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REVISION OF *CHELYDRA STRAUSI* SCHMIDT, 1966 (TESTUDINES: CHELYDRIDAE: CHELYDROPSINAE) FROM THE LATE PLIOCENE OF WILLERSHAUSEN, GERMANY

[Revisión de* Chelydra strausi *Schmidt, 1966 (Testudines: Chelydridae: Chelydropsinae) del Plioceno Superior de Willershausen, Alemania]

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ABSTRACT: The holotype (and hitherto single) specimen (part and counterpart) of *Chelydra strausi* Schmidt, 1966 from the Late Pliocene of the former clay pit of Willershausen (Lower Saxony, northwestern Germany) is revised for the first time. The main result of the present study is that it belong to the extinct genus *Chelydropsis* Peters, 1858, where it is preliminary assigned to *Ch*. aff. *nopcsai* (Szalai, 1934).

Key words: Late Pliocene, Willershausen, northwestern Germany, Testudines, Chelydropsinae, *Chelydra strausi* = *Chelydropsis* aff. *nopcsai*, revision.

RESUMEN: Se revisa por primera vez bajo aspectos nuevos el holotipo (y hasta ahora único ejemplar) (molde y contramolde) de *Chelydra strausi* Schmidt, 1966 del Plioceno tardío de la mina de arcilla en Willershausen am Harz (Baja Sajonia, noroeste de Alemania). El principal resultado de este estudio es que el ejemplar en realidad pertenece al género extinto *Chelydropsis* Peters, 1868 y provisionalmente a la especie *Ch*. aff. *nopcsai* (Szalai, 1934).

Palabras clave: Plioceno, Willershausen (NO de Alemania), Testudines, Chelydropsinae, *Chelydra strausi* = *Chelydropsis* aff. *nopcsai*, revisión.

Figure 1. Geographical position of the Late Pliocene Willershausen lake (from Google-Earth).

INTRODUCTION

The Upper Pliocene fossil lagerstätte Willershausen (Lower Saxony, Germany), a former clay pit, provided ann extraordinary rich faunal and floral assemblage and probably is the most diverse fossil site of the European Pliocene (e.g. KRÜGER, 1979; FERGUSON & KNOBLOCH, 1998; MEISCHNER, 1998, 2000; GEHLER, 2003; REICH & GEHLER, 2011). However, the reptile material from Willershausen is restricted to a single specimen (part and counterpart) of a juvenile chelydrid turtle only, unearthed by Adolf Straus in 1959, and firstly described as the new species *Chelydra strausi* by his academic teacher Hermann Schmidt (SCHMIDT, 1966).

The present article demonstates that *Chelydra strausi* Schmidt, 1966 really belongs to the extinct genus *Chelydropsis* Peters, 1868 where it is preliminary assigned to *Ch*. aff. *nopcsai* (Szalai, 1934).

A complete overview of the older literature on the fossil species of *Chelydra* and the Tertiary genus *Chelydropsis* in Central Europe has been compiled by KUHN (1964). In the last decades the following papers: CHKHIKVADZÉ (1989, 1990), DE BROIN (1977), DE LAPPARENT DE BROIN (2001), GAFFNEY & SCHLEICH (1994), GROSS (2002), HUTCHISON in STEYERMARK *et al*. (2008), MŁYNARSKI (1962, 1966, 1969, 1976, 1980a,b, 1981), PRITCHARD (1975), and SCHLEICH (1981, 1988) have added to our knowledge of these taxa.

The stratigraphic age and palaeoecology of the Willershausen Lagerstätte has been discussed in detail by MEISCHNER (2000). A short compilation was given by DLUSSKY *et al*. (2011).

TERMINOLOGY

Figure 2 shows a generalised reconstruction of the carapace and the plastron of *Emys* as an example for Testudines, without scale.

