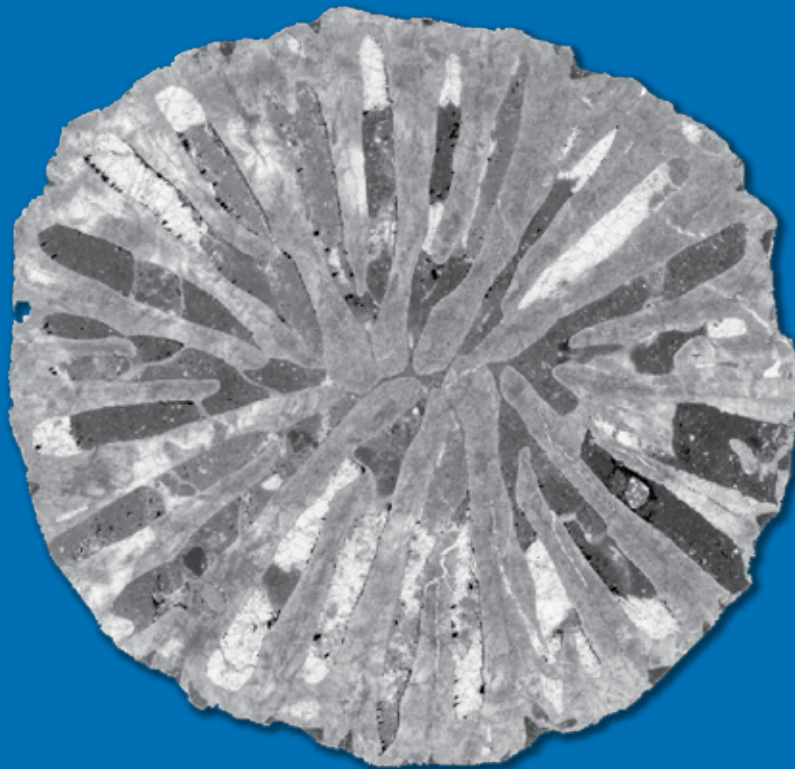


# Zitteliana

An International Journal  
of Palaeontology and Geobiology

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

53



München 2013



Bayerische  
Staatssammlung  
für Paläontologie und Geologie

- Zitteliana A 53, 169 – 177
- München, 31.12.2013
- Manuscript received  
13.12.2013; revision  
accepted 31.12.2013
- ISSN 1612 - 412X

## Transfer of type specimens of fossil fishes to the Bavarian State Collection for Palaeontology and Geology with some notes on their history of research

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### Abstract

Recent acquisitions to the Bavarian State Collection for Palaeontology and Geology comprise part of the palaeontological collections of the former Heimatmuseum Bad Windsheim and the former Institute of Palaeontology and Geology at the University of Würzburg. Among the specimens are the holotypes of three fishes, *Aphelolepis delpi* Heller, 1953, *Crenilepis sandbergeri* Dames, 1888 and *Coelacanthus giganteus* Winkler, 1880. The type specimen of *Crenilepis sandbergeri* erroneously has been reported as being lost, while *Coelacanthus giganteus* has been regarded even as a nomen nudum. *Crenilepis* Dames is shown to be nomenclaturally valid, while „*Crenilepis* Reis, 1887“ is not available, „*Crenolepis* Carus 1888“ is a misspelling, and „*Crenilepoides* Strand, 1929“ is an unjustified replacement name.

**Key words:** type specimens, *Aphelolepis delpi*, *Crenilepis sandbergeri*, *Coelacanthus giganteus*, *Ceratodus*, Middle Triassic

### Zusammenfassung

Neuere Zuwächse der Bayerischen Staatssammlung für Paläontologie und Geologie umfassen Teile der paläontologischen Sammlungen des früheren Heimatmuseums Bad Windsheim und des früheren Instituts für Paläontologie und Geologie der Universität Würzburg. Unter den bedeutenderen Stücken sind die Holotypen der Fische *Aphelolepis delpi* Heller, 1953, *Crenilepis sandbergeri* Dames, 1888 und *Coelacanthus giganteus* Winkler, 1880. Das Typusexemplar von *Crenilepis sandbergeri* wurde irrtümlich als verloren angesehen und *Coelacanthus giganteus* sogar als nomen nudum bezeichnet. Es wird gezeigt, dass *Crenilepis* Dames nomenklatorisch valide ist und dass „*Crenilepis* Reis, 1887“ nicht verfügbar, „*Crenolepis* Carus, 1888“ lediglich ein Schreibfehler und „*Crenolepoides* Strand, 1929“ ein überflüssiger Ersatzname ist.

