Rivista Italiana di Paleontologia e Stratigrafia	volume 114	no. 2	pp. 323-326	July 2008

SHORT NOTE – NOTA BREVE

FIRST RECORD OF A FOSSIL AMPHIBIAN IN SLOVENIA (LOWER TRIASSIC, OLENEKIAN)

SPENCER G. LUCAS [1], TEA KOLAR-JURKOVŠEK [2] & BOGDAN JURKOVŠEK [2]

Received: January 29, 2008; accepted: March 17, 2008

Key words: Amphibia, Lower Triassic, Taxonomy, Julian Alps, Slovenia.

Abstract. The first record of a fossil amphibian in Slovenia is a fragment of a rib. It was collected in the Lower Triassic of the Julian Alps, at the Studorski preval area. The carbonate succession of the Lower Triassic at Studorski preval is characterized by alternations of dolomite, limestone, marly limestone and marlstone with particular beds of oolitic limestone. The macrofauna found at the site indicates an Olenekian age. The bone fragment is a rod-like element with an expanded, complete articular end and a broken, narrow shaft with a finely pitted to radial surface texture. It is identified as the proximal portion of a rib of a temnospondyl amphibian, possibly of a capitosaur. The presence of an isolated temnospondyl bone in Lower Triassic strata in Slovenia is consistent with previous records of temnospondyls in marine Lower Triassic strata.

Riassunto. Il primo ritrovamento di anfibi fossili in Slovenia é costituito da un frammento di costola. È stato raccolto nel Triassico inferiore delle Alpi Giulie, nell'area di Studorski preval. La successione carbonatica a Studorski preval é caratterizzata da un'alternanza di dolomie, calcari, calcari marnosi e marne, con alcuni strati di calcari oolitici. La macrofauna che lo accompagna indica un'età Olenekiana. Il frammento osseo è un elemento a bastoncino con una terminazione articolare espansa e completa, ed una porzione allungata sottile e spezzata, con tessitura superficiale da finemente incavata a radiale. Viene identificata come la porzione prossimale di una costola di anfibio temnospondylo, forse di un capitosauro. La presenza di un osso isolato di temnospondylo nel Triassico inferiore della Slovenia è in accordo con precedenti ritrovamenti di temnospondyli in sedimenti marini del Triassico inferiore.

Introduction

The Julian Alps constitute the greater part of northwestern Slovenia and are part of the Southern Alps with characteristic thrust structures. The largest overthrust unit in the Slovenian part of the Julian Alps is represented by the Julian Alps Overthrust (Jurkovšek 1987 a,b) or Julian Nappe (Placer 1999), which forms strata ranging from Early Triassic through Cretaceous, though its major part is made up of Upper Triassic carbonates. Lower Triassic strata are scattered in narrow disconnected belts or patches in the wider Julian Alps area. They occur within smaller tectonic slices, and their footwall is not visible at any place. They are usually concordantly overlain by Anisian carbonates.

The amphibian bone documented here was collected during field work by Tea Kolar-Jurkovšek in August 2004 in the Lower Triassic strata that rest in the uppermost slice of the Julian Alps Overthrust situated southeast of Triglav Mt. (2863 m), the highest Slovenian peak, in the area of Studorski preval (1892 m) (Fig. 1). The lower part of these strata is in tectonic contact with the Norian – Rhaetian Dachstein limestone, whereas upwards they pass continuously into Anisian limestone and dolomite.

In the Lower Triassic of the Studorski preval there are mostly alternations of dolomite, limestone, marly limestone and marlstone with particular beds of oolitic limestone. A relatively very narrow rock belt that is exposed at the Studorski preval is marked by characteristic Lower Triassic macrofauna dominated by *Natiria costata, Turbo rectecostatus, Gervillia* sp. and poorly preserved ammonoids of the genus *Tirolites*. Conodont samples failed to be productive. The fossil

1 New Mexico Museum of Natural History and Science, 1801 Mountain Road N.W. Albuquerque, New Mexico 87104, U.S.A., E-mail: spencer.lucas@state.nm.us

2 Geološki zavod Slovenije, Dimiceva ulica 14, 1000 Ljubljana, Slovenia. E-mail: tea.kolar@geo-zs.si, bogdan.jurkovsek@geo-zs.si

Fig. 1 - Location of the Lower Triassic amphibian find at Studorski preval in the Julian Alps (Slovenia).

bone was collected in the secondary place in the highest point of the Studorski preval in a block of olive gray micritic limestone.

This paleontological evidence represents the first occurrence of a fossil amphibian in Slovenia. Other records of fossil amphibians in marine Triassic strata in the Alpine region are from the Middle and Upper Triassic of Austria (Stur 1873; Koken 1913; Sander & Meyer 1991).

