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Nomenclatural remarks on some taxa of the fossil fish family Lepidotidae (Ginglymodi: Lepisosteiformes).

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Abstract

Several open questions and erroneous practices regarding the nomenclature of lepidotids have been addressed. Conclusions and corrections are being offered for the authorship and date of the family name Lepidotidae, the correct spelling of *Lepidotes* vs. *Lepidotus*, the type species of *Lepidotes*, the correct spellings of *Lepidotes buelowianus* and *L. laevis*, the date of publication and the status of *L. patagonicus*, the genders of *Scheenstia* and *Callipurbeckia*, a homonymy in *Lepidotes pusillus*, and the status of the generic names *Lepidosaurus*, *Plesiodus*, *Prolepidotus*, *Scrobodus* and *Sphaerodus*.

Introduction

Since the introduction of *Lepidotes* by Agassiz in 1832 this genus has been a waste basket for a wide variety of fossil fishes, mostly species belonging to the orders Lepisosteiformes and Semionotiformes. Although several authors have tried to get this heterogeneous group at least partially sorted, only recently López-Arbarello has presented several important steps forward to achieve this goal. Combining the correction of earlier errors with the implementation of new results *Lepidotes elvensis* and *L. gigas* have been recognized as different species, *L. gigas* was confirmed as the type species of *Lepidotes*, at family level Lepidotidae has been revalidated from the long lasting synonymy with Semionotidae (Woodward 1895; Van der Laan 2018) and been moved from Semionotiformes to Lepisosteiformes (López-Arbarello 2012; López-Arbarello & Sferco 2018).
Despite the recent efforts, several aspects of the nomenclature of taxa in Lepidotidae at family, genus and species level still seem to be copied uncritically from earlier authors and need some correction and clarification of facts. Albeit the online availability of the applicable provisions of the International Code of Zoological Nomenclature (ICZN 1999) to science and public, the applicable clauses for each case are provided, trying to ease the reproducibility for those who do not deal with the ICZN on a regular basis.

1. Authorship and date of Lepidotidae

†Lépidoïdes Agassiz, 1833
†Lepidotidae Owen, 1860

ICZN - applicable clauses:

11.7.1. A family-group name when first published must meet all the following criteria. It must:

11.7.1.2. be clearly used as a scientific name to denote a suprageneric taxon and not merely as a plural noun or adjective referring to the members of a genus

11.7.2. If a family-group name was published before 1900, in accordance with the above provisions of this Article but not in latinized form, it is available with its original author and date only if it has been latinized by later authors and has been generally accepted as valid by authors interested in the group concerned and as dating from that first publication in vernacular form.

When referring to 'Lepidoïdes', Agassiz (1833-1843) started both, his chapters I. and XIII. by using the French word 'famille' and did clearly not just refer to a group of genera, but established a name for a new family, complying with clause 11.7.1.2.
In several recent papers (e.g. López-Arbarello & Wencker 2016; Cantalice et al. 2019; Cavin et al. 2020) the family name Lepidotidae has been assigned to the authorship of Owen (1860). As Van der Laan (2018) described correctly, Owen only latinized Agassiz' 'Lépidoïdes', but did not establish a new taxon under his authorship. Following Van der Laan (2018) and clause 11.7.2 the family group name Lepidotidae is to be assigned to the authorship of Agassiz.

As not unusual for voluminous works in the 19th century, also Agassiz published his 'Recherches sur les poissons fossiles' not only in five volumes of text and five volumes of figures, but did split those in 18 deliveries over eleven years. After having received all parts the subscribers could then send their collection of loose leaflets to a bookbinder. In addition to these deliveries for the main work he has provided supplementary information to his subscribers in ten 'feuilletons' (Agassiz 1834-1843). Independently from each other, Brown (1890) and Jeannet (1928, 1929) have both investigated the publication dates of these deliveries and published their concordant results.
As pointed out above, Agassiz has used 'Lepidoides' as a family name on page 1 and 'Lépidoïdes' on page 233, which, following Brown, have been published in two separate deliveries in 1833 and 1837, respectively. The 'famille des Lépidoïdes' was also mentioned on page 24 of his second feuilleton, which was published in 1835. Giving the due priority to the oldest date, in combination with the above demonstrated authorship of Agassiz, 'Lepidotidae' is available from vol. 2, page 1 of 'Recherches sur les poissons fossiles' and thus, the correct usage of the family name is 'Lepidotidae Agassiz, 1833'.

2. *Lepidotes* vs. *Lepidotus*

Lepidotus Asso, 1801
Lepidotus Stephens, 1830
†*Lepidotes* Agassiz, 1832
†*Lepidotus* Agassiz, 1833
Lepidotus Gistel, 1834
Lepidotus Curtis, 1838

ICZN - applicable clauses:

32.2. Correct original spelling - The original spelling of a name is the "correct original spelling", unless it is demonstrably incorrect as provided in Article 32.5.

33.3. Incorrect subsequent spellings - Any subsequent spelling of a name different from the correct original spelling, other than a mandatory change or an emendation, is an "incorrect subsequent spelling"; it is not an available name and… it does not enter into homonymy and cannot be used as a substitute name…

53.2. Homonyms in the genus group - In the genus group, two or more available names established with the same spelling are homonyms.