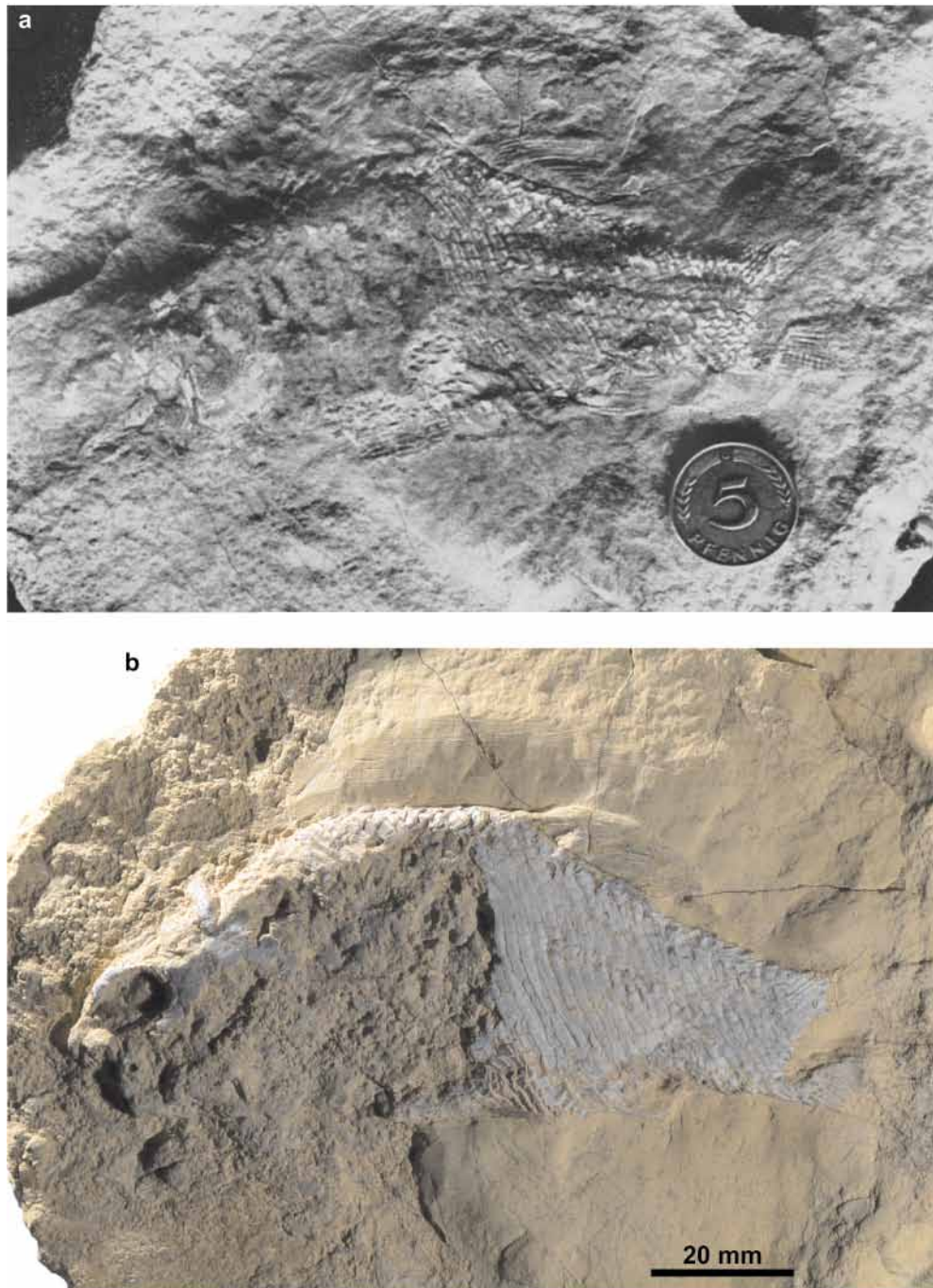
**Schlüsselwörter:** Typusexemplare, *Aphelolepis delpi*, *Crenilepis sandbergeri*, *Coelacanthus giganteus*, *Ceratodus*, Mittlere Trias

### 1. Introduction

The Bayerische Staatssammlung für Paläontologie und Geologie München (Bavarian State Collection for Palaeontology and Geology in Munich, SNSB-BSPG) recently has obtained larger parts of palaeontological collections which include type material from the Heimatmuseum Bad Windsheim and the Institute of Palaeontology and Geology at the University of Würzburg. The privately held Heimatmuseum Bad Windsheim collection of mainly archaeological items contained also some several hundred palaeontological specimens and was handed over by contract to the Archaeological State Collection (then Prähistorische Staatssammlung, now Archäologische Staatssammlung München) in 1977. Recently (2012) it was decided, that the palaeonto-

logical items might be better stored at the relevant state collection, i. e. the SNSB-BSPG.

The large and rich collection of the Institute of Palaeontology and Geology at the University of Würzburg (usual acronym PIW) contained roughly estimated some 100000 specimens. In 2008 this collection was renounced by its owner on occasion of the shutdown of that Institute and the transfer to SNSB-BSPG negotiated. A history of the Würzburg collection and an overview of material will be presented elsewhere. Due to the large size of this collection an exhaustive curatorial and integrative logistic handling of the material will probably take decades due to lack of additional work capacity. The purpose of this initial note is to announce the transfer of type material of some fossil fishes to the SNSB-BSPG with some remarks added on their



**Figure 1:** Holotype of *Aphelolepis delpi* Heller, 1953, SNSB-BSPG 2012 XVI 11; **(a)** photograph reproduced from Heller (1953, pl. 6), note lighting from down right; **(b)** new photograph.

type localities and ages as well as on their history of research.

