ISSN: 0211-8327 Studia Palaeocheloniologica IV: pp. 31-46

REDESCRIPTION OF *DESMEMYS BERTELSMANNI* (WEGNER, 1911) FROM THE UPPER JURASSIC AND LOWER CRETACEOUS OF GERMANY (TESTUDINES: PLEUROSTERNIDAE)

[Redescripción de Desmemys bertelsmanni (*Wegner*, *1911) del Jurásico Superior y Cretácico Inferior de Alemania (Testudines: Pleurosternidae)]*

Hans-Volker KARL[1,2], Christian J. NYHUIS[3] & Lennart SCHLEICHER[4]

[1] Thüringisches Landesamt für Denkmalpflege und Archäologie. Humboldtstraße 11. D-99423 Weimar, Germany. Email: hvkarl@web.de
[2] Geoscience Center of the University of Göttingen. Department of Geobiology. Goldschmidtstrasse 3. D-37077 Göttingen, Germany
[3] Institut für Geologie & Mineralogie der Universität zu Köln. Zülpicher Str. 49a. D-50674 Köln, Germany. Email: christiannyhuis@web.de
[4] Schäferweg 76. D-48599 Gronau (Westf.), Germany

(FECHA DE RECEPCIÓN: 2011-07-18)
BIBLID [0211-8327 (2012) Vol. espec. 9; 31-46]

ABSTRACT: A complete hypoplastron from the type material of *Desmemys bertelsmanni* (Wegner, 1911) is described and figured as neotype. This type sample is discussed and elucidated on geographically and stratigraphically comparable material. The type material is discussed on additional material from the Upper Jurassic which extends the stratigraphical rang of the genus.

Key words: Upper Jurassic, Kimmeridgian, Lower Cretaceous, Valanginian, Osterwald-Member, Berriasian, Wealden facies, Northwest Germany, *Desmemys bertelsmanni* (Wegner, 1911), pleurosternid river turtle.

RESUMEN: Se describe un hipoplastron completo de *Desmemys bertelsmanni* (Wegner, 1911) que, con figuras, se da como neotipo. Este tipo es discutido y aclarado sobre bases geográfica y estratigráfica con material adicional comparable

del Jurásico Superior y Sajoniense inferior. Se discute el material-tipo y se amplía el conocimiento del género con formas del Jurásico Superior, aumentando así su rango estratigráfico.

Palabras clave: Jurásico Superior, Kimmeridgiense, Cretácico Inferior, Valanginiense, Miembro Osterwald, Berriasiense, facies Wealdiense, Noreste de Alemania, *Desmemys bertelsmanni* (Wegner, 1911), tortuga fluvial pleurostérnida.

INTRODUCTION

Gerdemann's clay mining pit ("Ziegeleitongrube Gerdemann") has been a classical outcrop for German Wealden fossils (Berriasian; lowermost Cretaceous; Bückeberg-Formation) since the first part of the 20th Century. It is well known for the discovery of a 3.26-meter-long skeleton of the elasmosaurid *Brancasaurus brancai* (Wegner, 1914). Even a fragment of an armoured dinosaur has been described (SACHS, 1997).

End of the first decade of the 20th Century one almost complete specimen of a turtle has been discovered in the clay mining pit. This specimen included most parts of the shell, the complete pectoral girdle and femura. The owners of the clay pit, Mr. Gerdemann and Mr. Bertelsmann donated this stunning finding to the Mineralogical and Geological Museum of the University of Muenster. There it has been described by Th. Wegner in 1911 as *Desmemys bertelsmanni*. During World War II this specimen got destroyed completely. Only the labels and associated storage box have sustained since today. Fortunately Dr. Schleicher integrated one hypoplastron from the type material after the war into the exhibition of the Driland-Museum in Gronau (Westphalia). There it is exposed since today. On august 18th in 2010, this hypoplastron of *D. bertelsmanni* has been studied by the first and third authors (figure 1), the results are presented within this study.

GEOLOGICAL SETTING

The inoperative and today flooded clay mining pit "Ziegeleitongrube Gerdeman" (Gerdemann's clay mining pit) in Gronau (Westf.) (UTM 7°01'20.69"E, 52°12'43.70"N) is situated in the western limnic to brackish marginal facies of the Lower Saxony Wealden Basin close to the German and Netherland border (figure 2). Exposed layers reach from the brackish upper Berriasian (Osterwald-Member of the highest Bückeburg-Formation) to the fully marine developed ammonite leading lower Valanginian (figure 3). The Osterwald-Member consists of interbedded strata of mudstones and thin lumashells. This succession is the origin of the specimen described herein. Detailed profiles and further information on the geology and paleontology of the former Gerdemann's clay

pit are given in BESSIN (1928), HOSIUS (1893), KEMPER (1961a,b, 1963, 1976, 1992) and WEGNER (1926).