Three species have been originally presented with the new genus *Lepidotes* Agassiz, 1832: *Lepidotes gigas*, *L. frondosus*, and *L. ornatus*. By including all three also in his later work, then under *Lepidotus* (fig. 1), Agassiz (1833-1843) made it evident that he referred to the same generic taxon and did not intent to establish *Lepidotus* as a new genus with just one letter of difference. This appraisal was shared by Bronn (1848), Jordan & Branner (1908) and Jordan & Evermann (1917) who under their accounts of *Lepidotes* Agassiz, 1832, stated "postea *Lepidotus*", "altered spelling" and "later written *Lepidotus*", respectively.
Following the above provided clauses *Lepidotes* Agassiz, 1832, is the valid name of the genus, while *Lepidotus* Agassiz, 1833, must be considered as an 'incorrect subsequent spelling', is not available in zoological nomenclature and to be treated as not existing. Therefore, any species of fossil fish that has been described originally as *Lepidotus* should be treated as having been described in *Lepidotes*. This change, as *Lepidotus* of Agassiz (1833-1843) is not available, is not to be considered as a combination with a different genus and thus, authorship and year shall not be set in brackets when mentioning species originally described as *Lepidotus* which shall now be combined with *Lepidotes*.

Agassiz' motivation for changing the spelling from *Lepidotes* to *Lepidotus* may be indicated by the footnote he provided on page 181 of volume 2, part 1: "M. de la Bèche voudra bien me pardonner le léger changement que j'ai fait au nom de ce genre, en l'appelant *Dapedius* au lieu de *Dapedium*, après avoir adopté une terminaison masculine pour tous mes autres genres". The change in spelling may have been caused simply by Agassiz' very personal preference for making all generic names have the classical masculine *-us* ending. If this was actually the reason also for the change in the lepidotid genus we will probably never know with certainty.

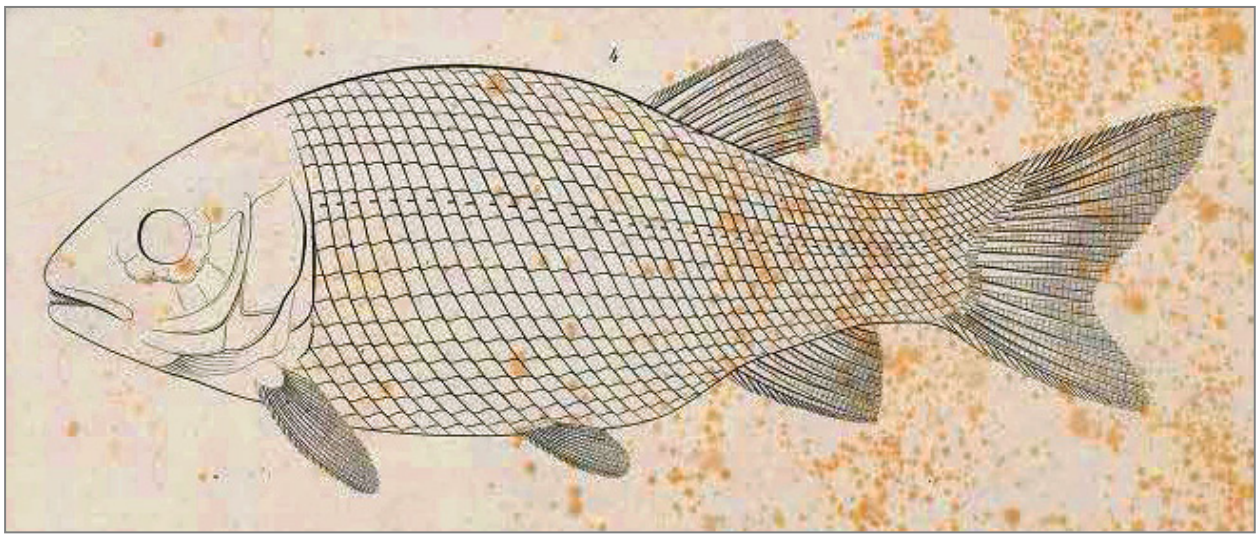


fig. 1. Reconstruction of how Agassiz assumed a representative specimen of *Lepidotes* would look like. Taken from Atlas 1, plate C, figure 4.

From today's view it was a lucky coincidence that he published *Lepidotes* first. *Lepidotus* was already then, in 1833, preoccupied by *Lepidotus* Asso, 1801, as well as by *Lepidotus* Stephens, 1830, and Agassiz would have proposed a double junior homonym. It seems that Asso's work on the extant fishes from Eastern Spain and Stephens' name for British beetles remained predominantly unnoticed by the paleoichthyological community during the last 190 years as so many of them used *Lepidotus* for extinct fossil fishes, assigning Agassiz' authorship to this genus.