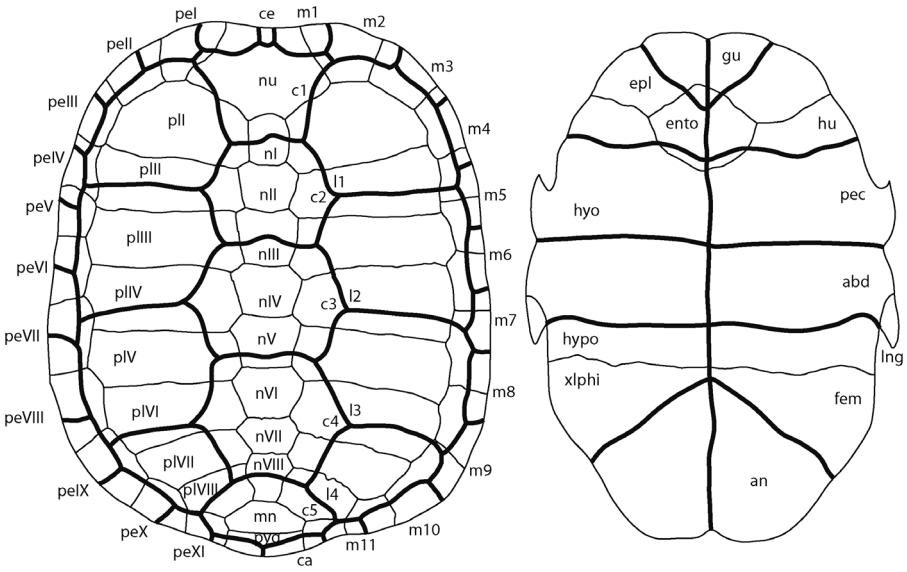

Figure 2. Terminology of the turtle shell (Emys orbicularis), *remarks in the text*.

Carapace plates: nuchal = nu, neurals = n I to n VIII, pleurals = pl I to VIII, peripherals = pe I to pe XI, metaneurals = mn I to II, pygal = py.

Carapace scutes: cervical = ce, centrals = c 1 to c 5, laterals = l 1 to l4, caudal = ca.

Plastron plates: epiplastrals = epi, entoplastron = ento, hyoplastron = hyo, hypoplastron = hypo, xiphiplastron = xiphi.

Plastron scutes: gulars = gu, humerals = hu, pectorals = pec, abdominals = ab, femorals = fe, annals = an.

SYSTEMATIC PALAEONTOLOGY

Order Testudines, Linnaeus, 1758

Gigaorder Casichelydia Gaffney, 1975

Megaorder Cryptodira Gray, 1825

Parvorder Eucryptodira Gaffney, 1975

Suborder Polycryptodira Gaffney, 1984

Superfamily Chelydroidae Gray, 1831

Family Chelydridae Agassiz, 1857

REMARKS: In consideration of both, the fossil and modern species, the current state of systematics of the Chelydridae as complied by HUTCHISON in STEYERMARK *et al.* (2008) is as follows:

Subfamily Protochelydrinae Gaffney, 1975

Denverus Hutchison & Holroyd, 2003

D. middletoni Hutchison & Holroyd, 2003

Protochelydra Erickson, 1973

P. zangerli Erickson, 1973

Subfamily Chelydropsinae Młynarski, 1980a

Chelydrasia Chkhikvadzé, 1999

Ch. minax Chkhikvadzé, 1971

Ch. poena Chkhikvadzé, 1971

Ch. apellanzini (Murelaga *et al.*, 1999)

Ch. decheni (H. v. Meyer, 1852)

Ch. sanctihenrici (De Broin, 1977)

"Ch." kusnetzovi (Chkhikvadzé, 1985)

Chelydropsis Peters, 1868

Ch. murchisoni (Bell, 1832) (syn. *Ch. carinata* Peters, 1868)

Ch. sansaniensis (Bergounioux, 1935)

Ch. nopcsai (Szalai, 1934) (syn. *Ch. pontica* [Pidoplichko & Tarashchuk, 1960])

