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A new dicynodont–archosaur assemblage from the Late Triassic (Carnian) of Poland

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ABSTRACT: This paper reports a new assemblage from the Late Triassic (mid–late Carnian) at Woźniki near Częstochowa (Poland). The Woźniki vertebrate assemblage is similar to that of Lisowice–Lipie Śląskie, a new locality bearing vertebrates from latest Triassic (latest Norian–early Rhaetian) strata of southern Poland, in the presence of dicynodonts, shark spines, plagiosaurs and a cyclotosaur, but conchostracans and bivalves are similar to those from the Krasiejów site (late Carnian). The most complete specimen from Woźniki belongs to a dicynodont, and consists of cranial and postcranial bones of a single individual. It demonstrates that large dicynodonts were part of the Late Triassic vertebrate assemblage in Central Europe. Numerous tetrapod tracks and traces are associated with skeletal fossils at Woźniki.

KEY WORDS: phytosaur, synapsid, Woźniki

In 2000, a new locality of Late Triassic age was reported from Krasiejów village in southern Poland (Dzik *et al.* 2000; see review in Dzik & Sulej 2007). Since then, numerous vertebrate taxa have been described from the Krasiejów claypit, including the abundant temnospondyl amphibians *Metoposaurus diagnosticus krasiejowensis* Sulej, 2002 (Sulej 2007), *Cyclotosaurus intermedius* Sulej & Majer, 2005, the phytosaur *Paleorhinus* (*P.* cf. *arenaceus* according to Dzik & Sulej 2007), the aetosaur *Stagonolepis olenkae* Sulej, 2010, the rauisuchid *Polonosuchus silesiacus* (Sulej, 2005 *sensu* Brusatte *et al.* 2009), and the dinosauriform *Silesaurus opolensis* Dzik, 2003.

Another Late Triassic locality of late Norian–early Rhaetian age was discovered in 2006 at the Lipie Śląskie claypit in Lisowice village. A dicynodont and a carnivorous dinosaur were described from this site by Dzik *et al.* (2008). During the spring and summer of 2007, a series of field trips and excavations were carried out by the present authors and students in search of vertebrates in the Polish Late Triassic. As a result, a new Late Triassic fossiliferous site was discovered in the vicinity of the town of Woźniki, Upper Silesia. The preliminary results of these exploratory works are reported here.

Vertebrate remains were previously described from the region around Woźniki by Roemer (1870), who illustrated a tooth of a possible phytosaur from the village of Czarny Las (=Helenenthal), '*Megalosaurus*' teeth from the village of Lubsza, and ganoid scales from Coglow Mountain (Góra Coglowa=Zogelberg), 1 km SE from Woźniki.

Among the new fossils, the most interesting are the remains of dicynodonts. Until recently, dicynodonts were believed to be rare in the Late Triassic, especially in Europe (King 1988). The associated assemblage of bivalves (including forms similar to unionids), characean gyrogonites and conchostracans suggest that the sediments at Woźniki were deposited within a freshwater environment.

Institutional abbreviations: MCZ=Museum of Comparative Zoology at Harvard University, Cambridge; MWG=Muzeum Geologiczne im. Stanisława Józefa Thugutta, Faculty of Geology, Warsaw University; SMNS=Staatliches Museum für Naturkunde, Stuttgart, Germany; ZPAL=Institute of Paleobiology, Polish Academy of Sciences, Warsaw.

1. Lithostratigraphy

The excavation of red and grey mudstones used to make bricks began in Woźniki in 1920, and the current claypit has been in use since the 1960s. The claypit is rectangular in outline (150 m long and 70 m wide), with the fossil locality in its east wall. The age of the fossiliferous strata at Woźniki is constrained by dates assigned to the underlying and overlying lithostratigraphic units (data from outcrop and also from core observations; see also Szulc *et al.* 2006) and new biostratigraphic data (conchostracans), discussed below.

The underlying deposits (2–3 metres below the bone-bearing horizon), well exposed in the western part of the Woźniki claypit, are red or reddish and greenish siltstones and mudstones, with several thin and two thick layers of carbonate grainstone and carbonaceous sandstone. The overlying deposits are red and reddish siltstones with greenish intercalations of mudstone and grainstone. Similar strata were described from the core of borehole CW 62, which was drilled at Woźniki and proposed to be of mid–late Norian age, based upon its lithostratigraphic correlation with beds in the other boreholes of the main Polish part of the Central European Basin (Szulc *et al.* 2006; Grodzicka-Szymanko & Orłowska-Zwolińska 1972).

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Figure 1 Exposure of fossiliferous strata in the Woźniki claypit, southern Poland: (A) rock column of the measured section; (B) view of eastern and northern walls; (C) accumulation of conchostracans *Laxitextella* cf. *laxitexta*.

The fossiliferous strata at Woźniki grade upwards conformably into the crenogenic–lacustrine deposits of the Woźniki Limestone. They are therefore related to the lithological succession associated with the advent of crenogenic sedimentation in the Upper Silesia area, considered to be of Norian age (Szulc *et al*. 2006).

In the claypit, the fossiliferous layer is grey, with a thickness of ~60 cm, and occurs seven metres below the top of the quarry. The characteristic red and reddish mudstones occur above and below this layer. Intercalations of irregular layers of ooid-like structures occur throughout the section, including the fossiliferous grey layer, and are especially common in the uppermost part of the northern wall. Pieces of this hard grainstone are destructive to the machinery used for making bricks, and are therefore thrown away by miners. Vertebrate ichnofossils (footprints) were found on isolated slabs of this grainstone.