Lepidotus Asso, 1801, and *L. catalonicus* Asso, 1801, are currently considered synonymous in both, genus and species, of *Brama* Bloch & Schneider, 1801, and *B. brama* (Bonnaterre, 1788), respectively (Fricke et al. 2021). Another genus named *Lepidotus* was described by Stephens (1830) in Coleoptera, Elateridae. In this case the homonymy was recognized and *Zalepia* Arnett, 1953, was introduced as a replacement name, which today is seen as a synonym of *Lacon* Laporte, 1838 (Kundrata et al. 2019). Only one year later than Agassiz, Gistel (1834) also presented *Lepidotus* as a new genus name for Coleoptera, generating a double homonymy with *Lepidotus* Asso, 1801, and Stephens, 1830. Gistel's genus is today considered a synonym of *Agriotes* Eschscholtz, 1829 (Bousquet & Bouchard 2017). Subsequently *Lepidotus* Curtis, 1838 was erected also in Elateridae and is now considered a synonym of *Prosternon* Latreille, 1834 (Zapata de la Vega & Sánchez-Ruiz 2012). Despite the fact that all four *Lepidotus* of Asso, Gistel, Stephens, and Curtis are considered synonyms of other genera, they still compete in homonymy.

3. Type species of *Lepidotes*

†*Lepidotes elvensis* (Blainville, 1818)
†*Lepidotes frondosus* Agassiz, 1832
†*Lepidotes gigas* Agassiz, 1832
†*Lepidotes ornatus* Agassiz, 1832

ICZN - applicable clauses:

67.2. Species eligible for type fixation (originally included nominal species) - A nominal species is only eligible to be fixed as the type species of a nominal genus or subgenus if it is an originally included nominal species.

67.2.1. In the meaning of the Code the "originally included nominal species" comprise only those included in the newly established nominal genus or subgenus, having been cited in the original publication by an available name…

69.1. Type species by subsequent designation - If an author established a nominal genus or subgenus but did not fix its type species, the first author who subsequently designates one of the originally included nominal species [Art. 67.2] validly designates the type species of that nominal genus or subgenus (type by subsequent designation), and no later designation is valid.

69.2. Eligibility of species for type fixation

69.2.2. If an author designates as type species a nominal species that was not originally included (or accepts another's such designation) and if, but only if, at the same time he or she places that nominal species in synonymy with one and only one of the originally included species (as defined in Article 67.2), that act constitutes fixation of the latter species as type species of the nominal genus or subgenus.

Agassiz (1832) presented the new genus together with three new species, *Lepidotes gigas*, *L. frondosus*, and *L. ornatus*, without explicitly fixing a type species for his new genus. As per clause 67.2, only these three species are eligible for the fixation of a type species. One year later (Agassiz 1833) he indicated by chronologically reverse synonymy that *Lepidotes gigas* was named in replacement for *Cyprinus elvensis* Blainville, 1818, without providing any reason on why he thought this replacement name was necessary from his point of view. In consequence numerous later authors (e.g. Quenstedt 1852; Branco 1887; Woodward 1895; Priem 1908) placed *Lepidotes gigas* as a junior synonym under *Lepidotes elvensis*, all of them using '*Lepidotus*', not *Lepidotes* (see above).
Woodward (1895) was the first to explicitly name a type species for the genus: *Lepidotus elvensis*. Under his account for this species he listed *Lepidotes gigas* as a junior synonym. This act would have perfectly fit with clause 69.2.2. However, Woodward intended to fix a type species for a not available genus name (see above). Therefore his fixation is herein considered invalid.
Jordan & Branner (1908) did state *Lepidotes gigas* as the type species of the genus, without any reference to *L. elvensis* and using the correct spelling of *Lepidotes*. Their act must be taken as the valid designation as described in clause 69.1.
López-Arbarello (2012) not only confirmed the designation of Jordan & Branner (1908), but as the first researcher since Agassiz' unfortunate statement also recognized *Lepidotes elvensis* and *L. gigas* as distinct species. At this point, based on the no longer existing synonymy, Woodward's designation would have become invalid anyway.

4. *Lepidotes buelowianus* – 'ü' vs. 'ue'

†*Lepidotus bülowianus* Jaekel, 1929
†*Lepidotus buelowianus* Jaekel, 1929

ICZN - applicable clauses:
32.5. Spellings that must be corrected (incorrect original spellings)
32.5.2.1. In the case of a diacritic or other mark, the mark concerned is deleted, except that in a name published before 1985 and based upon a German word, the umlaut sign is deleted from a vowel and the letter "e" is to be inserted after that vowel (if there is any doubt that the name is based upon a German word, it is to be so treated)

In the description of his new species *Lepidotus bülowianus*, Jaekel (1929) acknowledged two gentlemen with similar names, Ernst Ulrich von Bülow-Trummer and Kurd von Bülow. Referring to the first Jaekel also mentioned the 'old family from Mecklenburg', a region of Germany located between Berlin and the shores of the Baltic Sea where still today several villages and hamlets named Bülow exist as geographical names. The family name of Bülow is certainly to be considered a German word in the sense of clause 32.5.2.1.
Consequently the original name must be altered from *Lepidotus bülowianus* to *Lepidotes buelowianus*. In some rather recent works (e.g. López-Arbarello 2012; Ebert et al. 2017) the original spelling was still used as valid. Only Thies (1989) has already adapted the name to the correct spelling.

'Römer' is a frequent surname in Germany, having its origin in the denomination for someone who has done a pilgrimage to Rome. Thus, the same change of spelling is also to be conducted for *Lepidotus römeri* Dunker, 1846, to '*Lepidotes*' *roemeri*.