Subfamily Chelydrinae Gray, 1870

Chelydra Schweigger, 1812

Ch. serpentina (Linnaeus, 1758)

Ch. rossignoni (Bocourt, 1868)

Ch. acutirostris Peters, 1862

Macrochelys Gray, 1856

M. schmidti Zangerl, 1945

M. auffenbergi (Dobie, 1968)

M. temmincki (Troost, 1935)

Subfamily Chelydropsinae Młynarski, 1980a

Genus *Chelydropsis* Peters, 1868

HISTORY OF RESEARCH: *Chelydropsis* Peters, 1868 (based upon *Ch. carinata* Peters, 1868) was originally distinguished from *Chelydra* Schweigger, 1812 by three characters which are now regarded as artificial or caused by individual variation, respectively:

(i) Two nuchal plates ("*doppelte Nuchalknochenplatte*"),

(ii) double peripheral row ("*Marginalplatten*"= bony plates, marginals and supramarginals III to VIII but no horny shields or scutes),

(iii) neurals more slender and angular ("*mehr winkelig*") as in *Chelydra*.

Subsequent authors regarded *Chelydropsis* as superfluous, but Chkhikvadzé (1971) accepted this genus. DE LAPPARENT DE BROIN (2001) subdivided it into two species groups:

i. *Chelydropsis decheni* (v. Meyer, 1852) (plate 1, figure D-E; plate 2 figure A-D here) and *Ch. sanctihenrici* De Broin, 1977, both from the Oligocene and

ii. *Chelydropsis murchisoni* (Bell, 1832) (plate 1, figure A-B; plate 2, figure E here) from the Miocene.