Material and methods

The fossil bone (Fig. 2) was mechanically prepared with hand tools to remove it from the limestone matrix. It was photographed with a Canon EOS digital camera, and the photos were cropped, arranged and labelled with Adobe Photoshop. Repository of the specimen: Paleontological Collection Jurkovšek, Kamnica 27, Dol pri Ljubljani, Slovenia, that has been registered with the Natural History Museum of Slovenia, Ljubljana, abbreviated BJ.

Description

BJ 2479 is a small (~ 43 mm long) broken piece of bone that we identify as the proximal portion of a rib of a temnospondyl amphibian (cf. Nilsson 1943, figs. 13-14; Howie 1970, text-fig. 13; Schoch & Milner 2000, esp. figs. 11, 14; Sulej 2007, figs. 38-39) (Figs 2-3). The bone is a rod-like element with an expanded, complete articular end and a broken, narrow shaft. The bone surface has a finely pitted to radial surface texture.

The complete, proximal articular end of this bone is a trapezoid-shaped flange in antero-dorsal or postero-ventral views. The proximal end is flattened in the dorso-ventral plane so that the articular end is very thin, and it is also slightly concave proximally. Two articular surfaces meet each other at an obtuse angle, the shorter one identified by us as the capitulum and the longer one as the tuberculum. On the dorsal aspect, a low swelling (ridge) of bone marks the division between the two articular surfaces. Maximum width of the proximal end is 24.9 mm, whereas the minimum width (in the dorso-ventral plane) is only 7.8 mm.

The shaft of the bone is incomplete and has an oval to trihedral cross section. The entire shaft is concave anteriorly. A thin and slightly convex flange of bone on the posterior edge of the bone well distal to the articular end is identified by us as the proximal uncinate process.

The most likely candidates for a temnospondyl bone from the Early Triassic are capitosaurs and trematosaurs. Indeed, the size and shape of BJ 2479 closely match the proximal portion of the dorsal and sacral ribs of a capitosaurid amphibian such as *Parotosuchus* (Howie 1970, text-fig. 13). The possibility that this bone is an anterior caudal rib of a capitosaur also cannot be discounted. The bone differs from the sacral ribs of trematosaurs because they have more tubular shafts, less pronounced articular ends and more pronounced uncinate processes (e.g., Nilsson 1943; Dutuit 1976). It seems likely, then, that BJ 2479 belongs to a capitosaur, so we tentatively refer it as cf. Capitosauridae.

Occurrences of Lower Triassic amphibians

Records of temnospondyl amphibians in Lower Triassic marine rocks are common in Greenland, Spitzbergen (Svalbard) and Madagascar (see review by Lucas & Heckert 2000) (Fig. 4). These are mostly records of trematosaurs, which are believed to have been euryhaline and thus autochthonous to shallow marine deposits.