5. *Lepidotes patagonicus* – date and status

†*Lepidotus patagonicus* Ameghino, 1899

ICZN - applicable clauses:
12. Names published before 1931
12.1. Requirements - To be available, every new name published before 1931 must satisfy the provisions of Article 11 and must be accompanied by a description or a definition of the taxon that it denotes, or by an indication.

Gayet (1982) and Arratia & Cione (1996) claimed that Ameghino (1906) did not describe or figure his new species, as requested in clause 12.1 and thus, Arratia & Cione (1996) treated *Lepidotus patagonicus* as a nomen nudum. Regarding Ameghino's work from 1906 this is certainly correct, but those authors overlooked that *L. patagonicus* was not published by Ameghino in 1906 but in an earlier work dating from 1899. In the ‚Suplemento' (1899) to his ‚Sinopsis' (1898), Ameghino provided the following description for *Lepidotus patagonicus*:
„En los Ganoideos del órden de los Lepidostei agréguese la familia de los Sphaerodontidae representada por *Lepidotus patagonicus* n.sp., especie pequeña, cuyos dientes hemisféricos mas grandes solo tienen 5 mm. de diámetro. Las escamas romboideas con una gruesa capa de esmalte negro, liso y relumbroso tienen de 10 á 15 mm. de diámetro. Numerosos dientes y escamas aisladas del cretáceo de Patagonia."

As the argument of Arratia & Cione (1996) about a missing description is unjustified, the species is to be treated as valid under '*Lepidotes*' *patagonicus* Ameghino, 1899.

Another case to be mentioned in this context, although not a lepidotid and hence not within the intended scope of this contribution, is the one of *Paraikichthys ornatissimus* Ameghino, 1899.
Arratia & Cione (1996) declared *Paraikichthys ornatissimus* to be a nomen nudum due to a lack of description or figure, while referring to Ameghino '1900-1903' (actually meaning '1900' only, as published in parts). Ameghino in 1899 offered the following description: "*Paraikichthys ornatissimus* n.gen.n.sp.: los dientes hemisféricos mucho más pequeños que en *Lepidotus* y soldados á los huesos que los soportan sin dientes de reemplazamiento; escamas romboideas o rectangulares de 10 á 15 mm. de diámetro y con la cubierta de esmalte adornada con profundas estrías; este género parece aliado de *Colobodus* y *Gyrolepis* Ag. Cretáceo de Patagonia (formación guaranítica)."
Pending further investigation to enlucidate the status of this taxon, the nominal taxon *Paraikichthys ornatissimus* Ameghino, 1899, should be treated as valid.

To evaluate if Ameghino's descriptions are sufficient to determine the validity of these two taxa at species level is beyond the scope of the present note.

6. *Lepidotes laevis* – 'e' vs. 'ae'

†*Lepidotus levis* Agassiz, 1837
†*Lepidotus laevis* Agassiz, 1837

ICZN - applicable clauses:
32.4. Status of incorrect original spellings
32.5.1.1. The correction of a spelling of a name in a publisher's or author's corrigendum issued simultaneously with the original work or as a circulated slip to be inserted in the work (or if in a journal, or work issued in parts, in one of the parts of the same volume) is to be accepted as clear evidence of an inadvertent error.
33.3. Incorrect subsequent spellings
33.3.1. when an incorrect subsequent spelling is in prevailing usage and is attributed to the publication of the original spelling, the subsequent spelling and attribution are to be preserved and the spelling is deemed to be a correct original spelling.

Agassiz mentioned *Lepidotus laevis* three times in his work 'Recherche sur les poisons fossiles':
- volume 2, part 1, page 254, published in 1837, as *L. levis*
- volume 1, page XL, published in 1840 as *L. laevis*, and
- atlas 2, plate 29c, published in 1844 as *L. laevis.*

The first and oldest citation contains a detailed description of this taxon while the latter two only provide mere mentions, bare of any descriptive parts. In the description of the scales Agassiz used expressions as "Sa face extérieure est complètement lisse et très-polie" and "le bord postérieur même est parfaitement lisse sans la moindre trace d'ondulation" making very clear statements that these scales are perfectly smooth, even and polished. For this character 'levis' is the correct translation in Latin, as is 'lisse' in French. The subsequently used name *laevis* in Latin is an existing, yet erroneous spelling for *levis* (Freund 1845). When introducing *laevis* three years later Agassiz provided no explination for this change in spelling, nor did he make a statement about an earlier error and thus, clause 32.5.1.1. does not apply.
Surprisingly the earlier name *levis* which was published together with the detailed description seems not to have been used again, while *laevis* can be found in the publications ever since, from Agassiz' contemporaries to modern authors. Due to this overwhelmingly prevailing usage clause 33.3.1. is to be applied and '*Lepidotes*' *laevis* Agassiz, 1837 is deemed to be a correct original spelling.

7. Gender of *Scheenstia*

†*Scheenstia* López-Arbarello & Sferco, 2011

ICZN - applicable clauses:
30.2. Gender of names formed from words that are neither Latin nor Greek
30.2.1. If a name reproduces exactly a noun having a gender in a modern European language (without having to be transliterated from a non-Latin alphabet into the Latin alphabet) it takes the gender of that noun.
30.2.3. If no gender was specified, the name takes the gender indicated by its combination with one or more adjectival species-group names of the originally included nominal species.
Recommendation 30A. Gender and derivation to be made explicit. Authors should expressly state the gender and derivation of a new genus-group name when establishing it.