2. Invertebrates

Besides the previously identified ostracods (Kotlicki 1974), the Woźniki invertebrate fossil assemblage includes unionid bivalves and spinicaudatan crustaceans (conchostracans). Spinicaudatans form a common element of the European Late Triassic continental faunas (Kozur 1999; Olempska 2004; Kozur & Weems 2005, 2010). The earliest reference to them in Silesia is by Roemer (1870), who reported *Euestheria minuta* (von Zieten, 1833) [possibly *Laxitextella laxitexta* or a new species] from the Upper Keuper. Subsequently, two species were mentioned by Assmann (1937). The first complete description of the Late Triassic spinicaudatans from Poland was published by Olempska (2004), based on well preserved material from the late Carnian of Krasiejów.

Spinicaudatan specimens occur at Woźniki in a thin horizon of greenish-grey claystone (about 20 cm thick) located about 20–30 cm below the horizon with the dicynodont bone accumulation (Fig. 1). Almost 40 specimens were collected and are now under study. Isolated and poorly preserved conchostracan remains occur in the fossiliferous, bone-bearing claystone unit. All conchostracan specimens from this outcrop are preserved as closed carapaces filled with sediment (Fig. 1). Some are preserved as disarticulated weakly calcified ('chitinous') valves of different colours and states of preservation. Some valves are three-dimensionally preserved, and some show clear growth lines. Specimens appear to represent both juveniles and adults.

The spinicaudatan fauna from Woźniki consists of *Laxitextella* cf. *laxitexta* (Jones, 1890) and another, unidentified, species of the same genus, which suggests that the age of the stratum lies within the mid–late Carnian (from the *Anyuanestheria fimbriata*–*Laxitextella laxitexta* Zone to the *Laxitextella freybergi* Zone in the Germanic Basin, see Kozur 1999; Kozur & Weems 2010). The species discovered in the Woźniki locality have carapaces of moderate size with an almost straight dorsal margin, and vary in outline from elongate ovoidal to subquadrate, up to 7 mm long and up to 4–5 mm high (Fig. 1). The ventral margin of these forms is convex, the anterior margin is broadly rounded, and they have a characteristically small umbo which is situated close to the anterior end of the dorsal margin.

3. Vertebrate body fossils

In general, the bones collected at Woźniki are well preserved, although a few are partly crushed. Most of the elements were found within a 10 m^2 area, within a single layer of 30 cm thickness. The archosaur and cyclotosaur bones were found 20 cm above the dicynodont bone accumulation, but within the same bed. Bones are preserved in three dimensions with visible sutures.

