

## Nomenclatural remarks on the genus *Caturus* Agassiz, 1834 and its type species.

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### Abstract

The two existing designations of type species for the genus *Caturus* are found invalid as both based on unavailable names. Chronology and availability status of all included species are analyzed and *Caturus latus* Agassiz, 1839, is identified as the first species which, as based on a published illustration, gained availability. All previously published names of congeners are considered nomina nuda due to insufficient descriptions.

### Introduction

Between 1833 and 1843 Louis Agassiz published his famous opus *Recherches sur les poissons fossils* in five volumes of text and another five with plates. As during these eleven years he named dozens of genera and hundreds of species, it may be forgotten that some of the best known taxa in fossil fishes were actually published even earlier in publications of minor awareness level. One of these 'pre-*Recherches*' taxa is Agassiz' genus *Uraeus*, preoccupied by *Uraeus* Wagler, 1830 for a subgenus of cobra snakes, and subsequently replaced by the name *Caturus* by Agassiz himself. Neither for *Uraeus*, nor for *Caturus* a type species has been explicitly designated by Agassiz.

Woodward (1895) was the first author who explicitly mentioned a type species for *Caturus*: *C. furcatus* (Agassiz, 1833), a species placed originally in *Pachycormus*. Under *Caturus furcatus* he included *Uraeus nuchalis* Agassiz, 1833, *C. latus* Münster, 1834, and further species as junior synonyms. *Caturus furcatus* has been mentioned as the type species of the genus by several later authors (e.g. Lambers 1994; Müller 2011; Bogan et al. 2013), but none of them provided any reasoning for doing so. Thus, it is assumed that they uncritically followed Woodward (1895).

The only opinion differing from Woodward's has been published by Jordan (1919), who proposed *Uraeus nuchalis* as the type species of the genus. Jordan (1919) mentioned *U. nuchalis* as the 'orthotype' of the genus. The use of the term 'orthotype' is explained in his work as being applied for a type species of a genus that has been fixed by the original author, not subsequently by others, for what he did use the term 'logotype'. As Agassiz did not designate any type species, Jordan (1919) very probably assumed Agassiz' intention from the mere fact that *U. nuchalis* was the first species mentioned in the list of species included in *Uraeus* (fig. 5).

Both, Woodward (1895) and Jordan (1919), failed to validly designate a type species for *Uraeus/Caturus* by choosing unavailable species names.

Although *Caturus* and Caturidae as names of taxa in fossil fishes are in permanent use since the day of their respective publications, their systematic positions are still subject of research and investigation. In a phylogenetic hypothesis of López-Arbarelló & Sferco (2018) *Caturus furcatus*, among other taxa, took an unexpected position. Gouiric-Cavalli (2016) judged *Caturus* to be a wastebasket genus and recommended that the European remains need to be reviewed. The fact that during the early period Agassiz transferred *Uraeus gracilis* to *Pachycormus* and vice versa *Pachycormus furcatus* to *Caturus*, shows that not even the author of these taxa had a clear concept about these genera.

To make a redescription and definition of both, *Caturus* and Caturidae, possible it is striking to first define the type species of the genus (§61.1.2, ICZN 1999, hereinafter 'The Code'), what is the purpose of this contribution.

I. Genus *Uraeus* Ag. Charakterisirt durch die stark zurückgelegten fest anliegenden obern und untern Stachelfortsätze der Wirbel. Schwanzflosse groß, tief gabelig, gleichlappig. Rückenflosse den kleinen Bauchflossen entgegengesetzt, so wie die Afterflosse klein. — (Von diesem Genus und zwar vom *Solenhofer Uraeus pachyurus* Ag. ist das schönste Exemplar, das ich je gesehen, in der Brox'schen Sammlung in Heidelberg.)  
I *U. gracilis* Ag. Sehr schlank, und bedeutend groß, ziemlich grob-schuppig.

fig. 1.

Extract from Agassiz (1832) showing the first mention of *Uraeus* together with *U. pachyurus* and *U. gracilis*.

fig. 3.

Extract from Münster (1834) showing the 'description' of *Caturus latus*.

5<sup>e</sup> genre. *PACHYCORMUS* Agass.

Vol. 1. Tab. E. f. 1.