In the description of the new genus, López-Arbarello & Sferco (2011) provided the etymology as "The name *Scheenstia* is a compound word in Bavarian dialect composed of 'schee' (= beautiful), which becomes

'scheens' after appropriate conjugation in genitive masculine, and 'Tia' (= animal)". In the same paper the new genus name was only combined with *Scheenstia zappi*, being formed from the personal name of Mr. Manfred Zapp in the genitive case and not a declinable adjective.
The authors made a gender related statement as advised in Recommendation 30A, but did so incorrectly. The statement is erroneous in the word 'masculine' regarding the gender of the genus' name, which must be treated as neutrum. 'Scheens' in Bavarian, or 'schönes' in German, is the neutral form of an adjective describing a character (beautiful) of 'des Tia' or 'das Tier', a noun of neutral gender in both, Bavarian and German. As Bavarian is a dialect of German it forms part of a modern European language as required in clause 30.2.1. and thus, *Scheenstia* is to be treated as neutrum and the names of some included species must be adapted to *Scheenstia bernissartense*, *S. laeve*, *S. decoratum*, and *S. maximum*.
Just a lingual oddity: an alternative name in masculine gender, based on Bavarian grammar, could have been for example 'Scheenastoa' for 'schöner Stein', a 'beautiful stone'.

8. Gender of *Callipurbeckia*

†*Callipurbeckia* López-Arbarello, 2012

ICZN - applicable clauses:

11.8. Genus-group names - A genus-group name must be a word of two or more letters and must be, or be treated as, a noun in the nominative singular.
30.2. Gender of names formed from words that are neither Latin nor Greek
30.2.1. If a name reproduces exactly a noun having a gender in a modern European language (without having to be transliterated from a non-Latin alphabet into the Latin alphabet) it takes the gender of that noun.
30.2.3. If no gender was specified, the name takes the gender indicated by its combination with one or more adjectival species-group names of the originally included nominal species.
30.2.4. If no gender was specified or indicated, the name is to be treated as masculine, except that, if the name ends in *-a* the gender is feminine, and if it ends in *-um*, *-on*, or *-u* the gender is neuter.
31.2. Agreement in gender
31.2.2. Where the author of a species-group name did not indicate whether he or she regarded it as a noun or as an adjective, and where it may be regarded as either and the evidence of usage is not decisive, it is to be treated as a noun in apposition to the name of its genus (the original spelling is to be retained, with gender ending unchanged; see Article 34.2.1).
34.2.1. If a species-group name is a noun in apposition its ending need not agree in gender with the generic name with which it is combined and must not be changed to agree in gender with the generic name [Art. 31.2.1].
Recommendation 30A. Gender and derivation to be made explicit. Authors should expressly state the gender and derivation of a new genus-group name when establishing it.
Glossary. noun phrase, n. - A compound word consisting of a noun combined with another noun or modifying adjective, the compound being treated as a noun in apposition; if the adjective is the final element in a species-group name, its ending is determined by the gender of the noun it modifies (and not by that of the generic name with which the species-group name is combined).

López-Arbarello (2012) introduced the new genus providing the etymology as "From the Ancient Greek 'calli-', beautiful, and Purbeck, the current name of the area inhabited by the fish", without making a gender related statement as advised in recommendation 30A. Purbeck is known as the name for both, the district of Purbeck and the Isle of Purbeck, referring to the homonymous peninsula. As no specific gender can be assigned to this geographical name in English language clause 30.2.1 does not apply. López-Arbarello (2012) included three species in the new genus: *Callipurbeckia minor* (Agassiz, 1833), *C. tendaguruensis* (Arratia & Schultze, 1999), and *C. notopterus* (Agassiz, 1833). In Latin grammar the specific name *minor* could be of either feminine, masculine, or neutrum gender, and *tendaguruensis* could be either feminine or masculine.
The species name *notopterus* is a compound formed from the two ancient greek nouns *notos*, meaning 'back', and *pteros*, meaning 'wing' or 'feather'. Following the glossary of The Code this compound has to be treated as a noun in apposition, which will not change the ending when transferred to a genus of different gender (34.2.1).
Notopterus Lacepède, 1800, is a valid genus name in Osteoglossiformes. As a genus-group name *Notopterus* must be a noun or be treated as a noun (11.8), a property to be accepted for the same word as a species-group name, too. But, for *notopterus* as a species-group name there is also the opinion that it may be regarded to be an adjective (Alonso-Zarazaga, pers.comm.). Considering both, noun and adjective, as possible and following clause 31.2.2, *notopterus* is to be treated as a noun in apposition.
It actually does not make a difference if *notopterus* is being seen at as the compound of nouns mentioned in the glossary or being treated after clause 31.2.2, as the species name *notopterus* would have to be treated as a noun in apposition in either case.

Two of the three species names included in *Callipurbeckia* are adjectives which cannot be assigned to a single gender, and the third is no adjectival species-name at all, but a noun in apposition. As no indication

from 30.2.3 is available, the gender of *Callipurbeckia* needs to be defined by applying clause 30.2.4. and, as ending in *-a*, *Callipurbeckia* is to be treated as a genus in feminine gender.