Figure 1. The authors H.-V. Karl (left) and L. Schleicher (right) on 18th august in 2010 in Gronau (Westf.) with the neotypus specimen of Desmemys bertelsmanni *under study. In the display case bones of the elasmosaurid* Brancasaurus brancai *Wegner, 1914 are visible. Photo Mark Opelt, TLDA.*

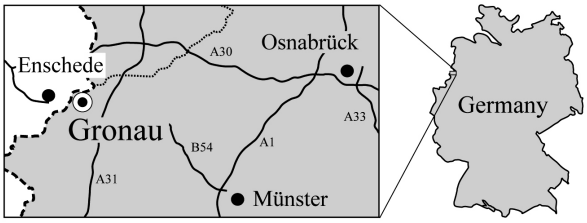

Figure 2a. Geographical Position of the type locality of Desmemys bertelsmanni *in the former Gerdemann's clay mining pit in Gronau, North Rhine-Westphalia, Germany.*

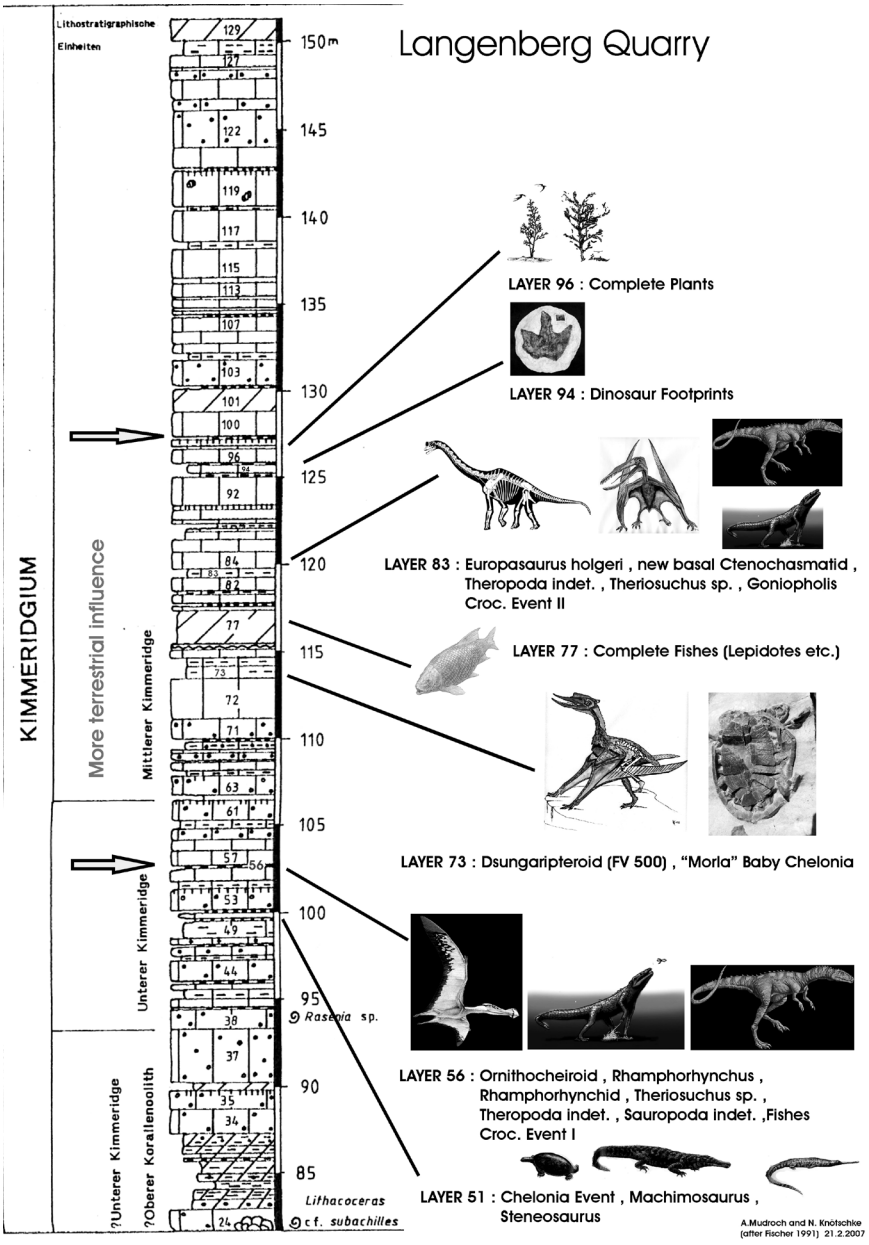

Figure 2b. Lithostratigraphy of the Langenberg Quarry in NW Germany. Please note sample location of Desmemys bertelsmanni. *DFMM 853 "Morla" in layer 73.*

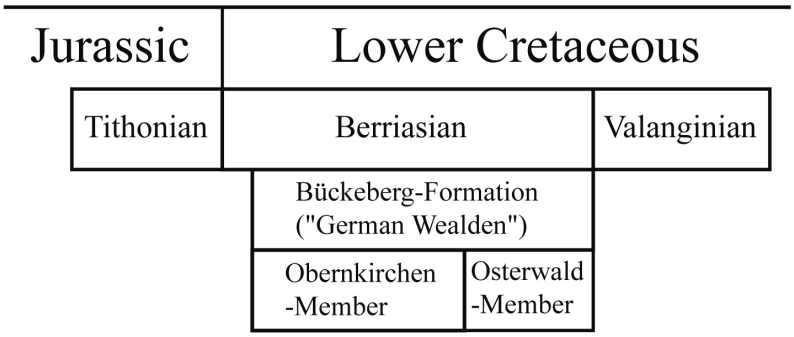

Figure 3. Lithostratygraphy of the Berriasian in NW-Germany modified after Kemper (1992).