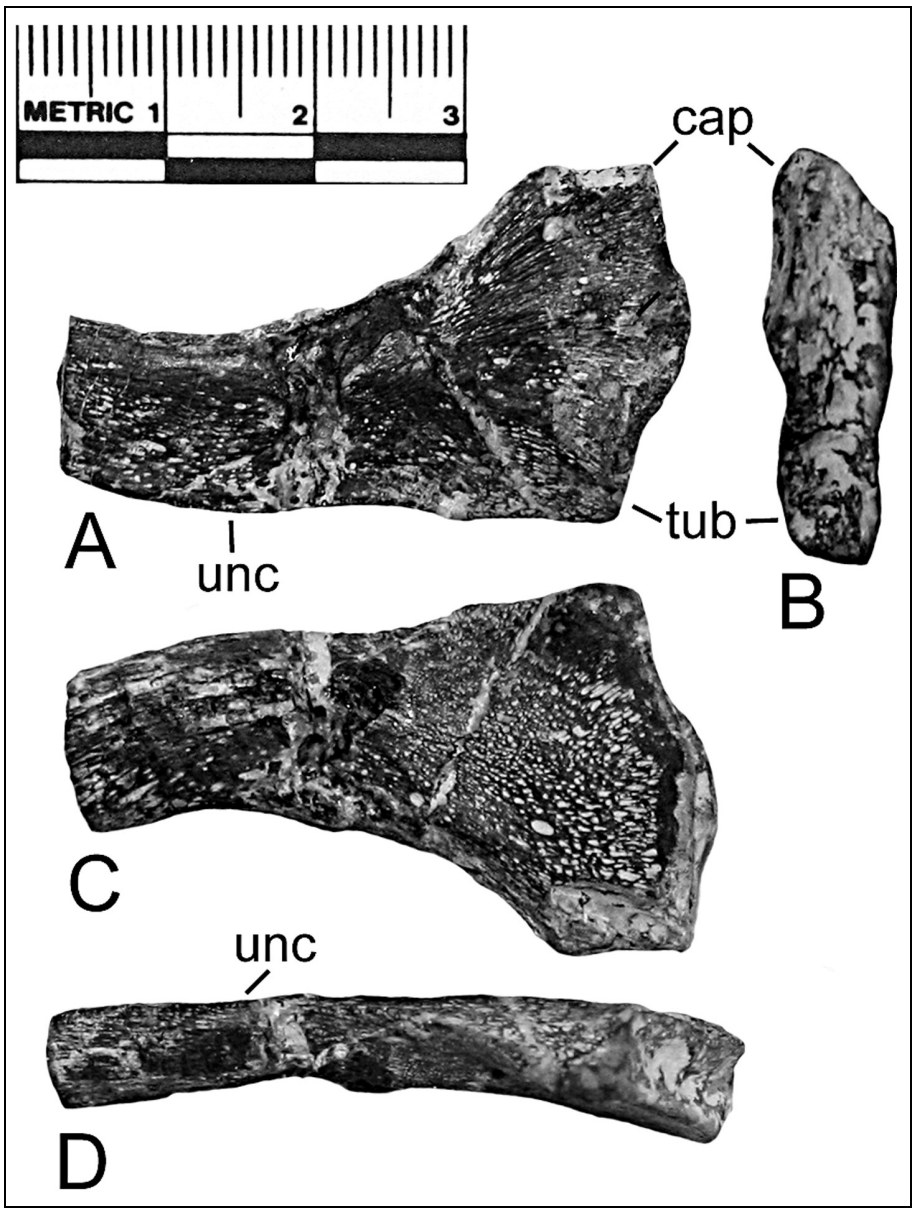

Fig. 2 - Incomplete rib of a temnospondyl amphibian (cf. Capitosauridae) from Slovenia, BJ 2479, in dorsal (A), proximal (B), ventral (C) and posterior (D) views. Abbreviations are: cap = capitellum, tub = tuberculum, unc = uncinate process.

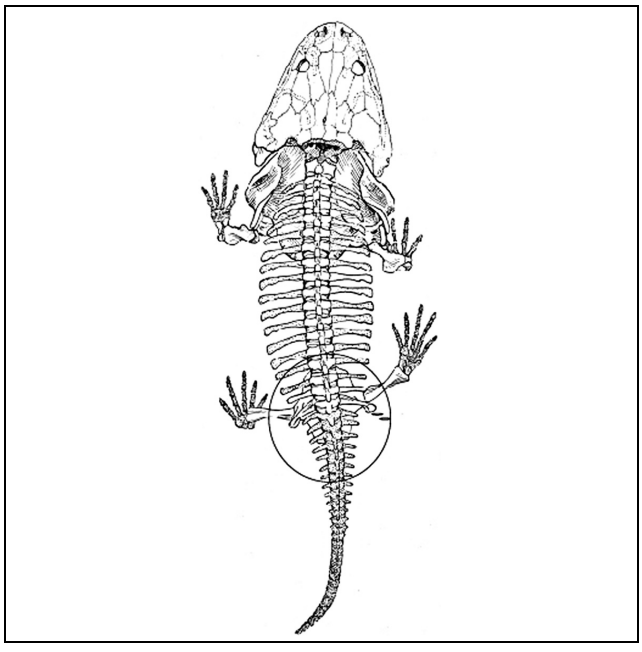

Fig. 3 - Skeleton of a temnospondyl (a metoposaur, from Sawin). The bone from Slovenia is from one of the ribs in the sacral-caudal region (circled).

However, there are Early Triassic marine records of what are perceived to have been purely freshwater amphibians, including a record in the Mangyshlak Peninsula of western Kazakhstan of the temnospondyl *Parotosuchus* in marine Olenekian strata (Lozovsky & Shishkin 1974). Thus, the presence of an isolated temnospondyl bone, possibly of a capitosaur, in Lower Triassic strata in Slovenia is consistent with previous records of temnospondyls in marine Lower Triassic strata.