9. Homonymy in *Lepidotes pusillus*

†*Lepidotus pusillus* Robertson, 1847
†*Lepidotes pusillus* Bocchino, 1973

ICZN - applicable clauses:
12. Names published before 1931
12.1. Requirements - To be available, every new name published before 1931 must satisfy the provisions of Article 11 and must be accompanied by a description or a definition of the taxon that it denotes, or by an indication.
12.3. Exclusions - The mention of any of the following does not in itself constitute a description, definition, or indication: a vernacular name, locality, geological horizon, host, label, or specimen.
53.3. Homonyms in the species group - Two or more available species-group names having the same spelling are homonyms if they were originally established in combination with the same generic name (primary homonymy), or when they are subsequently published in combination with the same generic name (secondary homonymy)…

Robertson (1847) presented a new species as *Lepidotus pusillus* from the Wealden in Sutherlandshire, United Kingdom. This taxon seems to have remained unnoticed to subsequent authors in paleoichthyology, what may have been caused due to the fact that the "Robertson Collection was dispersed by auction in London, about 1854, and some of the specimens were purchased by the British Museum, while others ultimately reached the Geological Society; several of the types, however, are missing" (Woodward & Sherborn 1890). Robertson only presented a name without any description, definition or indication as per clause 12.1. The only details shared by him are excluded by 12.3 and thus, *Lepidotus pusillus* Robertson, 1847, is not an available name.
From the Upper Jurassic in the Argentinean province of San Juan, Bocchino (1973) described *Lepidotes pusillus* as a new semionotid species. The homonymy that does appear at first sight is actually not existing as Robertson's taxon is not available. Clause 53.3 requires both names to be available, and therefor '*Lepidotes*' *pusillus* Bocchino, 1973, stands as valid.

10. *Lepidosaurus* – status

†*Lepidosaurus* Meyer, 1832

ICZN - applicable clauses:
12. Names published before 1931
12.1. Requirements - To be available, every new name published before 1931 must satisfy the provisions of Article 11 and must be accompanied by a description or a definition of the taxon that it denotes, or by an indication.
12.2. Indications - For the purposes of this Article the word "indication" denotes only the following:
12.2.5. in the case of a new genus-group name, the use of one or more available specific names in combination with it, or clearly included under it, or clearly referred to it by bibliographic reference, provided that the specific name or names can be unambiguously assigned to a nominal species-group taxon or taxa.

Lepidosaurus Meyer, 1832 has been treated as a synonym of *Lepidotes* Agassiz, 1832, at least since Woodward (1895). If earlier authors have also considered this synonymy previous to Woodward has not been investigated.
Meyer (1832) listed his new genus in his section B on saurians, in combination with a question mark, and with the following text [translated from German]: "In the year 1829 together with the *Rhacheosaurus* I have discovered scales, which are so big and strong, that they may originate from the skin cover of a big saurian. But this remains uncertain until bones together with similar scales would have been found, which would allow to recognize more about the animal, as these scales also could belong to a fish. In the meanwhile I address the animal with these beautiful scales with the name *Lepidosaurus*, albeit without reference to the class of animals it may belong to."
Frankly summarized, Meyer had no clue about the identity of the animal his scales belonged to, not even if a saurian or a fish. Thus, as he failed to include a nominal species-group taxon under his new genus or provide an indication for this, he did not comply with clause 12 and in consequence *Lepidosaurus* Meyer, 1832, is not an available genus-group name.

11. *Plesiodus*, *Prolepidotus*, *Scrobodus* – status

†*Lepidotes* Agassiz, 1832
†*Plesiodus* Wagner, 1863

†*P. pustulosus* Wagner, 1863
†*Prolepidotus* Michael, 1893
†*P. gallineki* Michael, 1893
†*Scrobodus* Münster, 1842
†*S. ovatus* Münster, 1842

ICZN - applicable clauses:

42.3. Application of genus-group names - The application of each genus-group name is determined by reference to the type species [Arts. 61, 66 to 70] of the nominal taxon that it denotes.

67.2. Species eligible for type fixation (originally included nominal species) - A nominal species is only eligible to be fixed as the type species of a nominal genus or subgenus if it is an originally included nominal species.

68.3. Type species by monotypy - When an author establishes a new nominal genus-group taxon for a single taxonomic species and denotes that species by an available name, the nominal species so named is the type species. Fixation by this means is deemed to be fixation by monotypy, regardless of any cited synonyms, subspecies, or unavailable names, and regardless of whether the author considered the nominal genus-group taxon to contain other species which he or she did not cite by name, and regardless of nominal species-group taxa doubtfully included or identified.

Plesiodus, *Prolepidotus*, and *Scrobodus* have been treated as synonyms of *Lepidotes* Agassiz, 1832, at least since Woodward (1895). If earlier authors have also considered these synonymies previous to Woodward has not been investigated.
Each of these three genera has been described including a single species, making the above listed species the type species of their respective genera by monotypy. In the case of *Scrobodus* it could be assumed that also *Scrobodus subovatus* Münster, 1842, would be eligible as type species under clause 67.2 as author and year do provoke the assumption to have been published in the same work (Münster 1842a). In fact Münster has published the description of *Scrobodus subovatus* in a later work (1842b), yet still in the same year. The chronological order of both works has been documented by Münster himself (1842a) by several announcements related to other species that “a more detailed description will be provided in” a subsequent work authored by him (1842b).