SYSTEMATIC PALAEONTOLOGY

Introduction - Desmemys was assigned by BERGOUNIOUX (1955) and VON HUENE (1956) as a representative of the family Thalassemydidae (ZITTEL, 1889). VON NOPSCA (1928) erected the subfamily Desmemydinae NOPSCA, 1928, ROMER (1956) and PRITCHARD (1975) follow this classification. MŁYNARSKI (1976) considerd the "Subfamilia Desmemydinae WILLIAMS 1955, emend. SUKHANOV 1964" to be a member of the superfamily Chelonioidea Baur, 1893. LAPPARENT DE BROIN (2001) listed the genus within ?Pleurosternidae (incertae sedis). Recently KARL *et al.* (2007) published an updated reconstruction and assigned *Desmemys* to the family Pleurosternidae COPE, 1868.

Order Testudines Linnaeus, 1758

Infraorder Cryptodira Cope, 1868

Capaxorder Selmacryptodira Gaffney, Hutchinson, Jenkins and Meeker, 1987

Superfamily Pleurosternoidea Cope, 1868

Family Pleurosternidae Cope, 1868

[syn. Glyptopsidae Marsh, 1890]

Included genera: *Pleurosternon* (= *Mesochelys*), *Glyptops*, *Compsemys*, *Dinochelys*, see also *Ballerstedtia*.

Subfamily Desmemydinae Nopsca, 1928

Diagnosis according MŁYNARSKI (1976): Marine turtles with strong shell. Peripheral fontanelles of carapace deeply. Well developed mesoplastra at plastron. Medial and lateral plastral fontanelles present. Acromial process of scapula elongated. Skull unknown.

Genus *Desmemys* Wegner, 1911

Diagnosis according MŁYNARSKI (1976): Carapace slightly domed, with a strong keel at pygal area, peripheral edge massive. Peripheral carapace fontanels present. Nine neurals extended, usually hexagonal. Two large broad metaneurals. Plastron thick, with rounded medial fontanels. Epiplastra developed, hyoplastra with strong axillar butresses. Xiphiplastra not fused. Characteristic surface sculpture, centrals very broad. Carapace length 18 cm, probably juvenile.

***Desmemys bertelsmanni* Wegner, 1911**

Neotypus: DLMG (Driland-Museum Gronau) n.º 536 (plate 2).

Type locality: "Ziegeleitongrube Gerdeman" (Gerdemann's clay mining pit) in Gronau, North Rhine-Westphalia, Germany.

Type horizon: Osterwald-Member; Berriasian, Wealden facies (western Lower Saxony Cretaceous basin), Lower Cretaceous.

Description of DLMG n.º 536: An almost complete right hyoplastron of a juvenile turtle which completely corresponds to the one figured by WEGNER (1911) in visceral view at his plate VIII. Only small parts of the axillary buttress are broken. On the ventral surface a sigmoidal horny scute sulcus is present. On the median edge 14 single processus are visible, posterior to them a smooth edge of the border of the central fontanel can be detected. The ventral surface is smooth and not as structured as the dorsal surface of carapace. WEGNER (1911) has figured the material only from the visceral side.

Description: An almost complete shell of a juvenile turtle. Some parts were destroyed in the recovery and renewed during preparation (plate 3, fig. 1). The carapace has a length in the current state of 75 mm and a width of 60 mm.

Material: GZG (Geoscience Centre of the University of Göttingen, Museum) n.º GZG.V.10005 (plate 2), collected by a student field trip in 1910.

Locality: Waltersberg near Holzen at Ith, Lower Saxony, Germany (TK 25 Blatt 4024 Alfeld, R 3547490, H 5756030).

Horizon: "Gigas-layer" Kimmeridgian, former Tithonian or "Portland", Upper Jurassic.

Description: An almost complete right hyoplastron of a medium sized turtle which in visceral view fits well with the figured one in WEGNER (1911) at his plate VIII. Only small parts of the axillary buttress are broken, as in neotype. On the ventral surface a sigmoidal horny scute sulcus is present. Posteriorly a second sigmoidal horny scute sulcus can be seen which crosses the median fontanel. On the median edge 2 single processus are visible. Posterior to them the border of the central fontanel is developed as a smooth

edge. The other processus are smoothed in the media edge, as it is typical for juvenile specimens.