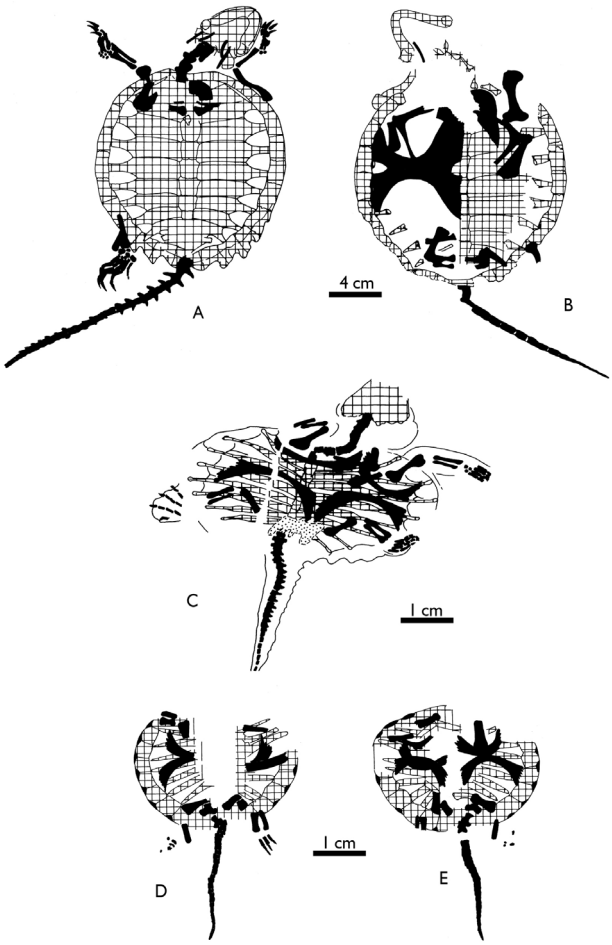

Plate 1. Figure A-B. Chelydropsis carinata *Peters, 1868 (*= Ch. murchisoni *Bell, 1832), Miocene, Öhningen (both slabs*: *A and B), after H. v. MEYER (1852). Ink sketch showing the distribution of skeletal remains and the long tail. Figure C.* Chelydropsis *aff.* nopcsai *(Szalai, 1934)*: *holotype of "*Chelydra strausi *Schmidt, 1966", Late Pliocene Willershausen lake, after SCHMIDT (1966), ink sketch showing the distribution of skeletal remains and the long tail. Figure D.* Chelydrasia decheni *(H. v. Meyer, 1852) (syn.* Chelydra decheni *H. v. Meyer, 1852), Oligocene, Rott (pit "Johanna Fundgrube"), ink sketch showing the distribution of skeletal remains and the short tail. A*: *after H. V. MEYER (1852), B*: *after H. V. MEYER (1865). Figure E.* Chelydrasia decheni *(H. v. Meyer, 1852) (syn.* Chelydra decheni *H. v. Meyer, 1852), Oligocene, Rott. A*: *Same specimen as in figure 5B, after H. V. MEYER (1852), pit "Johanna Fundgrube", posterior area of carapace. B*: *Nearly complete young individual in dorsal view, after H. V. MEYER (1865), pit "Krautgarten". Ink sketches showing the distribution of skeletal remains and the short tail. Figures A-E: Grid = carapace and skull, black = axial elements, extremities and plastron.*

MŁYNARSKI (1980a, b) added a third species group, which includes the following species:

iii. Chelydropsis pontica (Pidoplichko & Tarashchuk, 1960) which was originally described from its type horizon at the Plio-Pleistocene boundary in the Ukraine. Additional material was recorded from Pliocene deposits in other regions of Europe, as for examples in Moldavia (see also KHOSATZKI & REDKOZUBOV, 1989), Bohemia, Slovakia and probably Germany (DANILOV, 2005), and *Chelydropsis nopcsai* (SZALAI, 1934) from the Pliocene of Hungary and Central Europe. The taxon was originally described from a mandibular fragment with both dentaries and placed as an independent species in the genus *Trionyx* Geoffroy, 1809. MŁYNARSKI (1981) regarded *Chelydropsis nopcsai* (SZALAI, 1934) as a senior synonym of *Ch. pontica* (Pidoplichko & Tarashchuk, 1960).

The most eastern Chelydropsinae are compiled by CHKHIKVADZÉ (1989, 1990) from Kazakhstan:

iv. Chelydropsis minax Chkhikvadzé (1971), Oligocene, Zaizan Basin;

v. Chelydropsis kusnetzovi Chkhikvadzé (1985), Pliocene, Pavrodar;

vi. Chelydropsis poena Chkhikvadzé (1971), Miocene, Zaizan Basin.

Up to now, only two species from the German Tertiary were assigned to *Chelydropsis*: *Ch. decheni* (Oligocene, Rott near Bonn) and *Ch. murchisoni* (Miocene, Dechbetten, Frechen: KLEIN & LIEVEN, 2007; STRAUCH, 1990; Hambach; Öhningen; Sandelzhausen, etc.; skulls from Unterwohlbach: GAFFNEY & SCHLEICH, 1994). A subspecies of the latter, *Ch. murchisoni staeschei* Młynarski, 1980a, was described from the Late Miocene of the Steinheim Basin in southern Germany. In comparison with *Ch. murchisoni*, the epiplastrals of *Ch. decheni* are small and not crossed by the humeropectoral sulcus. This area is not preserved in the holotype of "*Chelydra strausi*" (plate 3), which shows typical characters of a very young individual (plate 1, figure C). KLEIN & MÖRS (2003) reported further remains of *Chelydropsis* from the Late Pliocene of Hambach (Rhineland, NW Germany). The same authors also described remains of *Chelydropsis murchisoni* from the same locality, but of an older (Middle Miocene) age.

As already mentioned by H. V. MEYER (1852) and also discussed by SCHMIDT (1966), the main difference between *Chelydropsis decheni* and *Ch. murchisoni* is the length of the tail. With the same size and the same number of tail vertebrae, the tail of *Ch. murchisoni* is significantly longer than in *Ch. decheni*, but of similar proportions as in "*Chelydra strausi*". This was the reason for KARL *et al.* (2008) to determine the Willershausen specimen as *Chelydropsis* cf. *murchisoni*. *Chelydropsis decheni* was quite recently removed from *Chelydropsis* and assigned to the genus *Chelydrasia* Chkhikvadzé, 1999.