López-Arbarello (2012) presented a generic analysis and redefinition for *Lepidotes*, restricting the included species to *Lepidotes gigas* Agassiz, 1832, *L. elvensis* (Blainville, 1818), *L. semiserratus* Agassiz, 1836, and *L. buelowianus* Jaekel, 1929. As she did not include *Plesiodus pustulosus*, *Prolepidotus gallineki*, or *Scrobodus ovatus*, as shown above all three type species by monotypy, in the group of species recognized so far to belong to *Lepidotes*, she tacitly revalidated the genera *Plesiodus*, *Prolepidotus*, and *Scrobodus* from the synonymy with *Lepidotes*. Each of these three genera is to be treated as valid, as long as its respective type species is not combined with a different genus.

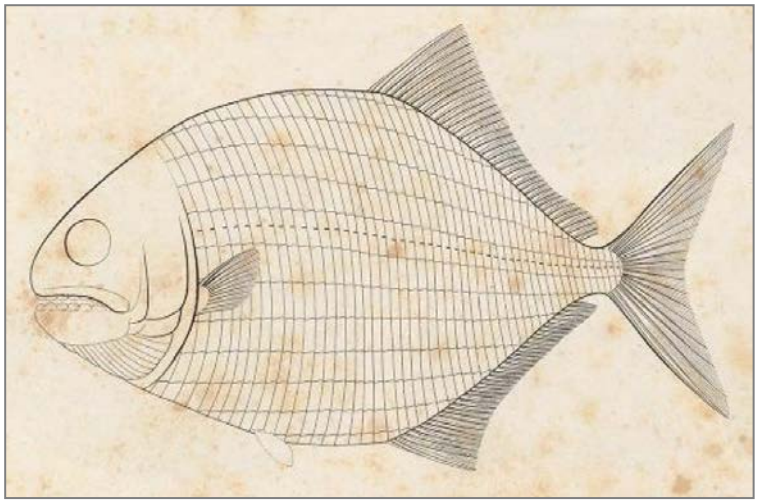


fig. 2.
Reconstruction of how Agassiz assumed a representative specimen of *Sphaerodus* would look like.
Taken from Atlas 1, plate G, figure 2.

12. *Sphaerodus* – status

†*Sphaerodus* Agassiz, 1833

ICZN - applicable clauses:

42.3. Application of genus-group names - The application of each genus-group name is determined by reference to the type species [Arts. 61, 66 to 70] of the nominal taxon that it denotes.

67.2. Species eligible for type fixation (originally included nominal species) - A nominal species is only eligible to be fixed as the type species of a nominal genus or subgenus if it is an originally included nominal species.
67.2.1. In the meaning of the Code the "originally included nominal species" comprise only those included in the newly established nominal genus or subgenus, having been cited in the original publication by an available name…
69.1. Type species by subsequent designation - If an author established a nominal genus or subgenus but did not fix its type species, the first author who subsequently designates one of the originally included nominal species [Art. 67.2] validly designates the type species of that nominal genus or subgenus (type by subsequent designation), and no later designation is valid.

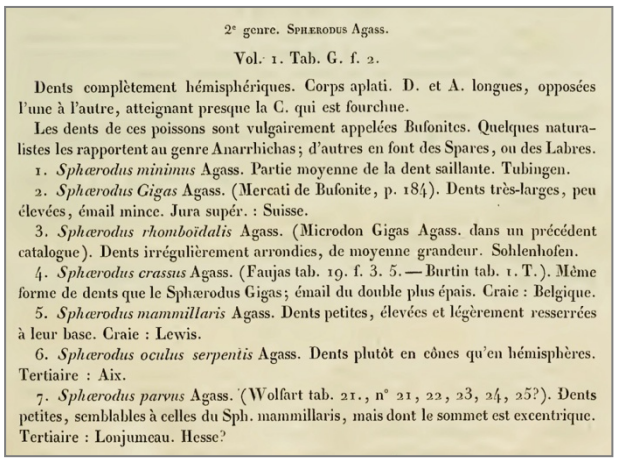
Sphaerodus Agassiz, 1833, has been treated as a synonym of *Lepidotes* Agassiz, 1832 at least since Woodward (1895). If earlier authors have also considered this synonymy previous to Woodward has not been investigated.
Together with his new genus *Sphaerodus* (fig. 2), Agassiz presented seven new species which are the originally included nominal species as mentioned in clause 67.2.1 (tab. 1, left column). This first mention of *Sphaerodus* was published in vol. 2, part 1, page 15 (fig. 3). In vol. 2, part 2, pages 209-216, he repeated the generic and specific names, but also added eleven new nominal species which had not been included in the first section (tab. 1, middle column). These two sections have been published by Agassiz in 1833 and 1843, respectively (Brown 1890; Jeannet 1929).
Agassiz did not fix a type species for *Sphaerodus* in either of his two deliveries.
Agassiz (1843) started the introduction of his second section on *Sphaerodus* questioning if a genus *Sphaerodus* does actually extist (fig. 4). It seems that he tried to explain that under the generic name of *Sphaerodus* only morphotypes of isolated teeth have been gathered in an informal group and only tentatively been labeled as species names for the mere reason of a systematical placement.
In both sections he used the term ‘genre’ for *Sphaerodus* in combiation with his own name for the authorship (figs. 3, 4) and provided species-group names to be combined with this genus. Despite his later doubts, by this action he formally established an available genus name in 1833. This appraisal was shared by subsequent authors who presented new nominal species names assigned to *Sphaerodus* (tab. 1, right column).