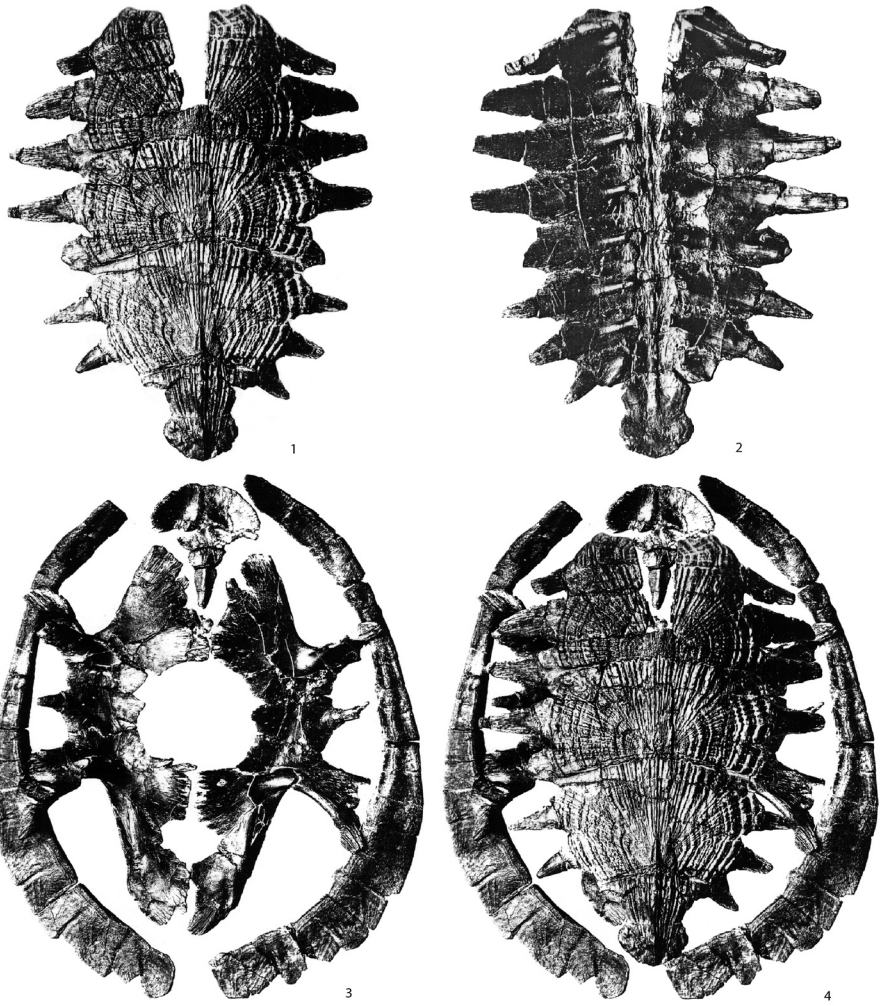

Plate 1. Lost or destroyed holotypus of Desmemys bertelsmanni *Wegner, 1911 from Gronau (Westf.). 1: carapace dorsal view. 2: carapace visceral view. 3: peripherals and plastron visceral view. 4: carapace and plastron in new combination. Without scale, from WEGNER (1911).*

Plate 2. Desmemys bertelsmanni *Wegner, 1911 from Gronau (Westf.), original, neotype (Neotypus). 1: right hyoplastron ventral view. 2: right hyoplastron visceral view. Scale bar = 5 cm*. Desmemys bertelsmanni *Wegner, 1911 from Waltersberg near Holzen, original. 3: right hyoplastron ventral view. 4: right hyoplastron visceral view. Photo Lennart Schleicher, Gronau (Westf.) and Mark Opelt, TLDA.*

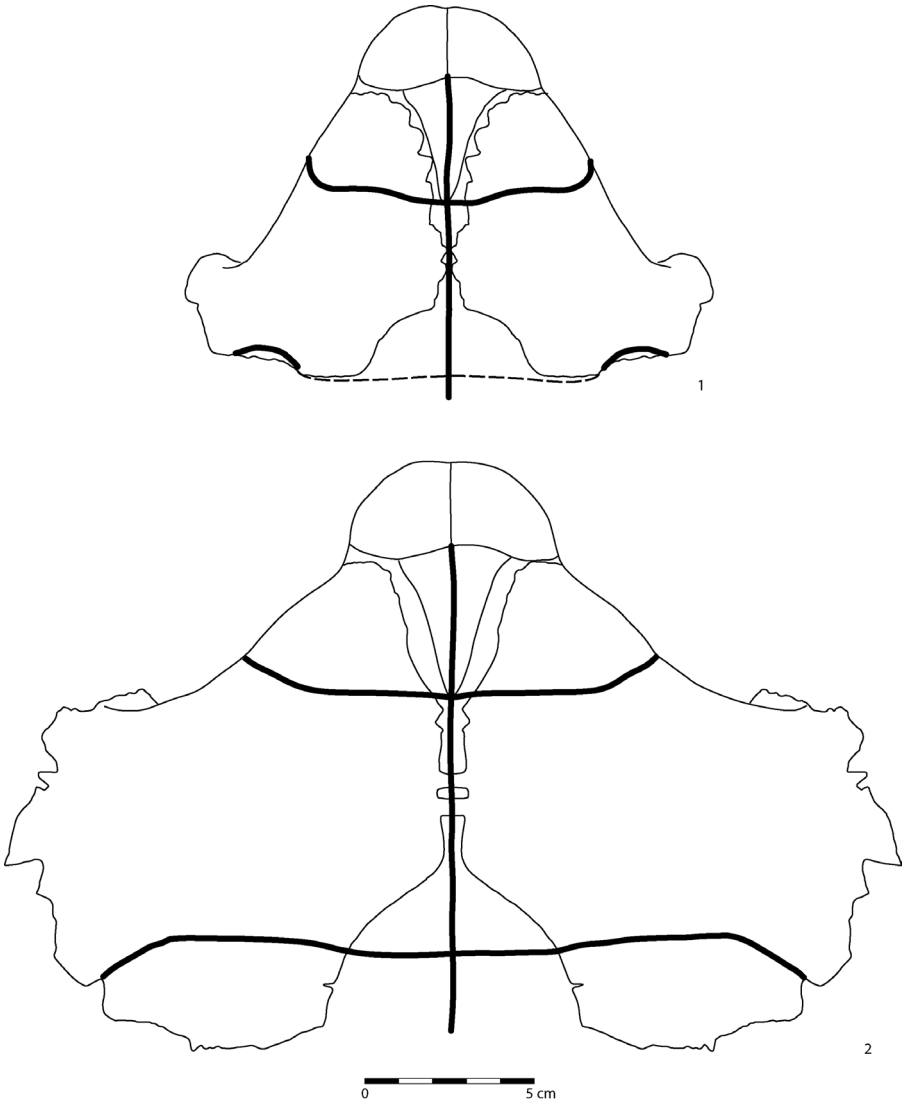

Figure 4. Schematic reconstruction of the anterior parts of the plastra of Desmemys bertelsmanni*; 1. DLMG n.º 536 from Gronau, ventral. 2. IGZG. C.10005 from Holzen, ventral by H.-V. Karl & Heike Künzel, TLDA.*

Material: DFMM (Dinosaurier-Freilichtmuseum Münchehagen "Dinopark") n.º 853 (plate 3).