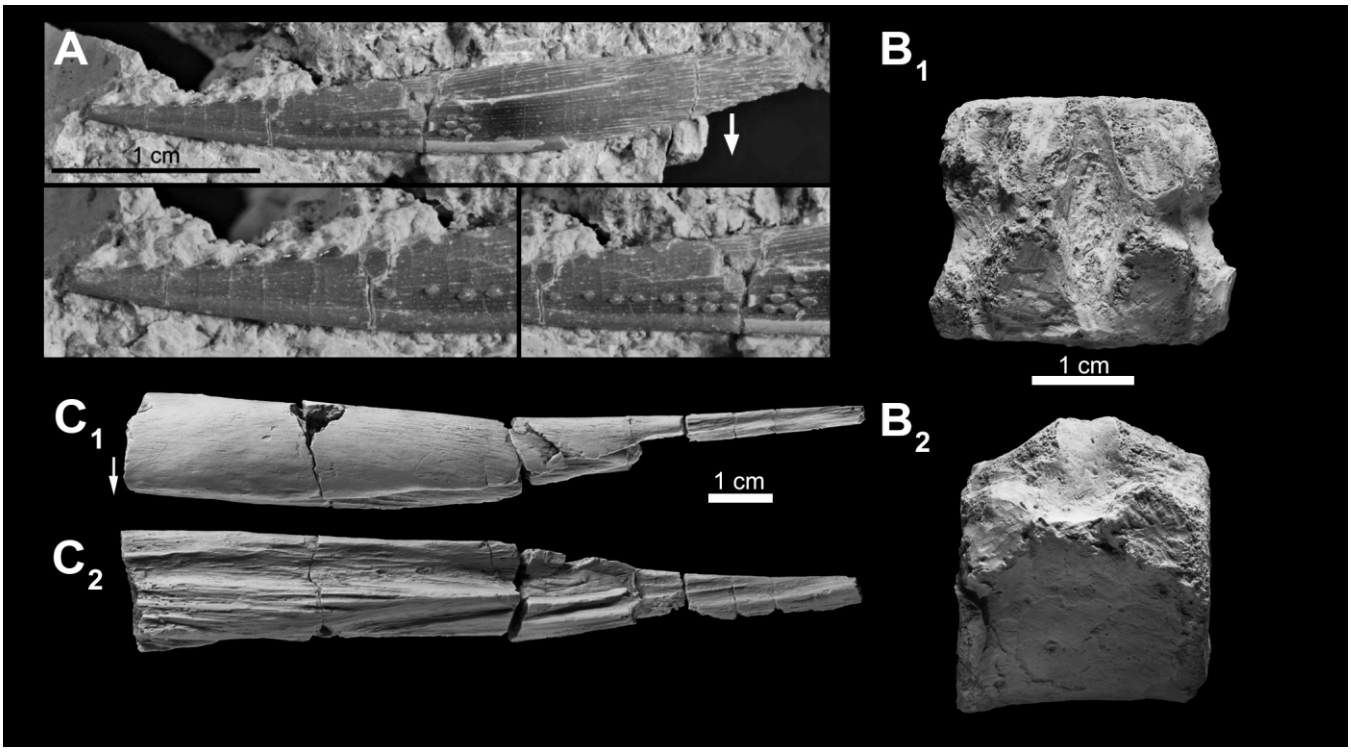

Figure 2 Vertebrate fossils from the Late Triassic of Woźniki, southern Poland. Shark and temnospondyls: (A) Fin spine of *Nemacanthus* ZPAL V.34/39, lateral view; (B) centrum of Plagiosauridae indet. ZPAL V.34/40, dorsal (B_1) and lateral (B_2) views; (C) cleithrum of *Cyclotosaurus* sp. MWG ZI/44/06, lateral (C_1) and anterior (C_2) views. Arrows indicate the anterior direction.

3.1. Chondrichthyian

Fragments of shark fin spines (MWG ZI/44/06, ZPAL V.34/39) were collected during the 2007. The fin spines are triangular in cross-section, with the anterior edge covered by an enameloid cap, the lateral surface covered with oval tubercles (Fig. 2), and sharp hook-like tubercles along the posterior edge (ZPAL V.34/39), all of which are diagnostic features of *Nemacanthus* (Stensiö 1921; Maisey 1977).

The genus *Nemacanthus*, and the species *N. monilifer*, was originally established by Agassiz (1837) on the basis of material from the Late Triassic (Rhaetian) part of Aust Cliff, southwest England. The holotype and referred specimens have ca. 37–100 tubercles (Stensiö 1921, Maisey 1977). By contrast with the specimens of *N. monilifer* illustrated by Agassiz (see Dineley & Metcalf 1999; fig. 11.10 E, F), Stensiö (1921; pl. 1: 19) and Maisey (1977; pl. 1: D), the Polish specimens display fewer tubercles (ca. 17) which are elliptical in shape and flattened dorsally (although this latter feature is probably the result of abrasion) (Fig. 2A). The Woźniki fin spines are referred to *Nemacanthus* sp., and are the first specimens of *Nemacanthus* from Poland.

3.2. Temnospondyls

The amphibian material from Woźniki includes just two bones: a centrum and a partial cleithrum.

The centrum (ZPAL V.34/40) is 22 mm long and, in terms of proportions, is much longer than any temnospondyl centrum except for the Plagiosauridae (Shishkin 1987; Yates & Warren 2000). The anterior and posterior articular surfaces for the neural arch are elongate and separated from one another by a deep fossa. They are also obliquely oriented cranio-caudally, exactly as in a 15 mm long centrum of *Gerrothorax* sp. from Kupferzell (SMNS 83469, TS pers. obs.; see also Huene 1922, figs. 39–40; Hellrung 2003). The parapophyses are situated very high on the centrum, close to the neural arch facets. Based on the proportions of the centrum and the oblique orientation of the elongate articulation facet for the neural arch, this specimen is referred to Plagiosauridae.

The ventral portion of a large cleithrum (MWG ZI/44/06, Fig. 2) is 17 mm wide, with an estimated length of 20 cm (Fig. 2C). The shape and fine sculpture are similar to the cleithrum of *Cyclotosaurus*, but differ from that of *Mastodonsaurus*, the second large temnospondyl known from the Carnian. The lateral surfaces of the specimen are straight and parallel to one another, the anterior edge being flat whereas the posterior one is convex, as in *Cyclotosaurus intermedius* from Krasiejów (Sulej & Majer 2005). In contrast, in *Mastodonsaurus giganteus*, the only species of the genus known from the Middle Triassic of the region (Schoch 1999), the medial surface of the cleithrum is concave, whereas both the anterior and posterior edges are slightly convex in lateral view (Schoch 1999). The cleithra of the other temnospondyl known from southern Poland, *Metoposaurus diagnosticus krasiejowensis* from Krasiejów (Sulej 2007), are much smaller than MWG ZI/44/06 (even in the adult individuals) and differ in outline, having strongly convex lateral and medial surfaces. The most likely identification for MWG ZI/44/06 is therefore a cyclotosaur.

3.3. Dicynodont

An accumulation (Fig. 3) of disarticulated bones of a dicynodont was found at Woźniki and includes skull and postcranial elements. The postcranial material is represented by vertebrae, ribs, scapula, precoracoid, clavicles, right humeral head, ulna, radius and femur. The proportions of the bones, their accumulation within a small area, and their identical mode of preservation suggest that all elements belong to the same individual.

Previously, only six genera of Late Triassic dicynodonts were recognised: *Placerias* Lucas, 1904 (Camp & Welles 1956), *Ischigualastia* (Cox 1965), *Dinodontosaurus* (Huene 1935),