Abbreviations

ASM-MBW former Heimatmuseum Bad Windsheim, now Archäologische Staatssammlung München, Zweigmuseum Archäologiemuseum im Fränkischen Freilandmuseum Bad Windsheim  
PIW former Paläontologisches Institut der Julius-Maximilians-Universität Würzburg (shutdown in 2006)  
SNSB-BSPG Staatliche Naturwissenschaftliche Sammlungen Bayerns, Bayerische Staatssammlung für Paläontologie und Geologie, München

## 2. Systematic Palaeoichthyology

Actinopterygii

Semionotiformes

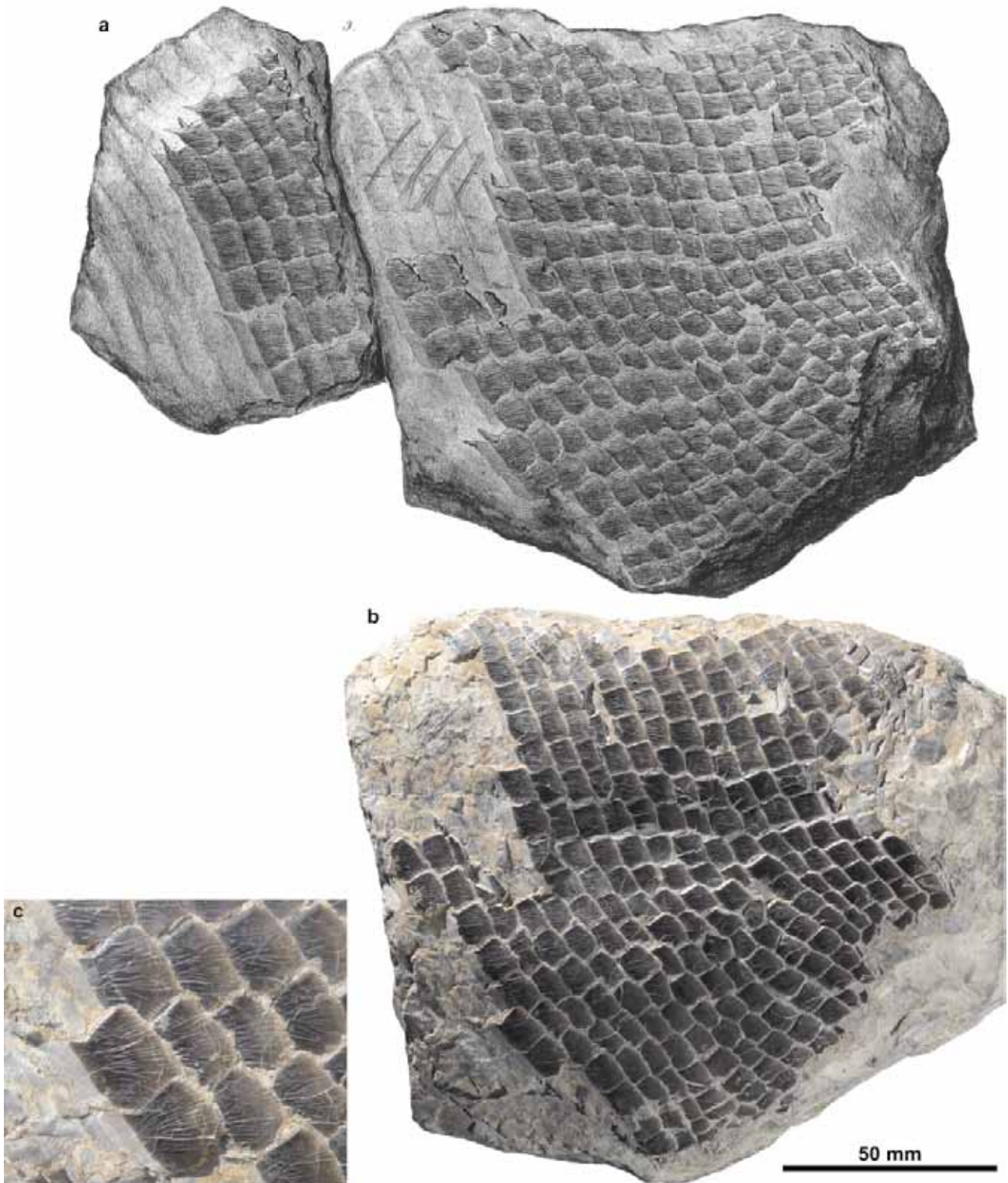
*Aphelolepis delpi* Heller, 1953

SNSB-BSPG 2012 XVI 11

formerly housed at ASM-MBW 1982-1563

Fig. 1

Holotype described and figured by Heller, 1953, Geol. Bl. NO-Bayern, 3: 81-87, pl. 6 (reproduced in Fig.1a), and Böttcher & Gregor (1983: 30, 32, pl. 2, fig. 3).