Locality: Florian von Pupka's quarry at Langenberg near Oker, Lower Saxony, Germany (GK 25, Blatt 4029 Vienenburg; R 4396750-4397600, H 5752900-5753100). The locality is described in KARL *et al.* (2006, 2007 and 2008).

Horizon: Kimmeridgian, Upper Jurassic.

Desmemys* aff. *bertelsmanni

Material: Leg. et coll. Thomas Hemker, Ahaus-Alstätte.

Locality: Hagemeister's clay pit, April 2007, Ahaus-Alstätte, North Rhine-Westphalia, Germany (UTM 52°07'42.02"N, 6°54'52.44"E).

Horizon: Lower Aptian, Lower Cretaceous.

Description: In a small geode from 42.7 x 32.7 x 24.8 in volume (plate 4), a small limbbone like radius of a Mesozoic turtle is preserved. Only few remnants are present in situ, as the inside imprint. Measurements of the radius are given in table 1:

	[MM]
Radius length	32.3
Radius proximate width	10.9
Radius distal width	11.8
Radius minimal width	5.1

Table 1: Messurements of Testudines *gen. et spec. indet.*

DISCUSSION

Due to the high quality of the original illustrations a comparison between the former Holotype and the herin described neotype of *Desmemys bertelsmanni* (Wegner, 1911) is possible even today. The morphological characters of the neotype fully correspond to those of the original description for *D. bertelsmanni*. Therefore affiliation of this neotype to the holotype is indisputable.

The relatively large fontanelles of this semi-adult specimen were previously interpreted as a characterictic feature of a sea turtle. This affilation is excluded because of the presence of mesoplastra. Today *Desmemys* is seen in relation to the Upper Jurassic genus *Dinochelys* (BRINKMAN *et al.*, 2000). Both share a pronounced radial structure of centrals, which originally is affiliated to *Desmemys*. The dorsal carapace structure of *Hoyasemys jimenezi* Pérez-García, De la Fuente, & Ortega, 2011 is similar to that of *Desmemys*, but a mesoplastron is still unknown.

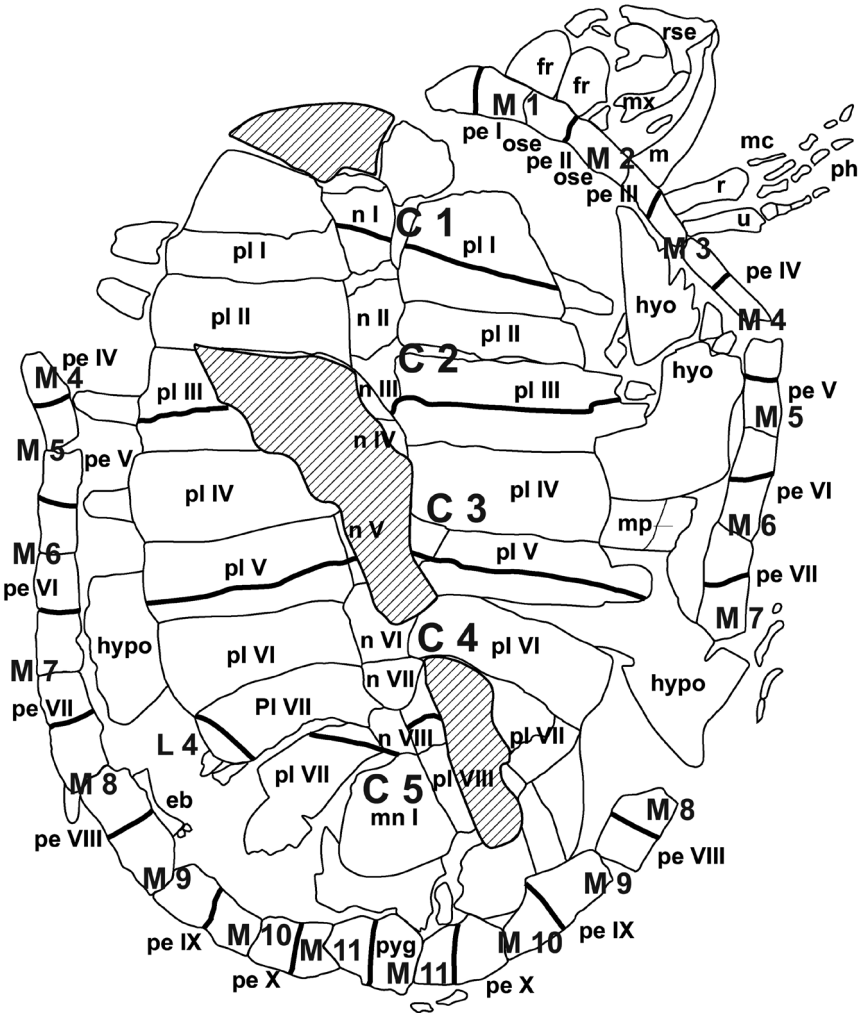

Figure 5. Desmemys bertelsmanni *Wegner, 1911 from Langenberg near Oker, schematic sketch of the preserved parts, H.-V. Karl & Heike Künzel, TLDA. Bony elements (thin lines)*: *nI-VII= neurals, pl I-VIII= pleurals, pe I-X= peripherals, mn= metaneural, pyg= pygal, hyo= hyoplastron, mp= mesoplastron, hypo= hypoplastron, rse= crushed rostral skull remains, ose= crushed occipital skull remains, fr= frontals, mx= maxilla, m= lower jaw, r= radius, u= ulna, mc= metacarpals, ph= phalanges; Horny elements.*