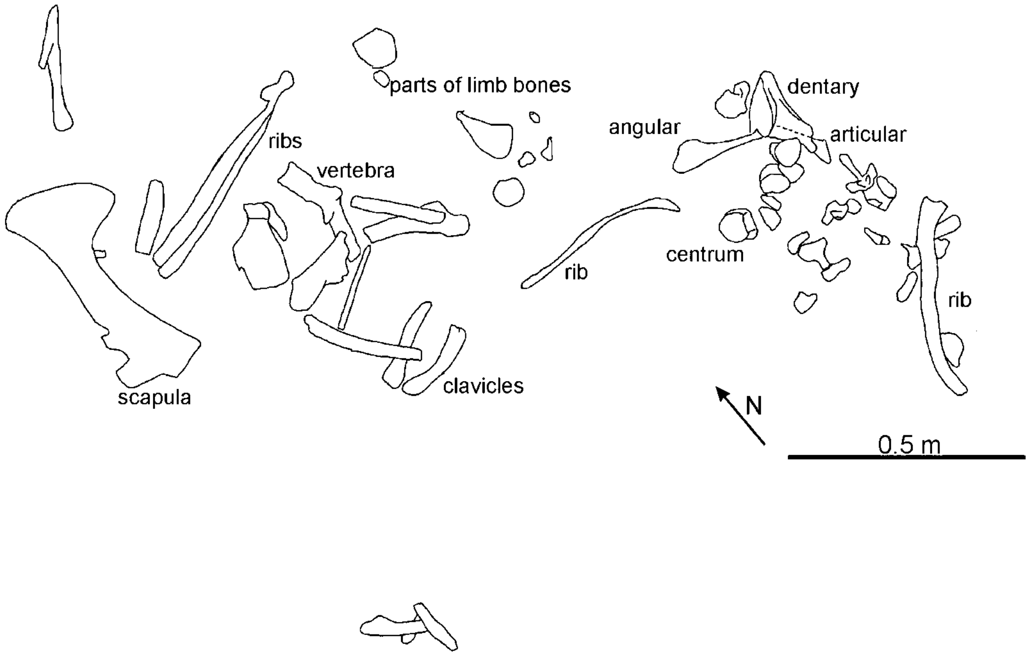

Figure 3 Dicynodont bone accumulation discovered in the lower part of the Woźniki section.

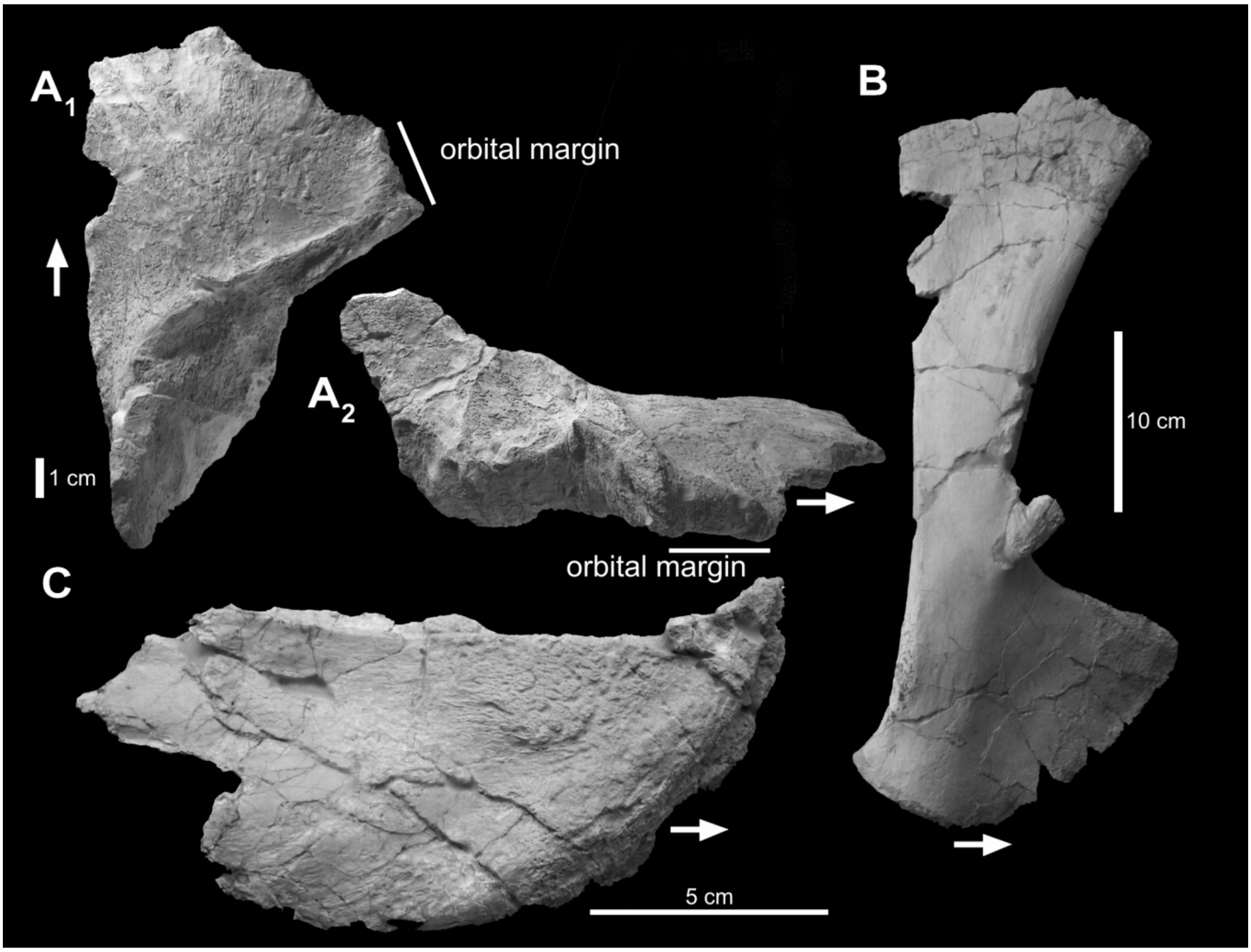

Figure 4 Dicynodont bones from the Late Triassic of Woźniki, southern Poland: (A) frontal ZPAL V.34/1, dorsal (A_1) and lateral (A_2) views; (B) scapula ZPAL V.34/7, lateral view; (C) dentary ZPAL V.34/3, lateral view. Arrows indicate the anterior direction.