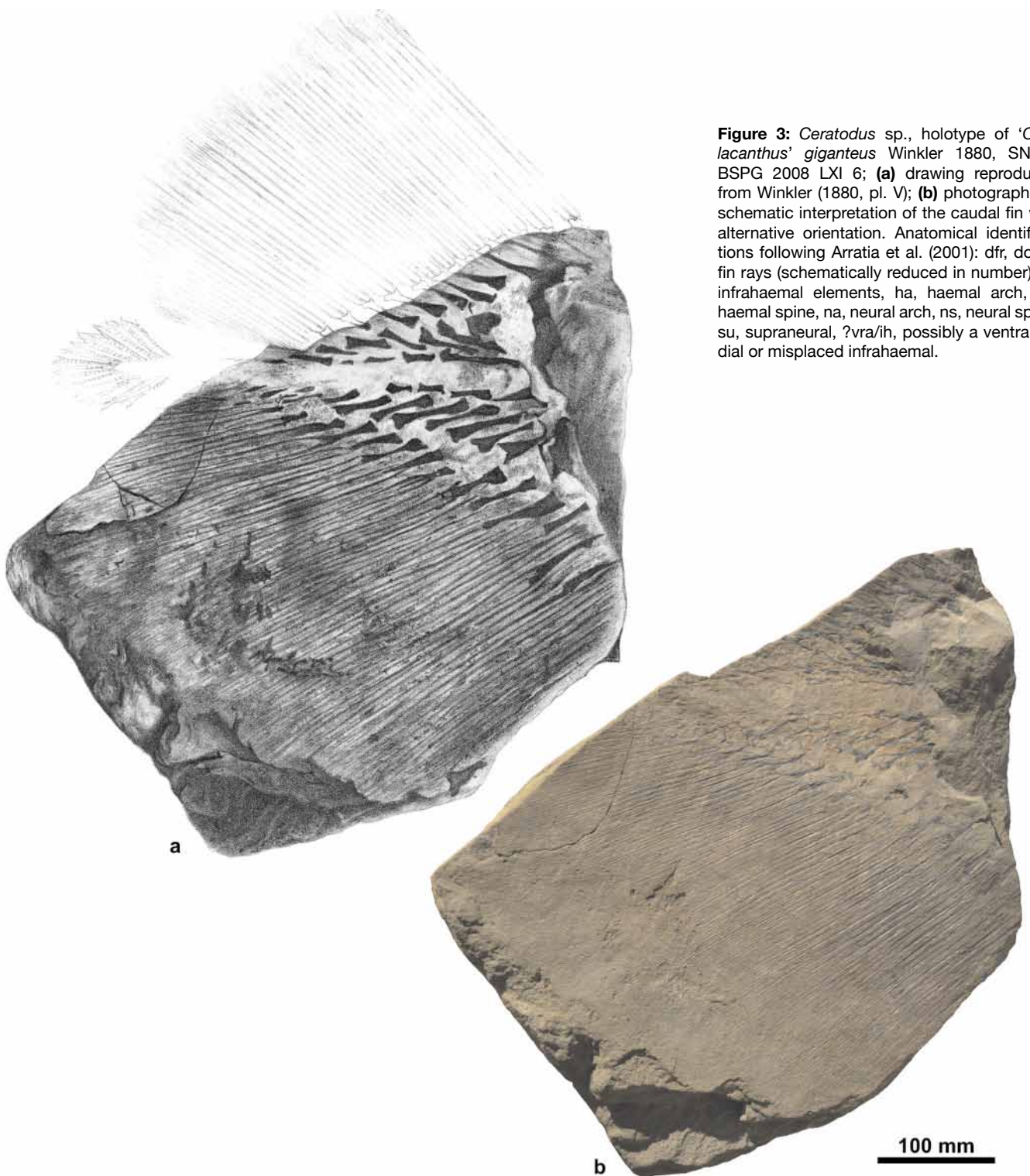
**Figure 2:** Holotype of *Crenilepis sandbergeri* Dames, 1888, SNSB-BSPG 2008 LXI 5; **(a)** drawing reproduced from Dames (1888, pl. XV, fig. 3); **(b)** photograph; **(c)** detail of scales.

Type locality: Quarry between Bergtshofen and Buchheim, NE of Burgbernheim.

Type horizon: Grenzdolomit, Lower Keuper.

Age: Ladinian, Middle Triassic.

Remarks: The species was named in honour of Hermann Delp, then director of the Heimatmuseum Bad Windsheim, who obtained the specimen. Since the description by Florian Heller and accounting for the different appearance of the specimen as shown in figs. 1a and 1b, the specimen has apparently lost