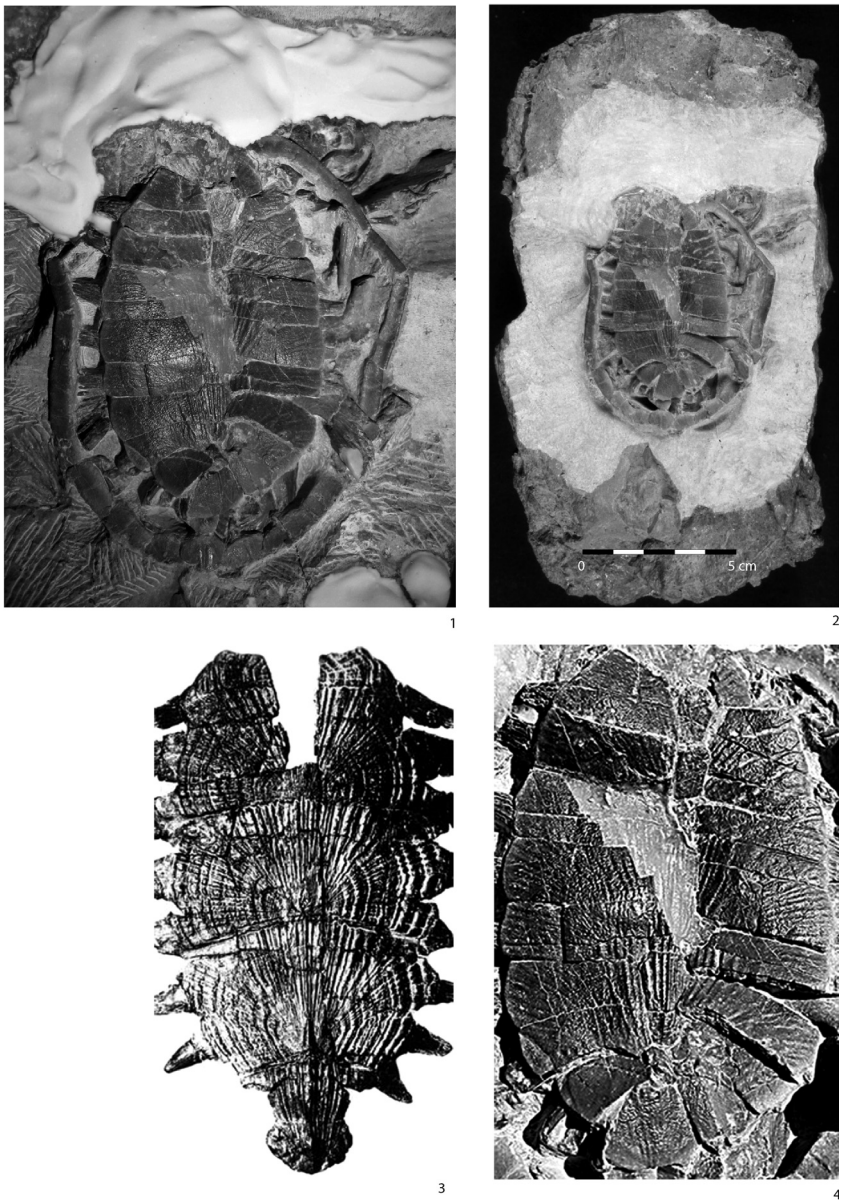

Plate 3. Desmemys bertelsmanni *Wegner, 1911 from Langenberg near Oker, original. Scale bar = 5 cm. Photos Dirk Urban, Erfurt, Nils Knötschke, Münchehagen and Brigitte Stefan, TLDA. Figure 1: "Morla" during preparation. Figure 2: same specimen after the preparation. Figure 3:* Desmemys bertelsmanni *according Wegner, 1911, discus. Figure 4: same specimen as figures 1-2, discus with ornamentation is affiliated to* Desmemys *in figure 3.*