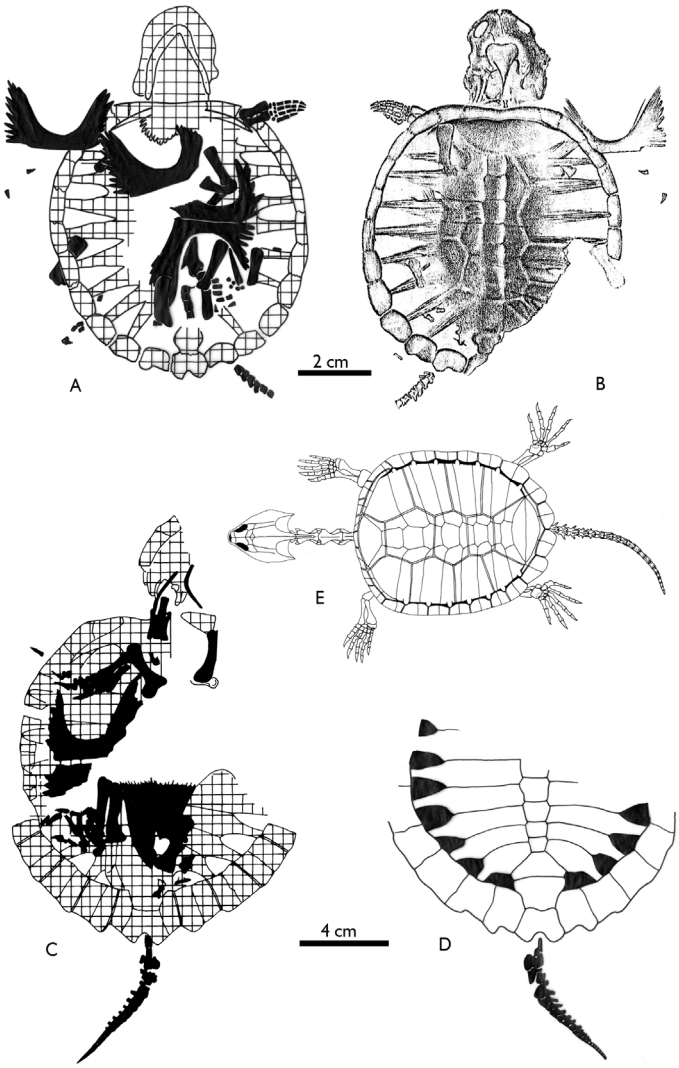

Plate 2. Figure A-B. Chelydrasia decheni *(H. v. Meyer, 1852) (syn.* Chelydra decheni *H. v. Meyer, 1852), Oligocene, Rott, pit "Krautgarten", after H. v. Meyer (1856). A*: *Dorsal view. B*: *ventral view. Ink sketches showing the distribution of skeletal remains and the extremely short tail of this very young individual. Grid = carapace and skull, black = axial elements, extremities and plastron. Figure C-D.* Chelydrasia decheni *(H. v. Meyer, 1852) (syn.* Chelydra decheni *H.v. Meyer, 1852), Oligocene, Rott, pit "Krautgarten", after H. v. Meyer (1852). Ink sketch showing the distribution of skeletal remains and short tail. Grid = carapace and skull, black = axial elements, extremities and plastron. Figure E.* Chelydropsis carinata *Peters, 1868 (syn.* Chelydropsis murchisoni staeschei *Młynarski, 1980a), Late Miocene, Steinheim Basin, after Młynarski (1980a).*

Chelydropsis aff. ***nopcsai*** **(Szalai, 1934)**

SYNONYMS:

- "Die amerikanische Schildkrote *Chelydra*", SCHMIDT, 1961: 4;
- *Chelydra straussi* Schmidt, 1966: 25, fig. 1.
- "die einzige Schildkröte… Gattung *Chelydra*", STRAUSS, 1966: 63.
- "Schildkröte der Gattung *Chelydra*… von H. Schmidt 1966 als neue Art BESCHRIEBEN", STRAUSS, 1967: 22.
- "Sumpfschildkröte *Chelydra straussi* H. Schmidt 1967", GERSDORF, 1968, 1977: 2.
- *Chelydra straussi* Schmidt, MŁYNARSKI, 1968: 352.
- "eine ausgestorbene Art der Alligatorschildkröten", GERSDORF, 1977: 2.
- "eine Schildkröte der heute in Amerika lebenden Gattung *Chelydra*", STRAUSS, 1978: 132.
- "eine neue Art der heute in Amerika heimischen Gattung *Chelydra*", STRAUSS, 1979: 32.
- *Chelydropsis straussi* (Schmidt), GAUDANT, 1977: 3.
- *Chelydra straussi*, FERGUSON & KNOBLOCH, 1998: 282.
- "Alligator-Schildkröte" *Chelydra straussi* Schmidt 1966, KRÜGER, 1998: 186, unnumb. fig. (lower).
- "di tartarughe (*Chelydra*)", MEISCHNER, 2000: 225.
- *Chelydropsis straussi* (Schmidt, 1966): GEHLER, 2003: 26.
- *Chelydropsis straussi* (Schmidt, 1966), *Chelydropsis murchisoni-sansaniensis*-Gruppe: KLEIN & MORS, 2003: 21-22.
- "eine juvenile Schildkröte der Familie Chelydridae", GEHLER & REITNER, 2004: 91.
- *Chelydropsis* cf. *murchisoni* (Bell, 1832), KARL, GEHLER & REICH, 2008: 96.

MATERIAL: Holotype (part and counterpart), GPIG/GZG.W.05873a: "Straus 5873a+b", Göttingen collection: nearly complete juvenile specimen (plate 1-C; plate 3, figures 1-2); the epithet "*straussi*" was chosen in honour of the palaeobotanist Dr. Adolf Straus (1904-1986), Berlin.

HOLOTYPE (PART): Small juvenile individual (hatchling; first or second year) in dorsal view as shown in plate 1. Measurements: length of trunk ~25 mm; width of carapace ~61 mm; length of tail ~34 mm, tail including 25 vertebrae. Further bones are preserved nearly in the origin position: both humeri, radii, and ulnae; metatarsals of the left hand; both femora, tibiae, and fibulae; metacarpals of the left foot, phalanxes of the last three toes. Possible remains of skin impressions surround the shell (unossified peripherals), the neck and the right foot. The skull is preserved in palatal view without the broken rostral area. As regarded by SCHMIDT (1961, 1966), the main character of the Willershausen specimen is the relatively