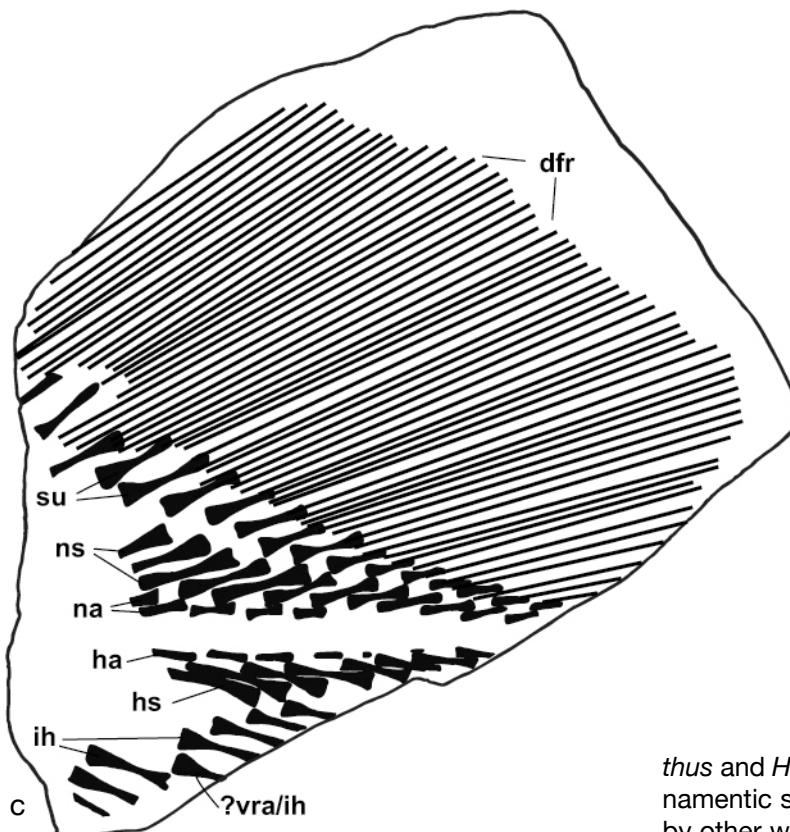
**Figure 3:** *Ceratodus* sp., holotype of '*Coelacanthus*' *giganteus* Winkler 1880, SNSB-BSPG 2008 LXI 6; **(a)** drawing reproduced from Winkler (1880, pl. V); **(b)** photograph; **(c)** schematic interpretation of the caudal fin with alternative orientation. Anatomical identifications following Arratia et al. (2001): dfr, dorsal fin rays (schematically reduced in number), ih, infrahaemal elements, ha, haemal arch, hs, haemal spine, na, neural arch, ns, neural spine, su, supraneural, ?vra/ih, possibly a ventral radial or misplaced infrahaemal.

some scales and bones. Apart from Heller (1953), the specimen was only once shortly characterized and figured by Böttcher & Gregor (1983: 30, 32, pl. 2, fig. 3). Otherwise, *Aphelolepis* has hardly ever been mentioned in the scientific literature and if, it has been listed as a semionotiform without any discussion (e.g. Romer 1966: 353; Carroll 1988: 603; Gardiner 1993: 618; Sepkoski 2002: 308; Gallo 2005: 768; Sytchevskaya et al. 2009: 205). The taxon is therefore in need of revision.

Perleidiformes  
*Crenilepis sandbergeri* Dames, 1888  
 SNSB BSPG 2008 LXI 5  
 formerly housed at PIW.  
 Fig. 2

Holotype described and figured by Dames, 1888, 170-171, pl. XV, fig. 3 (reproduced in Fig. 2a).

Type locality: Krainberg (or Greinberg) in Würzburg.



Type horizon: Quaderkalk-Formation (Semipartitus-Schichten); Zone of *Ceratites* (*Discoceratites*) *semipartitus* (Buch, 1849), Oberster Muschelkalk, mo3 (Sandberger 1890: 30).

Age: Lower Ladinian, Middle Triassic.

Remarks: The species was named in honour of its discoverer Fridolin Sandberger, then Professor at the University of Würzburg. Jordan (1920: 440) dubbed the type-specimen “a fragment of a scale from the Muschelkalk of Krainberg”, which is obviously incorrect (cf. Fig. 2) and probably derived from the introductory sentence by Dames (1888: 170): “Zur Aufstellung einer neuen Gattung giebt ein grosses, schön erhaltenes Schuppenstück eines grossen Fisches Veranlassung...”. The old fashioned term “Schuppenstück” refers to a ‘piece with scales’ or ‘part of the scaly armor of a fish’, i. e. part of the squamation, not a single scale. The specimen originally was composed of two rock pieces yielding the scale rows (cf. fig. 2a), of which the smaller anterior piece has been lost and only the larger posterior part is preserved at the BSPG. Furtheron the preserved piece has lost several of the scales during the last 125 years. Woodward (1895: 314) regarded *Crenilepis sandbergeri* as “a generically indeterminable portion of squamation which may belong either to the Palaeoniscidae or to a fish resembling *Eugna-*

*thus* and *Heterolepidotus*”. However, the delicate ornamental structure of the scales has been identified by other workers as diagnostic and referable as distinct genus within the Colobodontidae and Perleidiiformes (e.g. Gardiner 1967: 200; Mutter 2004: 199). Additional material from France, Italy, Germany, Switzerland and Spain has been attributed to *Crenilepis* by various authors (Stolley 1920: 43-44 with *Colobodus bassanii* de Alessandri, described from Italy, transferred to *Crenilepis* as a second species; Corroy 1929: 102, pl. XII, figs 29-30; Ørvig 1978: 51, fig. 34; Diedrich 2003: 142, fig. 21; Fortuny et al. 2011: 72; Mutter 2004: 199-201, but in the latter work note that neither Nybelin 1977: 12 - or Lehman 1966: 114 before - nor Schultze & Kriwet 1999 did refer *Crenilepis* to *Colobodus*). However, Sun et al. (2008: 366) challenged the referral of material of other localities to *Crenilepis* for stratigraphic and diagnostic reasons and stated that the type specimen of *Crenilepis sandbergeri* “is lost, and, anyway, the specimen was an undiagnostic fragment of body”. It appears, that for about a century the original material has not been studied by any palaeoichthyologist and any comparisons are based on the figure in Dames’ work.