Jachaleria (Bonaparte 1970), *Stahleckeria* (Huene 1935), *Moghreberia* (Dutuit 1980) and the new taxon from Lisowice-Lipie Śląskie (Dzik *et al.* 2008). Of these, only *Ischigualastia*, *Dinodontosaurus* and *Moghreberia* are known from associated cranial and postcranial materials of the same individual (King 1988). Unfortunately, reconstructions of their whole skeleton

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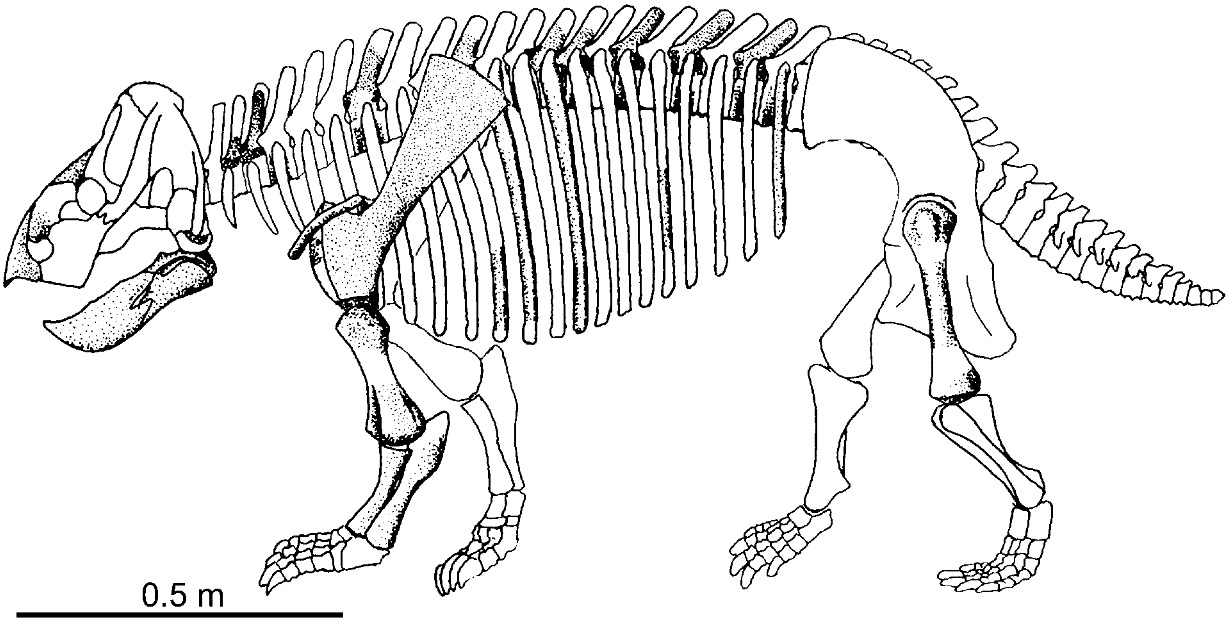

Figure 5 Reconstruction of dicynodonts from the Late Triassic known from part of a skeleton, based on: premaxilla ZPAL V.34/2; nasal ZPAL V.34/42; frontal ZPAL V.34/1; dentary ZPAL V.34/3; angular ZPAL V.34/5; surangular and articular ZPAL V.34/4; vertebrae: ZPAL V.34/30, ZPAL V.34/32, ZPAL V.34/14, ZPAL V.34/31, ZPAL V.34/33, ZPAL V.34/13, ZPAL V.34/12, ZPAL V.34/34, ZPAL V.34/35, ZPAL V.34/36; ribs: ZPAL V.34/15, ZPAL V.34/20, ZPAL V.34/21, ZPAL V.34/22, ZPAL V.34/23; scapula ZPAL V.34/7; humerus ZPAL V.34/6; radius ZPAL V.34/10; ulna ZPAL V.34/9; femur ZPAL V.34/8. The reconstruction is based on *Ischigualastia* (MCZ 3120) and *Dinodontosaurus turpior* (MCZ 1670) reconstructions of Cox (1965).

have not been published, and the proportions of the skeleton are known only for *Dinodontosaurus turpior* (Huene 1935; Cox 1965). The future detailed description of the Woźniki material will add important new information on the skeletal proportions of Late Triassic dicynodonts; some of the most important characters are summarised in the present paper.