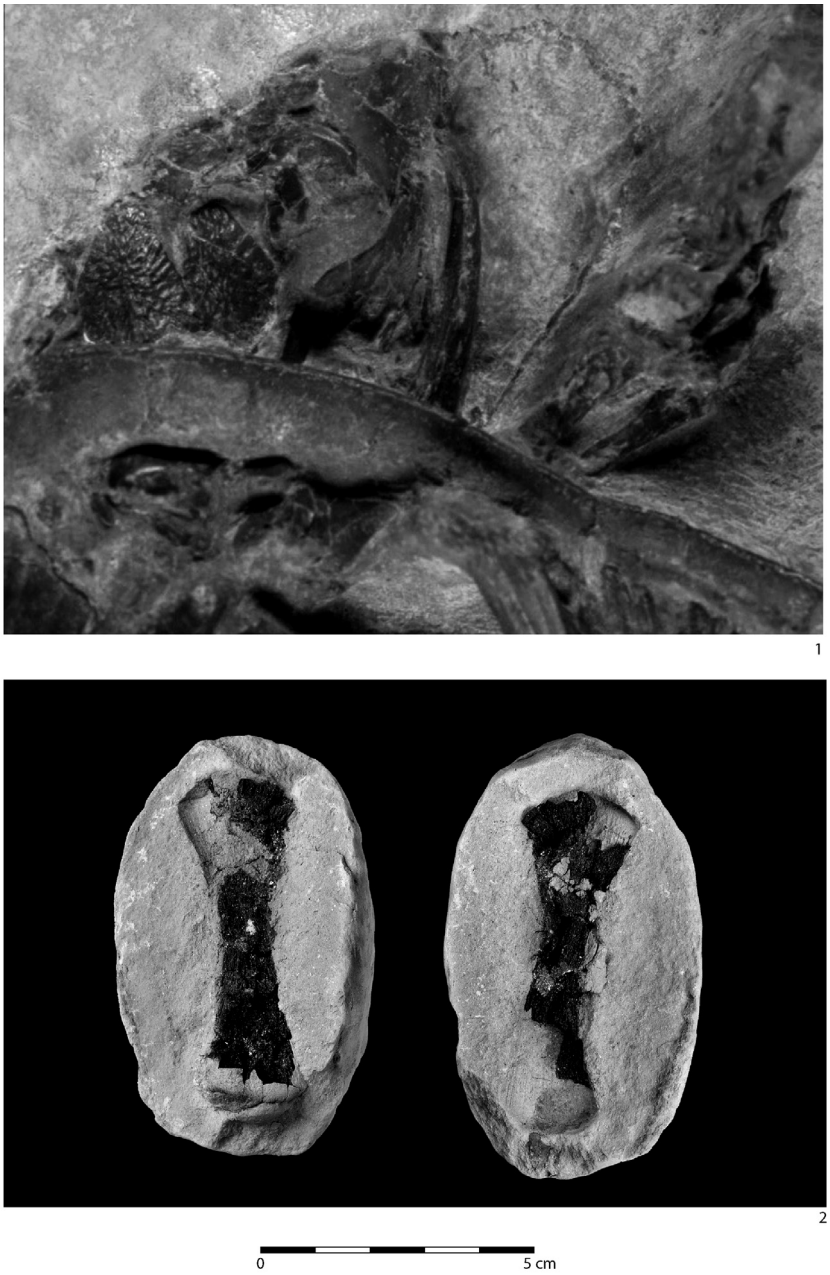

Plate 4. Testudines gen. et spec. indet.: 1-Radius of a Mesozoic turtle in a geode from Hagemeister's clay pit in Ahaus-Alstätte. Scale bar = 5 cm. Photo Brigitte Stefan, TLDA.

The new material from Langenberg near Oker and Waltersberg near Holzen described within this study extends the stratigraphic distribution of the genus *Desmemys* below the Jurassic-Cretaceous boundary. According to figure 2b the sample location of *Desmemys bertelsmanni* DFMM 853 "Morla" in layer 73 (middle Kimmeridgian) is substantially younger than the other so far proven turtles from layer 51 (lower Kimmeridgian), as *Plesiochelys* or *Craspedochelys*. All so far discovered fossil turtle remains from Langenberg have an aquatic background (KARL *et al*., 2007), JANSEN & KLEIN (2010) follow this approval.

ACKNOWLEDGEMENT

We greatly thank curator Anke Rehorst from Driland-Museum (Gronau, Westf.), Mike Reich (Göttingen), Thomas Hemker (Ahaus-Alstätte) and Nils Knötschke (Dinosaur Park Münchehagen) for permission to publish their important material. Jens Lehmann (Bremen) graciously briefed us about the stratigraphy of Ahaus-Alstätte. Additional gratitude is extended to Alexander Mudroch and Nils Knötschke for the permission to use their table in our figure 2b.

BIBLIOGRAPHY

BERGOUNIOUX, F. M. (1955): Chelonia. *In*: PIVETEAU, J. (Ed.): *Traité de Paléontologie*, **5**: 487-544. Paris.

BESSIN, B. (1928): *Das Wealdenbecken und seine Überlagerung durch die marine Untere Kreide in Norddeutschland*. 21. 71 pp. Jahresbericht des Niedersächsischen Geologischen Vereins zu Hannover.

BILLON-BRUYAT, J.-P.; LÉCUYER, Ch.; MARTINEAU, F. & MAZIN, J.-M. (2005): Oxygen isotope compositions of Late Jurassic vertebrate remains from lithographic limestones of western Europe: implications for the ecology of fish, turtles and crocodilians. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **216**: 359-375, figs. 1-6. Amsterdam (Elsevier).

BRINKMAN, D. B.; STADTMAN, K. & SMITH, D. (2000): New Material of *Dinochelys whitei* Gaffney, 1979, from the Dry Mesa Quarry (Morrison Formation, Jurassic) of Colorado. *Journal of Vertebrate Paleontology*, **20 (2)**: 269-274.

FRERICHS, U. (2005): Knochen eines Landtieres im Untercampan von Höver (?). *Arbeitskreis Paläontologie Hannover*, **33**: 1 ff.

GAFFNEY, E. S. & MEYLAN, P. A. (1988): A phylogeny of turtles. 103-156. *In*: BENTON, M. J. (Ed.): *The phylogeny and classification of tetrapods*. Volume 1. *Amphibians, Reptiles, Birds. Systematics Association*. Special Volume **35A**. Oxford University Press, Oxford, 377 pp.