S. crassus Agassiz, 1833	*S. annularis* Agassiz, 1843	*S. semiglobosus* Dunker, 1846
S. gigas Agassiz, 1833	*S. cinctus* Agassiz, 1843	*S. hybridus* Münster, 1846
S. mammillaris Agassiz, 1833	*S. conicus* Agassiz, 1843	*S. subradiatus* Münster, 1846
S. minimus Agassiz, 1833	*S. depressus* Agassiz, 1843	*S. subannularis* Münster, 1846
S. oculusserpentis Agassiz, 1833	*S. discus* Agassiz, 1843	*S. submamillaris* Münster, 1846
S. parvus Agassiz, 1833	*S. irregularis* Agassiz, 1843	*S. tetragonus* Münster, 1846
S. rhomboidalis Agassiz, 1833	*S. lens* Agassiz, 1843	*S. globulosus* Pictet & Campiche, 1858
	S. microdon Agassiz, 1843	*S. globatus* Schmid, 1861
	S. mitrula Agassiz, 1843	*S. gigantiformis* Schauroth, 1865
	S. neocomiensis Agassiz, 1843	
	S. truncatus Agassiz, 1843	

tab. 1. Species originally combined by Agassiz with *Sphaerodus* in 1833 (left) and in 1843 (middle). Additional nominal species combined with *Sphaerodus* by subsequent authors (right).

Jordan & Evermann (1917) mentioned *Sphaerodus conicus* as the ‘logotype’ of the genus. The use of the term ‘logotype’ is explained in their work as being applied for a type species of a genus that has been fixed subsequently by the ‘first reviser’, but not by the original author. As *S. conicus* was not included in Agassiz’ section dating to 1833 (tab. 1, left), but has been published ten years later (tab. 1, middle), the subsequent designation mentioned by Jordan & Evermann (1917) is to be rejected, as *S. conicus* is not eligible for type fixation under clause 67.2.

In consequence, *Sphaerodus* still lacks a type species and is not clearly defined. In the hypothetical case that all seven originally included species would be assigned to at least two different older genera, it would still not be defined to which other genus *Sphaerodus* would be a synonym at generic level. As long as no type species is subsequently determined and this very species would then be assigned to a different genus, *Sphaerodus* is to be treated as valid.



2e genre. Sphærodus Agass.

Vol. 1. Tab. G. f. 2.

Dents complètement hémisphériques. Corps aplati. D. et A. longues, opposées l'une à l'autre, atteignant presque la C. qui est fourchue.

Les dents de ces poissons sont vulgairement appelées Bufonites. Quelques naturalistes les rapportent au genre Anarrhichas; d'autres en font des Spares, ou des Labres.

1. *Sphærodus minimus* Agass. Partie moyenne de la dent saillante. Tubingen.

2. *Sphærodus Gigas* Agass. (Mercati de Bufonite, p. 184). Dents très-larges, peu élevées, émail mince. Jura supér. : Suisse.

3. *Sphærodus rhomboïdalis* Agass. (Microdon Gigas Agass. dans un précédent catalogue). Dents irrégulièrement arrondies, de moyenne grandeur. Sohlenhofen.

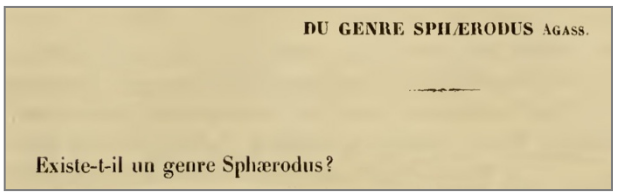
4. *Sphærodus crassus* Agass. (Faujas tab. 19. f. 3. 5. — Burtin tab. 1. T.). Même forme de dents que le Sphærodus Gigas; émail du double plus épais. Craie : Belgique.

5. *Sphærodus mammillaris* Agass. Dents petites, élevées et légèrement resserrées à leur base. Craie : Lewis.

6. *Sphærodus oculus serpentis* Agass. Dents plutôt en cônes qu'en hémisphères. Tertiaire : Aix.

7. *Sphærodus parvus* Agass. (Wolfart tab. 21., n° 21, 22, 23, 24, 25?). Dents petites, semblables à celles du Sph. mammillaris, mais dont le sommet est excentrique. Tertiaire : Longjumeau. Hesse?

fig. 3.
First mention of *Sphaerodus* and its
then included seven nominal species (1833).
vol. 2, part 1, page 15



DU GENRE SPHÆRODUS AGASS.

Existe-t-il un genre Sphærodus?

fig. 4.
From the introduction to Agassiz'
second section of *Sphaerodus* (1843).

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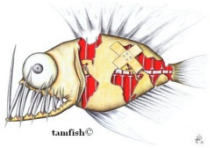

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