Analysis Using Parsimony*4.0b10; Sunderland (Sinauer Associates Inc.).

Tate, R. & Blake, J. F. (1876): The Yorkshire Lias; London (John van Voorst), xxiii + 474 pp.

Tykoski, R. S., Rowe, T. B., Ketcham, R. A. & Colbert, M. W. (2002): *Calsoyasuchus valliceps*, a new crocodyliform from the Early Jurassic Kayenta Formation of Arizona. –Journal of Vertebrate Paleontology, **22:** 593-611.

Vignaud, P. (1995): Les Thalattosuchia, crocodiles marins du Mésozoique: Systématique phylogénétique, paléoécologie, biochronologie et implications paléogéographiques. – Thèse de l'Université de Poitiers (unpublished), 410 pp.

Vignaud, P. (1998): Une novelle especе de *Steneosaurus* (Thalattosuchia, Teleosauridae) dans le Callovien du Poitou (France) et la systematique des *Steneosaurus* longirostres du Jurassique Moyen d'Europe occidental. – Palaeovertebrata, **27:** 19-44.

Westphal, F. (1961): Zur Systematik der deutschen und englischen Lias Krokodilier. – Neues Jahrbuch. für Geologie und Paläontologie, Abhandlungen **113:** 207-218.

Westphal, F. (1962): Die Krokodilier des deutschen und englischen oberen Lias. – Palaeontographica, **A118:** 23-118