The new material contains a mosaic of characters found in Middle and Late Triassic dicynodonts. The length of the frontal (ZPAL V.34/1) indicates a similar degree of elongation of the snout to that observed by Keyser (1974) in the Late Triassic forms *Stahleckeria* and *Ischigualastia*. In the Woźniki taxon, the frontal (Fig. 4) forms a greater contribution to the orbital margin than in *Stahleckeria* (Huene 1935; Maisch 2001; TS pers. obs.), and is more similar to *Rechnisaurus* (Roy Chowdhury 1970; Bandyopadhyay 1989) and *Rabidosaurus* (Kalandadze 1970). The frontal is very narrow in width at the level of the pineal foramen, similar to the condition in *Kannemeyeria simocephalus* (Weithofer 1888; Camp & Welles 1956) and *Jachaleria* (Vega-Dias & Schultz 2004). The shape of the frontal suggests that the postorbital was posteriorly elongated and that the skull roof was wide behind the pineal foramen, similar to *Stahleckeria* and *Placerias*. The preparietal is absent (there is no suture for this bone on the frontal) as in *Stahleckeria* (Huene 1935; Maisch 2001; TS pers. obs.), whereas all other Triassic dicynodonts retain the preparietal (Camp & Welles 1956; Cox 1965; Vega-Dias & Schultz 2004). The dentary of the Woźniki dicynodont is low (ZPAL V.34/3, Fig. 4) and has a very distinct groove and ridge on the lateral surface and dorsal area that suggest a horn would have been present in life. The anterior end of the dentary is dorsally directed and pointed, similar to that of juvenile individuals of *Stahleckeria potens* (Vega-Dias *et al*. 2005). The posterior border of the scapula (ZPAL V.34/7) is slightly concave (Fig. 4). The large acromion process is thin and triangular in lateral view, and lacks an additional ridge. The acromion is located at the anterior edge of the scapula shaft as in *Stahleckeria* (Huene 1935; TS pers. obs.), but it differs from *Stahleckeria* in lacking the dorsal ridge of the acromion process. Based on the presence of the high sagittal crest on the frontal, this new taxon is referred to the kannemeyeriiformes (Maisch 2001). Reconstruction of its whole skeleton is shown in Figure 5.

3.4. Phytosaur

A phytosaur osteoderm and phytosaur-like teeth were collected from Woźniki (Fig. 6A–E). Although the osteoderm (MWG ZI/44/01) is incomplete in some parts, it is possible to restore its outline, which was possibly subquadrangular. The dorsal surface, which has been slightly abraded by erosion, is roughly sculptured. A knob-like projection, which extends approximately 1.5 cm anteriorly, is located at the postero-medial corner of the osteoderm. Robust ridges, which are long on the lateral surface of the knob and shorter on its medial surface, are separated by irregular pits and radiate from the knob to the edges of the osteoderm, as in the osteoderms of *Parasuchus hislopi* from India (Chatterjee 1978). The knob-like projection is a character typical for phytosaurian osteoderms, as opposed to the prominent longitudinal ridge that is present in basal crocodylomorph archosaurs and rauisuchians (Clark *et al*. 2000; Sues *et al*. 2003; Gower & Schoch 2009). The opposite, ventral, side of the osteoderm is smooth. Below the knob-like projection there is a concavity, most probably to receive the process of the succeeding osteoderm (Chatterjee 1978). The whole osteoderm can be divided into two parts: the horizontal one and the lateral angled ventrally, which tapers towards its lateral edge. The above description indicates that the osteoderm was located on the postero-dorsal part of the body, based on the reconstruction of Chatterjee (1978).

The teeth can be divided into two morphotypes – those that are slender and conical and those that are labiolingually compressed and subtriangular in lateral view. The conical teeth vary in size and the degree to which they are curved in distal and lingual directions. The tooth crown height (TCH; dental

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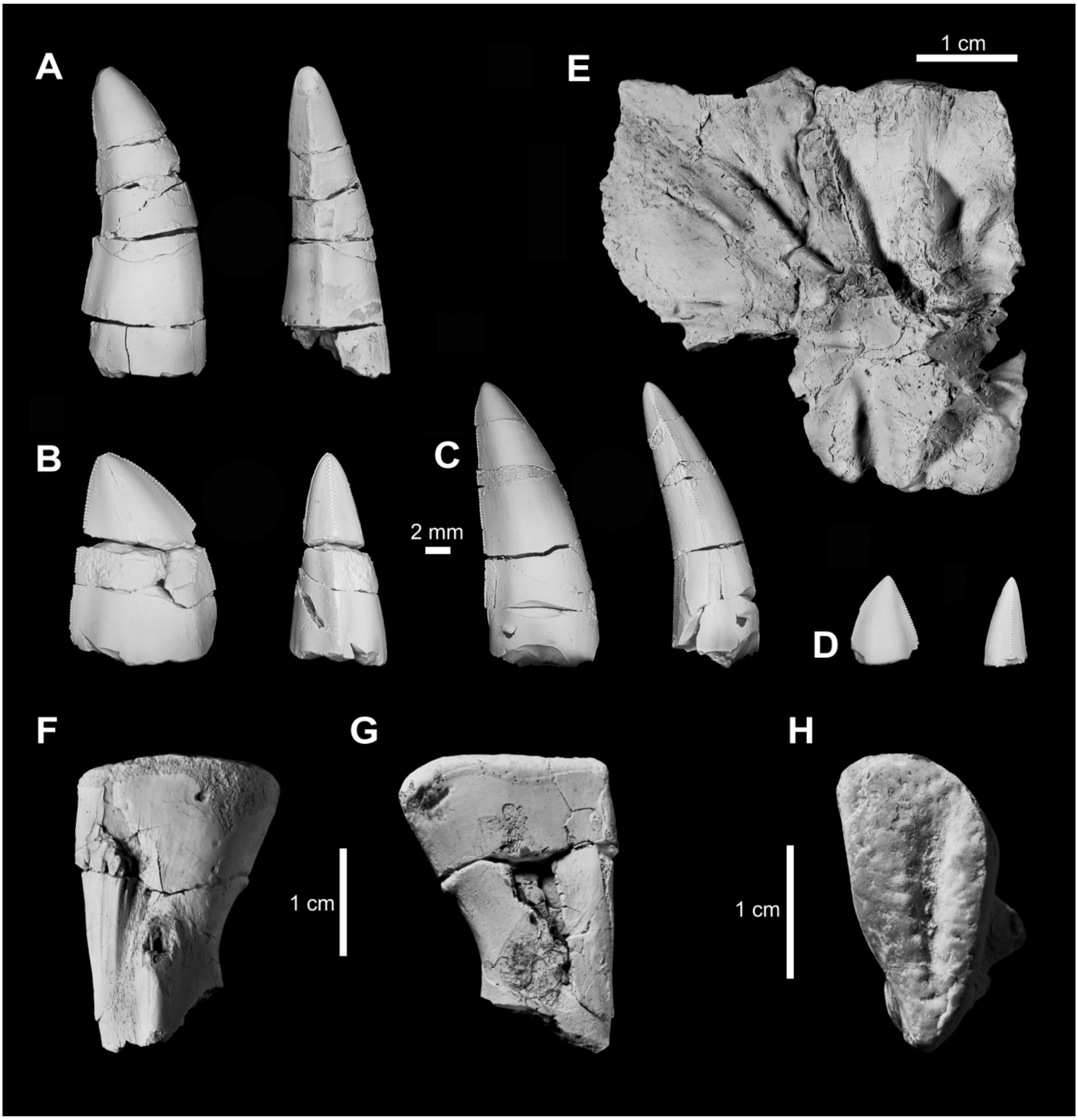