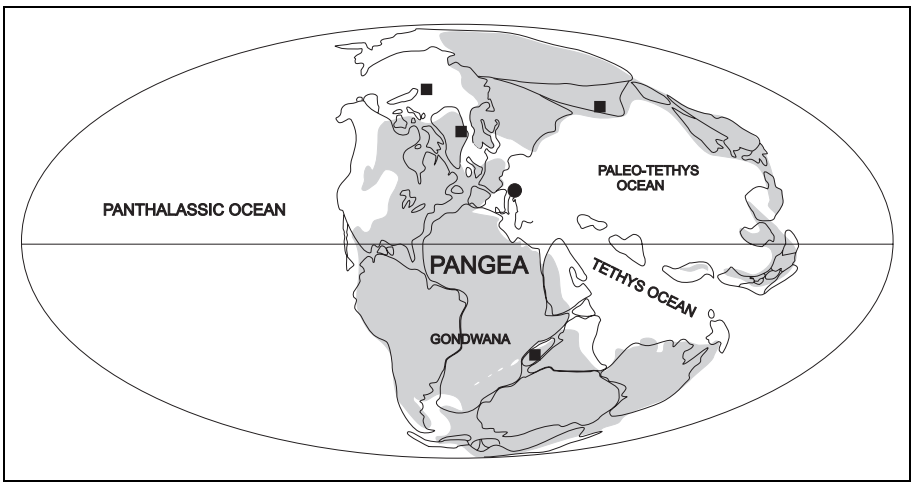

Fig. 4 - Palaeogeographic map for the Early Triassic, modified from Scotese (2001). Black dot indicates position of the Julian Alps on the world map, and black boxes indicate other occurrences of temnosopondyl amphibians in marine Lower Triassic rocks. Ancient landmasses are marked grey.

Acknowledgements. The study was partly supported by the Slovenian Research Agency (programme number P1-0011 and project number J1-9465). This is contribution to the IGCP-Project 467. We are grateful to Maurizio Gaetani and Ralf Werneburg for helpful comments on the manuscript.

REFERENCES

Dutuit J.-M. (1976) - Introduction à l'étude paléontologique du Trias continental Marocain. Description des premiers stegocephales recueillis dans le couloir d'Argana (Atlas Occidental). *Mém. Mus. Nat. Hist. Nat.,* Nouvelle Série 336: 1-253, Paris.

Howie A. A. (1970) - A new capitosaurid labyrinthodont from East Africa. *Palaeontology,* 13: 210-253, London.

Jurkovšek B. (1987a) - Osnovna geološka karta SFRJ 1:100.000. List Beljak in Pontebba / Basic Geological Map of SFR Yugoslavia, Sheet Beljak and Pontebba, 1:100.000. *Zvezni geološki zavod, Beograd* (in Slovenian), Beograd.

Jurkovšek B. (1987b) - Tolmac za list Beljak in Pontebba. Osnovna geološka karta SFRJ 1:100.000 / Explanatory book, sheet Beljak and Pontebba L 33-51 L 33.52. Basic Geological Map of SFR Yugoslavia 1:100.000. *Zvezni geološki zavod, Beograd,* 1-58 (in Slovenian with English summary), Beograd.

Koken E. (1913) - Beiträge zur Kenntnis der Schichten von Heilgenkreuz (Abteitel, Sudtirol). *Abh. Kaiserlich-Königlichen Geol. Reich.*, 15: 1-43, Wien.

Lozovsky V. R. & Shishkin M. A. (1974) - Pervaya nakhodka labirintodontov v nizhnem Triase Mangyshlaka [First discovery of a labyrinthodont in the Lower Triassic of Mangylshlak]. *Doklady Akademii Nauk SSSR,* 214: 169-172, Moskva.

Lucas S. G. & Heckert A. B. (2000) - Biochronological significance of Triassic nonmarine tetrapod records from marine strata. *Albertiana,* 24: 27-32, Utrecht.

Nilsson T. (1943) - Ueber einige postcranial Skelettreste der triassischen Stegocephalen Spitzbergens. *Bull. Geol. Inst. Univ. Uppsala,* 20: 227-272, Uppsala.

Placer L. (1999) - Contribution to the macrotectonic subdivision of the border region between Southern Alps and External Dinarides. *Geologija,* 41 (1998), 223-255, Ljubljana.

Sander P. M. & Meyer C. (1991) - A labyrinthodont jaw fragment from the marine Triassic of the Alps. *Neues Jahr. Geol. Paläont. Monat.*, 1999: 222-232, Stuttgart.

Schoch R. R. & Milner A. R. (2000): Stereospondyli. Encyclopedia of Paleoherpetology 3B: 1-203, Verlag Dr. Friedrich Pfeil, München.

Scotese C. R. (2001) - Atlas of Earth History. Volume 1, Paleogeography, PALEOMAP Project, 52 pp., Arlington, Texas.

Stur D. (1873) - *Mastodonsaurus giganteus* Jaeger im Lunzersandstein der Grube Pielach bei Kirchberg an der Pielach, in den nordöstlichen Kalkalpen. *Verhand. Kaiserlich-Königlichen Geol. Reich.t,* 1873: 18-19, Wien.

Sulej T. (2007) - Osteology, variability, and evolution of *Metoposaurus*, a temnospondyl from the Late Triassic of Poland. *Paleontologia Polonica,* 64: 29-139, Warszawa.