Vertèbres ordinaires. P. grandes; D. opposées aux V.. Corps renflé dans sa partie moyenne.

1. *Pachycormus furcatus* Agass. Queue très-grande, fourchue; tête petite proportionnellement. Sohlenhofen.

fig. 2. *Pachycormus* gen.nov. and *P. furcatus* sp.nov. (Agassiz 1833).

Von zwei Arten Hayfischen erhielt ich grosse Bruchstücke von *Kelheim*, und einen schönen neuen *Caturus* von *Solenhofen*, dem *Cat. elongatus* Ag. ähnlich, aber verhältnissmässig viel breiter mit sehr kleinen Schuppen. Ich nenne ihn *C. latus*.

### Status and type species of *Caturus*

- † *Uraeus* Agassiz, 1832
- † *U. gracilis* Agassiz, 1832
- † *U. pachyurus* Agassiz, 1832
- † *Caturus* Agassiz, 1834
- † *C. latus* Agassiz, 1839
- † *C. furcatus* Agassiz, 1842

### ICZN - applicable clauses:

#### Chapter 4 - Criteria of availability

- 10. Provisions conferring availability
- 10.1. General conditions to be met - A name or nomenclatural act is available, and takes authorship and date, only when it has satisfied the provisions of this Article...
  - 10.1.1. If publication of the data relating to a new nominal taxon or a nomenclatural act is interrupted and continued at a later date, the name or act becomes available only when the requirements of the relevant Articles have been met.
- 11. Requirements
  - 11.9. Species-group names
    - 11.9.3. A species-group name must be published in unambiguous combination with a generic name (either explicit, or implicit by context);
      - 11.9.3.1. the generic name need not be valid or even available;
    - 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:
        - 12.2.7. the proposal of a new genus-group name or of a new species-group name in association with an illustration of the taxon being named, or with a bibliographic reference to such an illustration...
    - 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.

#### Chapter 5 - Date of publication

- 21. Determination of date
  - 21.5. Dates of work issued in parts - If parts of a work were published on different days, the date of publication of each part is to be separately determined.

#### Chapter 9 - Genus-group nominal taxa and their names

- 42. The genus group
  - 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.
    - 42.3.2. Nominal taxa of the genus group established before 1931 (...) may have had no type species fixed; in such cases Article 69 applies.

## Chapter 12 - Homonymy

54. Names that do not enter into homonymy - The following do not enter into homonymy:
- 54.2. a name that is unavailable [Art. 10.1]...
60. Replacement of junior homonyms
- 60.3. Junior homonyms without synonyms - If the rejected junior homonym has no known available and potentially valid synonym it must be replaced by a new substitute name, with its own author and date; this name will then compete for priority with any synonym recognized later.

## Chapter 13 - The type concept in nomenclature

- 61.1. Statement of the Principle of Typification
- 61.1.2. Objectivity provided by typification is continuous through the hierarchy of names. It extends in ascending order from the species group to the family group. Thus the name-bearing type of a nominal species-group taxon is a specimen or a set of specimens (a holotype, lectotype, neotype or syntypes), that of a nominal genus-group taxon is a nominal species defined objectively by its type; that of a nominal family-group taxon is the nominal genus on which its name is based.

## Chapter 15 - Types in the genus group

- 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...
- 67.2.2. If a nominal genus or subgenus was established before 1931 ... without included nominal species [Art. 12], the nominal species that were first subsequently and expressly included in it are deemed to be the only originally included nominal species.
69. Type species not fixed in the original publication
- 69.3. Type species by subsequent monotypy - If only one nominal species was first subsequently included in a nominal genus or subgenus established without included species, that nominal species is automatically fixed as the type species, by subsequent monotypy.
- R69A. Recommendation 69A. Criteria of preference - In designating a type species for a nominal genus or subgenus, an author should give preference to a species that is adequately described or illustrated, or of which type material still exists.

## Chapter 16 - Types in the species group

75. Neotypes
- 75.3. Qualifying conditions - A neotype is validly designated when there is an exceptional need and only when that need is stated expressly and when the designation is published with the following particulars:
- 75.3.2. a statement of the characters that the author regards as differentiating from other taxa the nominal species-group taxon for which the neotype is designated, or a bibliographic reference to such a statement;
- Glossary  
definition - A statement in words that purports to give those characters which, in combination, uniquely distinguish a taxon.  
description - A statement in words of taxonomic characters of a specimen or a taxon.