A close view at the scales (Fig. 2c) shows a characteristic irregularly branching pattern of loosely spaced and rather smooth wrinkles or furrows (cf. descriptions and figures by Dames 1888; Woodward 1889: 460; Schmidt 1928: 367, fig. 1034), much unlike the regular parallel pattern of closely spaced strong wrinkles on scales from Monte San Giorgio material depicted by Mutter (2004: 203, fig 4) and attributed by him to *Crenilepis* and *Colobodus*. It appears thus that *Crenilepis sandbergeri* is a distinguishable and potentially valid taxon but is in need of further investigation.

Note on nomenclature: In addition to the taxonomic uncertainty noted above, *Crenilepis* apparently causes some nomenclatural trouble, with two other names occasionally used as replacements: “*Crenolepis*”, is attributed to Carus 1888 in various nomenclators (Schulze et al. 1928: 825, Neave et al. 1939: 868) and regarded as a replacement name for the presumably preoccupied *Crenilepis* Dames 1888. From probably one of these nomenclators “*Crenolepis*” re-entered as presumably available name into scientific works (e.g. Romer 1966: 353; Gardiner 1967: 200; Carroll 1988: 602; Sepkoski 2002: 307; Jin et al. 2003: 181). However, “*Crenolepis*” is just a misspelling of *Crenilepis* Dames in a bibliographical listing of new zoological works, citing Dames (1888) and just noting the genus name as new (but not as a replacement of *Crenilepis*) (Carus 1888: 640). “*Crenolepis*” has therefore no nomenclatural standing and cannot be used e.g. as a replacement name for *Crenilepis*.

More decisively, Strand (1929: 27) reported “*Crenilepis* Reis, Sitz.-Ber. Akad. Wiss. München 1887, fasc. 1. p. 40, t. 5, f. 3 (1887)” as older homonym of *Crenilepis* Dames, 1888 and he proposed “*Crenilepoides* Strand n. n.” as replacement (“*Crenilepoides*” in Carroll 1988: 602 is a misspelling). “*Crenilepoides*”, however, became largely ignored by later workers and *Crenilepis* was used still by most recent authors. The latter procedure is correct, since the above cited work by Reis does not exist: The Sitzungsberichte der Bayerischen Akademie der Wissenschaften 1887 have no work by Otto Maria Reis and the volume for 1887 no plates at all, and in addition, no known works of Reis deal with *Crenilepis*, so the citation is erroneous. Moreover, the indicated details “p. 40, t. 5, f. 3” apply obviously to the work by Dames 1888 on *Crenilepis sandbergeri*, with the numbering of pages and plates from the reprint edition cited. There is therefore no need to replace *Crenilepis* Dames; *Crenilepoides* Strand, 1929 is an unnecessary and erroneously given replacement name.

Dipnoi

Ceratodontiformes

‘*Coelacanthus*’ *giganteus* Winkler, 1880

currently assigned to *Ceratodus* sp.

SNSB-BSPG 2008 LXI 6

formerly housed at PIW, No. F 806 (fide Kelber &

Okrusch 2006: 84)

Fig. 3

Holotype described and figured by Winkler, 1880, 170-171, pl. V (reproduced in Fig. 3a). Also figured by Schmidt (1928: 346, fig. 968 after Winkler), Geyer (2002: 260, fig. 115, photography), Simon et al. (2003: 921, fig. 8) and Kelber & Okrusch (2006: 84, fig. 4c); the latter two as photography from the exhibit in the former Palaeontological Institute in Würzburg).

Type locality: Werksandsteinbruch at the Faulenberg in Würzburg (Deecke 1926: 86; Geyer 2002: 260; Kelber & Okrusch 2006: 84, 92)

Type horizon: Upper layers of the Lettenkohlen-Sandstein (Winkler 1880: 34), i.e. Hauptsandstein or Werksandstein of the Lettenkohlenkeuper, uppermost ku1.

Age: Ladinian, Middle Triassic.

Remarks: Fossil finds of *Ceratodus* consisting of teeth had long been known in Middle and Western Europe and were thought to belong to some extinct chondrichthyan (cf. Agassiz 1838). In 1870, a recent member of this genus was discovered in Australia and named as ‘*Ceratodus*’ *forsteri* Krefft. In the 1870ies there was therefore some hype to get specimens of this living fossil for European museums. The knowledge of the complete skeleton of ‘*Ceratodus*’ *forsteri* (now *Neoceratodus*) afterwards would have allowed the identification of fossil postcranial remains of *Ceratodus* s. str., of which but only one is known: SNSB-BSPG 2008 LXI 6.