HUENE, F. V. (1956): *Paläontologie und Phylogenie der niederen Tetrapoden*. Fischer, Jena, 716 pp.

JANSEN, M. & KLEIN, N. (2010): Eine kleine Schildkröte (Reptilia: Testudines) aus dem oberen Jura Niedersachsens (Norddeutschland) und ihre Referenz für aquatische

Anpassung und Ontogenie. *Zitteliana*, **B 29**: 54. (Paläontologie im Blickpunkt. 80th Annual Meeting of the Paleontological Society in Munich, 5th-8th October 2010, abstracts, Munich).

KARL, H.-V. (2002): Übersicht über die fossilen marinen Schildkrötenfamilien Zentraleuropas (Reptilia, Testudines). *Mauritiana (Altenburg)*, **18 (2)**: 171-202.

KARL, H.-V.; GRÖNING, E.; BRAUCKMANN, C. & KNÖTSCHKE, N. (2008): First remains of the head of *Steneosaurus* (Crocodylomorpha: Teleosauridae) from the Late Jurassic of Oker (Lower Saxony, Germany). *Studia Geologica Salmanticensia*, **44 (2)**: 187-201.

KARL, H.-V.; GRÖNING, E.; BRAUCKMANN, C.; SCHWARZ, D. & KNÖTSCHKE, N. (2006): The Late Jurassic crocodiles of the Langenberg near Oker, Lower Saxony (Germany), and description of related materials (with remarks on the history of quarrying the "Langenberg Limestone" and "Obernkirchen Sandstone"). *Clausthaler Geowissenschaften*, **5**: 59-77.

KARL, H.-V.; STAESCHE, U.; TICHY, G.; LEHMANN, J. & PEITZ, S. (2007): Systematik der Schildkröten (Anapsida: Chelonii) aus Oberjura und Unterkreide von Nordwestdeutschland. Geologisches. Jahrbuch.; Hannover.

KEMPER, E. (1961a): Mikrofauna und Faziesfossilien im unteren Mittelvalendis Nordwestdeutschlands. *Neues Jahrbuch für Geologie und Paläontologie Monatshefte*, **2**: 87-94.

KEMPER, E. (1961b): Die Ammonitengattung *Platylenticeras* (=*Garnieria*). Mit einem Beitrag zur Stratigraphie und Bionomie ihrer Schichten (Untere Kreide, mittleres Valendis). *Beihefte Geologisches. Jahrbuch*., **47**: 195.

KEMPER, E. (1963): Die Aufschlüsse der Unterkreide im Raum Rheine-Ahaus. *Geologisches. Jahrbuch*., **80**: 447-494.

KEMPER, E. (1976): *Geologischer Führer durch die Grafschaft Bentheim und die angrenzenden Gebiete mit einem Abriss der emsländischen Unterkreide*. 5.ª ed. Nordhorn, Bentheim (Heimatverein Grafschaft Bentheim), 206 pp.

KEMPER, E. (1992): *Die tiefe Unterkreide im Vechte-Dinkel-Gebiet*. Losser (Stichting Het Staringmonument te Losser), 95 pp.

KUHN, O. (1964): Testudines. *In*: WESTPHAL, F. (Ed.): *Fossilium Catalogus*, I: *Animalia*, Pars **107**; 299 S. Gravenhage.

LAPPARENT DE BROIN, F. de (2001): The European turtle fauna from the Triassic to the Present. *Dumerilia*, **4 (3)**: 155-217.

MŁYNARSKI, M. (1976): Testudines. *In*: KUHN, O. (Ed.): *Encyclopedia of Paleoherpetology*, Part **7**: 130 pp.

NOPSCA, F. V. (1928): The genera of reptiles. *Palaeobiologica*, **1**: 161-188.

PÉREZ-GARCÍA, A.; DE LA FUENTE, M. S. & ORTEGA, F. (2011): *Hoyasemys jimenezi* gen. et sp. nov., a freshwater basal eucryptodiran turtle from the Lower Cretaceous of Spain. *Acta Palaeontologica Polonica* (in press): 10.4202/app. 2011.0031.

PRITCHARD, P. C. H. (1975): Directory of turtle genera. *Chelonia*, **2 (5)**: 1029.

ROMER, A. S. (1956): *Vertebrate paleontology*. 1st ed. 1945. Chicago, 687 pp.

SACHS, S. (1997): Erster Nachweis eines gepanzerten Dinosauriers (Reptilia, Ornithischia, Thyreophora) aus der Unterkreide (Berrias) von Gronau in Westfalen. *Neues Jahrbuch für Geologie und Paläontologie Monatshefte*, **1**: 56-64.

SUKHANOV, V. B. (1964): Testudinata. *In*: ORLOV, I. A. (Ed.): *Osnovy Paleontologii, part Amphibia, Reptilia, Aves*. Moskva, pp. 354-438.

WEGNER, T. (1911): *Desmemys Bertelsmanni* n. g. n. sp. Ein Beitrag zur Kenntnis der Thalassemydidae Rütimeyer. *Palaeontographica*, **LVIII**: 105-132.

WEGNER, T. (1914): *Brancasaurus brancai* n. g. n. sp., ein Elasmosauride aus dem Wealden Westfalens. *Branca-Festschrift*, **9**: 235-302. Borntraeger, Leipzig.

WEGNER, T. (1926): *Geologie Westfalens und der angrenzenden Gebiete*. 2. Auflage. Paderborn (Schöningh), 500 pp.