Agassiz (1832) erected the new genus *Uraeus* for fossil fishes providing a short descriptive text about this taxon (fig. 1). This text may be taken as the description required for new taxa by The Code (§12.1), making *Uraeus* Agassiz, 1832 available. Together with the new generic name he presented the names of two new species to be included in this genus: *Uraeus gracilis* and *U. pachyurus*. For *U. gracilis* he restricted his 'description' to the statement "very slender, considerably big, rather big-scaled" (fig. 1). These few general words are not sufficient to differentiate this species as distinct. Therefore the specific name *Uraeus gracilis* Agassiz, 1832, must be treated as a nomen nudum and is unavailable.

For *Uraeus pachyurus* he only shared the information that the most beautiful specimen he had ever seen was from Bronn's collection in Heidelberg (fig. 1). This information is of even less value regarding the verification of the taxon's distinctiveness. The mere mention of this specimen from Heidelberg is explicitly excluded from the indications which may replace a lacking description (§12.1, §12.3) and in consequence also *Uraeus pachyurus* Agassiz, 1832 is considered to be a nomen nudum and is unavailable.

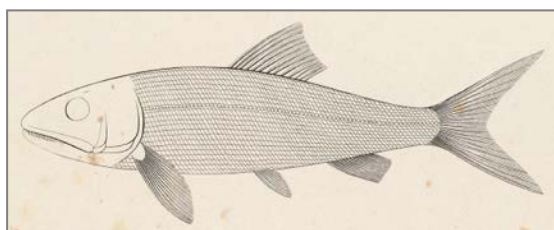
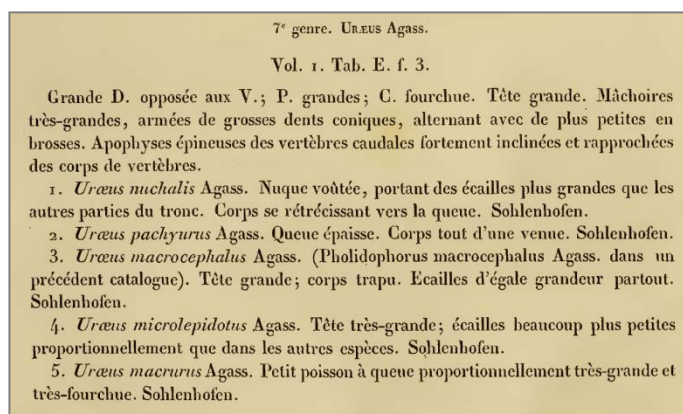


fig. 4.  
Reconstruction of how Agassiz assumed a representative specimen of *Uraeus* would look like. Taken from Atlas 1, plate E, figure 3.

fig. 5.  
Genus *Uraeus* with several new species, being *U. nuchalis* the first in the list (Agassiz 1833).



By providing two insufficiently described species and unavailable specific names together with his new genus *Uraeus*, Agassiz left an 'empty' genus, with no originally included species (having been cited in the original publication by an available name, §67.2.1) and hence eligible as a type species for this genus (§67.2). One year later, Agassiz (1833) followed this path when 'describing' the new species *Pachycormus furcatus* by only presenting a new name together with some general words which do not allow to distinguish this species from others (fig 2). To judge if in this context and moment *Pachycormus* was an available name for a genus is beyond the scope of the present contribution, actually it does not matter (§11.9.3.1).

Just as in the case of the above mentioned species in *Uraeus*, for *P. furcatus* Agassiz again produced a nomen nudum, unavailable for zoological nomenclature (§12.1). In the same publication he transferred *Uraeus gracilis* to *Pachycormus*, and presented new species in *Uraeus*: *U. nuchalis*, *U. macrocephalus*, *U. microlepidotus*, and *U. macrurus*, maintaining also *U. pachyurus* in this genus. *Uraeus* now included five species, all of them unavailable due to the lack of description, definition or indication (§12.1), and thus, still without containing a single species qualified to be eligible as the type species for *Uraeus*.