The specimen was found in summer 1874 at the Faulenberg quarry during a field trip led by Prof. Fridolin Sandberger by one of his students, Théagène Akestorides. The fish originally was complete but had been broken into pieces by the quarry workers. In a letter dated 11th February 1875 [see appendix], and an accompanied sending of 2 photographs, Sandberger asked fish expert Franz Steindachner from Vienna for identification of the fossil fish (letter legacy of Steindachner, No. 433.01, Naturhistorisches Museum Wien). The fish was then publicly introduced in 1877 at a scientific congress in Munich by Sandberger (1877: 155), who showed “the larger part of the skeleton of a fossil fish” [transl.]. Prof. Franz von Leydig – a zoologist of Tübingen (formerly Würzburg) and an expert on lungfishes but not present at the meeting – is reported by Sandberger as the first to identify the fish as *Ceratodus* (see also Quenstedt 1885: 295; Teller 1891: 33), a view confirmed by Franz Steindachner at the meeting. In conclusion, the specimen was referred to *Ceratodus kaupii* on reason of *C. kaupii* teeth found stratigraphically a few feet above (Sandberger 1877: 155). In 1878 Sandberger was at a meeting of the Senckenbergische Naturforschende Gesellschaft in Frankfurt, where a recent *Neoceratodus forsteri* was just new and exhibited. Sandberger reported on this occasion the finding of a “skeleton without teeth” of the fossil species *Ceratodus kaupii* (Sandberger 1878: 144-145).

In 1879, Sandberger sent the specimen to Tiberius Cornelius Winkler in Haarlem, who described it – quite surprisingly – as a coelacanth and added in his plate-figure a supposed supplementary caudal fin typical of coelacanths (cf. Fig. 3a). Winkler (1880: 33-39) based on this partial skeleton a new species

which he called *Coelacanthus giganteus*. Karl Alfred von Zittel (1887: 259-260; see also Teller 1887: 148) from Munich rejected Winkler's view and again pointed out the dipnoan affinities based on detailed morphological description. Zittel assumed identity with *Ceratodus*, the common dipnoan of the German Triassic, after comparison with the skeleton of the recent dipnoan *Neoceratodus forsteri*. After the discovery of cranial material of *Ceratodus* in Austria (Stur 1886: 381), Sandberger sent unrequested the caudal remain from Würzburg to Vienna for further studies (Stur 1887: 31). In Vienna, Friedrich Teller (1891: 3, 33-34) studied the original material and added to the description of the fin, further demonstrating the erroneous reconstruction of the tail fin by Winkler. Teller assigned SNSB-BSPG 2008 LXI 6 to *Ceratodus kaupii*. Most later authors (Sandberger 1890: 39; Woodward 1891: 273; Woodward in Miall 1907: 33; Peyer in Stromer & Peyer 1917: 65; Deecke 1889: 113, 1926: 85, 87; Stromer 1938: 249; Schultze 1992: 283) accepted the determination by Zittel and kept '*Coelacanthus*' *giganteus* in synonymy of *Ceratodus* sp. However, Loth et al. (2013: 158) still mentioned *Coelacanthus giganteus* as name of the lungfish. And also rather recently, Cloutier & Forey (1991: 72) and Forey (1998: 364), in discussing the fossil record of actinistians, regarded *Coelacanthus giganteus* Winkler, 1880 as a "nomen nudum", which is objectively incorrect since the type material was described and figured by Winkler and is still available and not lost.

Geyer (2002: 260) called attention to the tail as supposed "only lungfish from the Germanic Keuper known so far" [transl.]; however *Ceratodus* teeth from the Keuper were already reported by Sandberger (1877: 155) and before and since then by many others (e.g. Plieninger in Meyer & Plieninger 1844: 85; Schmidt 1938: 116; also probably Agassiz 1838: 135, cf. Schultze 1992: 267). Nevertheless, up to now, SNSB-BSPG 2008 LXI 6 is the most complete postcranial remain of a *Ceratodus* or a Triassic lungfish in Europe (for more complete other fossil dipnoans see e.g. Arratia et al. 2001 for a restoration of a complete *Paraceratodus* from the Lower Triassic of Madagascar and other refs therein, and Schultze 1992, 2004 for the fossil record of *Ceratodus* and dipnoans in general).

Note on orientation and size of the animal: The specimen, indicating a large fish, consists only of the mid-caudal portion of the skeleton, which is therefore of limited use for a whole body size estimation. Sandberger (1878: 144-145) was the first with an estimate and assumed the size of the fossil form to be 6 times the size of the recent species '*Ceratodus*' *forsteri*. Later however, Sandberger (1882: 15) reported the body size to be only about 1.2 m. Winkler (1880: 39), based on comparison with '*Coelacanthus harlemensis*' (the coelacanth *Coccoderma*), estimated the size of '*Coelacanthus*' *giganteus* at about 2.5

m. This size estimate was accepted recently by Simon et al. (2003: 921) for the lungfish.