Figure 6 Archosaur bones from the Late Triassic of Woźniki, southern Poland. (A–D) Phytosaurian teeth (in labial and posterior views): (A) MWG ZI/44/02; (B) MWG ZI/44/01; (C) MWG ZI/44/04; (D) MWG ZI/44/03. (E) osteoderm (in dorsal view), MWG ZI/44/05. (F–H) proximal head of a dinosauriform femur (in anterior (F), posterior (G) and dorsal (H) views), ZPAL V.34/41.

measurements follow Hungerbühler 2000, fig. 2) of the specimen MWG ZI/44/02 is 25 mm. Although crushed, this tooth is slightly distally recurved and has mesial and distal carinae with serrations. The cross-section of the tooth is asymmetrical, with the lingual surface more flattened than the strongly convex labial surface – a condition typical for the phytosaurian dentition. Specimen MWG ZI/44/03 (TCH 23 mm) is very similar to MWG ZI/44/02, but curves lingually towards its apex. Serrations on the carinae are clearly visible.

The second morphotype (subtriangular in lateral view, crowns labiolingually compressed; specimens MWG ZI/44/04 [TCH 16] and MWG ZI/44/05) is posteriorly recurved and has an asymmetrical cross section. Serrated carinae are present on mesial and distal edges. Based upon comparisons to specimens from Krasiejów and the description of the dentition of *Nicrosaurus kapffi* presented by Hungerbühler (2000), the specimens described in this paper probably belonged to the anterior and posterior parts of the jaws, respectively.

The specimens cannot be assigned to a specific genus, but the age of Woźniki (Carnian), the presence of phytosaurs in the nearby (approximately 25 kilometres) Krasiejów locality of similar age, and the abundance of the clade in other Upper Triassic sites suggests that they can be assigned to Phytosauria, and possibly the genus *Paleorhinus* (= *Parasuchus*).

3.5. Dinosauriformes

A proximal femur (ZPAL V.34/41) of a small archosaur has a general shape and thin walled bone that is similar to *Silesaurus opolensis* from Krasiejów. The anterior trochanter forms as a vertical shelf (Fig. 6), as occurs in some specimens of *S.*

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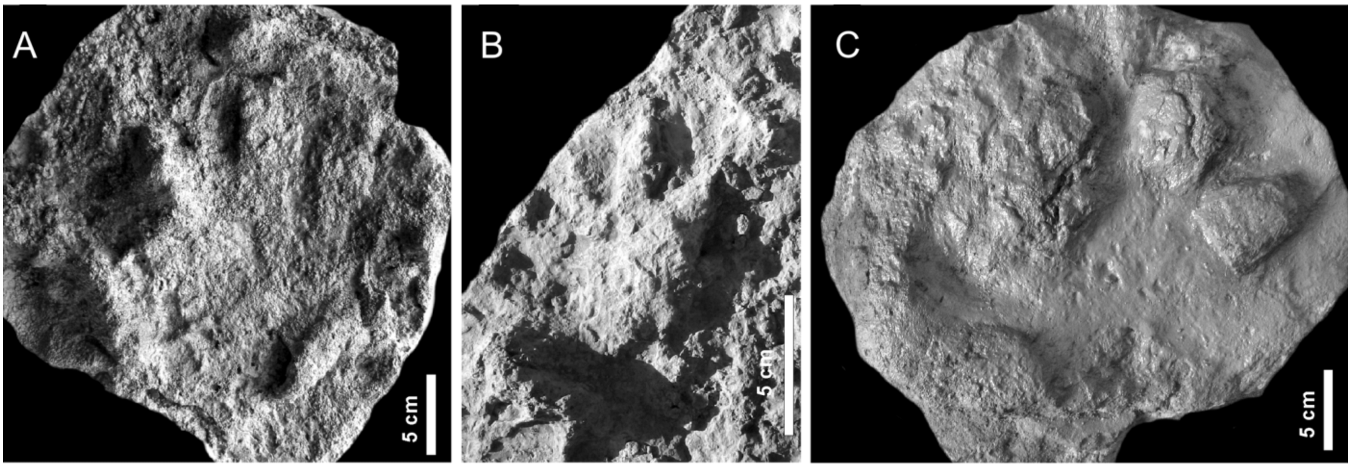

Figure 7 Tetrapod tracks from the Woźniki locality (all specimens preserved as natural casts): (A) Chirotheriidae indet., footprint of medium-sized archosaur ZPAL V.34/36; (B) Dinosaur-like animal footprint ZPAL V.34/37 (cf. *Grallator* isp.); (C) Tetrapoda indet., supposed dicynodont track ZPAL V.34/38.

opolensis (ZPAL AbIII/460/1 and ZPAL AbIII/457). The dorsolateral trochanter is a vertical shelf similar to the anterior trochanter. The femoral head is triangular in proximal view, but only weakly medially extended, also similar to *Silesaurus*. This specimen is referred to Dinosauriformes.