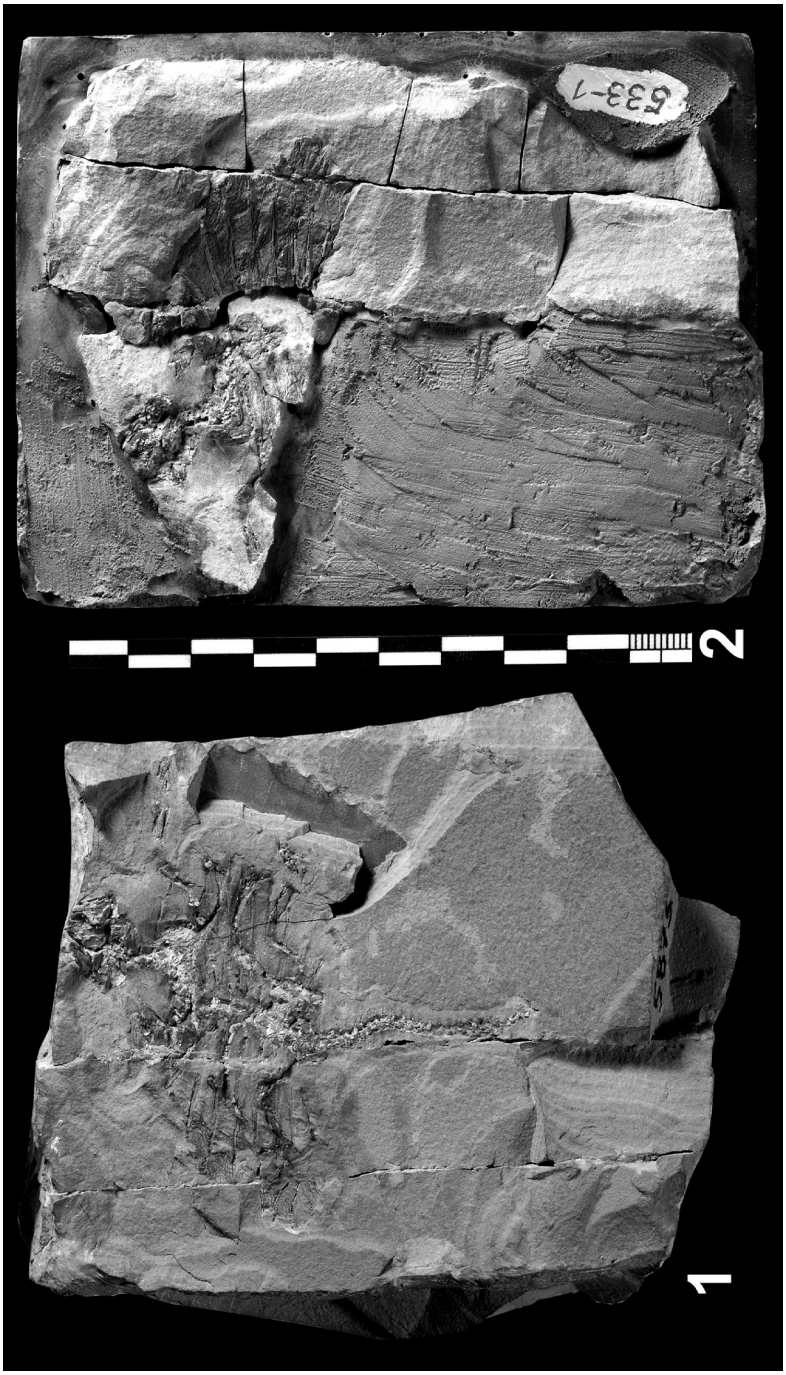

Plate 3. Figures 1-2. Chelydropsis *aff.* nopcsai (*Szalai, 1934*): *1. Holotype (part) and 2. Holotype (counterpart) of* "Chelydra strausi *Schmidt, 1966", Late Pliocene, Willershausen, Lower Saxony, Germany. Fossil lagerstätte Willershausen collection of the "Geoscience Museum", Göttingen University, GZG.W.05873a + b (original publication number #533), photograph GZG.*

short distance of the lateral wings of the bridge (lateral hyo- and hypoplastral processes), but the individual was too immature for a differentiation on specific level. The maximal carapace length of "*Chelydropsis murchisoni*" is 35 cm and thus much larger than in the Willershausen specimen (DANILOV, 2005).

HOLOTYPE (COUNTERPART): Some remains of the skeleton corresponding with the plate (see above), including skull, neck, left arm and parts of the right shell and foot. The fossil is distributed over ten single rock fragments.

CONCLUSIONS

Chelydropsis murchisoni (Bell, 1832) and its younger synonym *Ch. carinata* Peters, 1868 are of Miocene age and thus distinctly older than the Willershausen specimen. Furthermore, due to the immature characters and the lack of important features of the skull of the latter, a direct comparison between *Ch. murchisoni* and "*Ch. strausi* Schmidt, 1966" is impossible. Therefore we prefer to assign the Willershausen specimen tentatively to the contemporaneous (Pliocene) species *Ch.* aff. *nopcsai* (Szalai, 1934).

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