A comparison of SNSB-BSPG 2008 LXI 6 with completely known Triassic lungfishes like *Paraceratodus* (Schultze in Arratia et al 2001: fig. 28B) and *Gosfordia* (Ritchie 1981: fig. 2b) indeed shows an impressive size: *Gosfordia truncata* Woodward is known from a complete specimen of 50 cm length; the dorsal fin rays are generally longer than the ventral ones and attain about 10 cm length (measurement taken from figure). In BSPG 2008 LXI 6, the dorso-ventral orientation is not known as the caudal skeleton is nearly symmetrical in its neural and haemal arches and spines as well as supraneural and infrahaemal elements – a condition seen in most lungfishes. It was generally assumed that the side with the preserved long fin rays is the ventral one (cf. Winkler 1880). However, in the extreme example of *Gosfordia* with a very deep and short tail it is seen that the dorsal side of the caudal fin is much more extensive, which is tendentially true for all dipnoans but usually less accentuated. Tentatively, it is assumed here that *Ceratodus* as represented by SNSB-BSPG 2008 LXI 6 had the same general proportions as *Gosfordia* and that the caudal fin is shown upside-down in Figs. 3a and 3b. A new interpretative sketch with anatomical identifications following Arratia et al. (2001) and the alternative orientation is seen in Fig. 3c. Given the size relation of dorsal fin ray length : body length as 1:5 in *Gosfordia*, SNSB-BSPG 2008 LXI 6 with a maximum length of dorsal fin rays of 31 cm as preserved would indicate a whole body length of 1,55 m – which is within the high end range of living *Neoceratodus forsteri* specimens and in accordance with the size of large *Ceratodus kaupii* teeth.

### Acknowledgments

The scientific community is indebted to the efforts of the former Chair of Palaeontology of Würzburg, Franz Theodor Fürsich, and his colleagues to save the palaeontological collections of Würzburg from impending waste disposal after the shutdown of the institute by the University. Winfried Werner (SNSB-BSPG) provided access to specimens and logistic help, information on collection history as well as corrections to the initial draft. Christa Riedl-Dorn (Naturhistorisches Museum Wien) provided a copy of the letter of Sandberger to Steindachner. Ronald Böttcher (Staatliches Museum für Naturkunde Stuttgart) kindly reviewed the submitted work and added to accuracy of information. Andrea Schwarz (SNSB-BSPG) is thanked for technical assistance with photography. This contribution is part of an ongoing project to reorganize and digitize the fish collection at the SNSB-BSPG, which is partly supported by the Volkswagenstiftung grant I/84 640 to Oliver Rauhut (2009) and DFG grant MO 2350/1-1 to Markus Moser (2013).



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## Appendix

Transcript of a 3-paged letter of Fridolin Sandberger to Franz Steindachner in Vienna (letter legacy of Steindachner, No. 433.01, Naturhistorisches Museum Wien) regarding the discovery of a large fish which later became the holotype of 'Coelacanthus' giganteus Winkler.

*Hochgeehrter Herr!*

*Im Sommer 1874 fand sich im Sandstein der Lettenkohlengruppe am Faulen Berge 3/4 Stunden von Würzburg das Fragment eines riesigen fossilen Fisches, wovon ich Ihnen beifolgend zwei Photographien übersende. Sonst ist in dem erwähnten Bausandstein noch nie etwas Anderes, als z. Th. prachtvoll erhaltene fossile Land-Pflanzen (Equiseten, Farne und Cycadeen) vorgekommen, welche von Schönlein und Schenk monographisch bearbeitet wurden; der Sandstein scheint daher eine reine Süßwasserbildung zu sein. Es unterliegt [p. 2] keinem Zweifel, daß der Fisch ganz vollständig war und nur durch die Unachtsamkeit der Arbeiter zertrümmert worden ist. Allein die Platte lag schon wochenlang*

*mit andern zur Abfuhr aufgesetzt und auch Stundenlange Nachforschungen mit einer Anzahl meiner Zuhörer führten nicht zur Entdeckung des Rests des Skelets. Die anatomischen Charaktere dieses neuen Triasfisches sind so merkwürdig, daß ich ihn Ihnen als dem bewährtesten Kenner fossiler Fische mit der Bitte unterbreite, mir Ihr Urtheil über ihn gütigst mitzutheilen und ihn natürlich, wenn [p. 3] es Ihnen der Mühe werth scheint, zu beschreiben. Den Hrn. Prof. Al. Agassiz und Hyatt bitte ich meine freundlichsten Grüße zu sagen und bleibe Ihrer gütigen Antwort gewärtig mit ausgezeichneter Hochschätzung*

*Ihr  
ergebenster  
D. F. Sandberger  
Würzburg 11. Febr. 1875.*

*P.S. Da die gleichzeitige Sendung der Photographien in einem Packet auf Schwierigkeiten gestoßen ist, so sende ich sie getrennt. Das Original hat 52 Centimeter Länge 43 — [Centimeter] Breite woraus Sie Sich von den Dimensionen eine klare Vorstellung werden machen können.*