3.6. Tetrapod tracks

Twenty-six tetrapod tracks and traces (manus and pes imprints) were recovered from Woźniki, preserved mostly as natural casts and moulds on isolated slabs from the lower part of the profile and from the track-bearing layer, although one poorly preserved trackway was also found. The most common imprints represent dinosauromorph/dinosauriforms or basal dinosaurs (cf. *Grallator* isp. or cf. *Atreipus* isp., see Gierliński *et al.* 2009), but isolated traces of other archosaurs (cf. *Brachychirotherium* isp., cf. *Apatopus* isp., Chirotheriidae indet.) were also found (Fig. 7). A poorly preserved enigmatic tetra- or pentadactyl lacertoid-like track (Rhynchosauroidae indet.), large ichnites with short wide digit impressions probably made by synapsids, and traces made by swimming animals are also known. The identified ichnotaxa represent at least eight different kinds of track makers.

The most common tracks are those of a small dinosauromorph/dinosauriform or basal theropod dinosaur (cf. *Grallator*) (Fig. 7B; specimens ZPAL V.34/37). These tracks have a narrow pes, with digit III projecting relatively far anterior to digits II and IV. Such tracks are very common and well-described from Upper Triassic and Lower Jurassic strata. In western North America they occur in the Chinle Group and the Triassic portion of the Wingate Sandstone, in the Triassic–Jurassic strata of the Newark Supergroup and in the Lower Jurassic strata of the Moenave and Kayenta Formations (e.g., Lockley & Hunt 1995; Lockley & Meyer 2000; Olsen *et al.* 1998; Gaston *et al.* 2003; Lucas *et al.* 2006).

Another important dinosauromorph/dinosauriform trace fossil (cf. *Atreipus*) represents a quadrupedal animal with a tridactyl pes and a tetradactyl manus. The two sets of pes and manus impressions are 9 and 12 cm long, with relative digit proportions similar to that observed in *Grallator*, but they have metatarsal-phalangeal pads of digits II and IV well impressed as oval structures. In specimen ZPAL V.34/39, the distal phalangeal pads are confluent with the more proximal pads, a feature that is characteristic of such tracks. The hallux is not impressed. In both specimens, the manus is wider than long. In the manus imprint of specimen ZPAL V.34/39, it is evident that digit III is the longest, followed by digits II, IV and I. Olsen & Baird (1986) argued that *Atreipus* is likely to be the track of an ornithischian dinosaur. However, Olsen (*in* Lucas & Sullivan 2006) posited that this track might represent a non-dinosaurian dinosauromorph. *Atreipus* is currently known from the late Middle and early Late Triassic of Europe, from the Rock Point Formation of Glen Canyon National Recreation Area in southeastern Utah, western North America, and from Triassic strata of the Newark Supergroup, eastern North America (Olsen & Baird 1986; Lockley & Hunt 1995; Lockley *et al.* 1998; Lockley & Meyer 2000; Hunt & Lucas 2006).

An isolated imprint of cf. *Brachychirotherium* (ZPAL V.34/40) represents a pentadactyl and semiplantigrade pes, with digit V set apart from the other digits, all of which face forward and are thick (spatulate). Digit III is the longest and thick digital pads are visible. *Brachychirotherium* is the most common Late Triassic chirotherian, and its stratigraphically-highest occurrence is Late Triassic (e.g., Haubold 1971; Silvestri & Szajna 1993; Szajna & Silvestri 1996; Klein & Haubold 2003, 2004; Szajna & Hartline 2003; Demathieu & Demathieu 2004; Lucas *et al.* 2005, 2006; Lucas & Tanner 2007; Lucas 2007). The chirotherian tracks of *Brachychirotherium* have been assigned to derived crurotarsans (Karl & Haubold 1998) such as rauisuchians (e.g., Olsen *et al.* 2002) or aetosaurs (Lockley & Hunt 1995).

Two specimens of possible synapsid prints were found (Fig. 7C). The material consists of isolated, probably pes imprints, which are similar to one another in overall morphology. Both tracks are pentadactyl, with a broad, subcircular to subtriangular sole and short digit impressions that lack claw marks and scale imprints. The Woźniki tracks are similar to other tracks attributed to large therapsids (e.g. dicynodonts) from Russia (Surkov *et al.* 2007).

5. Conclusions

The new vertebrate assemblage from Woźniki shows the unique nature of the Silesian faunal assemblages within the Late Triassic Germanic Basin. The presence of a silesaurid dinosauriform in Krasiejów and Woźniki, dicynodonts in Lisowice and Woźniki, and the lack of sauropodomorphs (plateosaurids), which are numerous in the western part of the Germanic Basin, suggest environmental differences between west and east parts of the basin but discussion of the nature of these faunal differences demands further study.

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