During fall of 1833 Agassiz has been in Prague and reviewed the collection of fossil fishes in the local Natural History Museum (Agassiz 1833c). The list of the taxa he did identify during this visit (Agassiz 1834a) contained *Uraeus furcatus* as a new combination for this species from *Pachycormus*. Just as a name in a list and, as before, unavailable. It must have been only a little timespan later when he had to recognize that the herpetological community among his colleagues did accept *Uraeus* Wagler, 1830 as the generic name for the Egyptian cobra snakes and that his name for fossil fishes was preoccupied, and a junior homonym. Thus, *Uraeus* Agassiz, 1832, for which no synonym existed, was replaced by the nomen novum *Caturus* Agassiz, 1834 (§60.3).

The new name *Caturus* was accepted very rapidly, as shown by the fact that a new species *Caturus latus* was published yet in the same year (Münster 1834). The 'description' of *Caturus latus* was limited to the information that the new species is similar to *C. elongatus*, but in relation a lot wider, with very small scales (fig. 3). Again a 'description' which does not allow to recognize the species when examining a fossil specimen. Together with *C. latus* the unavailable names of species contained in *Uraeus/Caturus* (fig. 4) by then summed up to six (table 1).

With delivery 10/12 in 1839 the subscribers of 'Recherches sur les poissons fossiles' received an illustration of '*Caturus latus* Münster' (fig. 6), showing a complete fish and to be included as plate 56 in Atlas 2. This illustration was the first published information on a species assigned to *Caturus*, earlier *Uraeus*, good enough to make a specific name in this genus available (§12.2.7). This delivery did not include any text or illustration on another species of *Caturus* and in consequence *Caturus latus* Agassiz, 1839, did become the type species of the genus by subsequent monotypy (§69.3).

Names take authorship and date of publication from the moment of gaining availability (§10.1) and thus the correct usage is *Caturus latus* Agassiz, 1839. Due to the above indicated unavailability, *Caturus latus* Münster, 1834 is to be treated as not existing and as such does not enter into homonymy with *Caturus latus* Agassiz, 1839 (§54.2).

name	author	act	status	publication	livraison	date
<i>Uraeus</i>	Agassiz	gen.nov.	preoccupied, unavailable	NJ 1832: 142	-	1832
<i>U. gracilis</i>	Agassiz	sp.nov.	nomen nudum, unavailable	NJ 1832: 142	-	1832
<i>U. pachyurus</i>	Agassiz	sp.nov.	nomen nudum, unavailable	NJ 1832: 142	-	1832
<i>Pachycormus</i>	Agassiz	gen.nov.	available	NJ 1833	-	1833
<i>P. furcatus</i>	Agassiz	sp.nov.	nomen nudum, unavailable	NJ 1833	-	1833
<i>P. gracilis</i>	Agassiz	comb.nov.	nomen nudum, unavailable	NJ 1833	-	1833
<i>U. furcatus</i>	Agassiz	listing	nomen nudum, unavailable	VMP 1834 (12): 70	-	1834
<b><i>Caturus</i></b>	Agassiz	nom.nov.	replacement name, available	NJ 1834 (4): 387	-	<b>1834</b>
<i>C. latus</i>	Münster	sp.nov.	nomen nudum, unavailable	NJ 1834 (4): 539	-	1834
<b><i>C. latus</i></b>	Agassiz	illustration	plate, available	Rpf A2: 56	10+12	<b>1839</b>
<b><i>C. furcatus</i></b>	Agassiz	illustration	plate, available	Rpf A2: 56a	14	<b>1842</b>
<i>C. furcatus</i>	Agassiz	text	detailed description, available	Rpf 2 (2): 116	17	1843
<i>C. latus</i>	Agassiz	text	detailed description, available	Rpf 2 (2): 117	17	1843

tab. 1. Genera and species treated in the present contribution listed in chronology of the respective publications. Abbreviations used in the column 'publication': NJ = Neues Jahrbuch, VMB = Verhandlungen der Gesellschaft des Vaterländischen Museums in Böhmen, Rpf = Recherches sur les poissons fossils, V = text volume, F = feulleton, A = atlas. Column 'livraison' indicates the deliveries of Agassiz' 'Recherches' (Brown 1890; Jeannot 1928).

The illustration of *Caturus furcatus* shown on plate 56a of Atlas 2 (fig. 7) resembles a similar case. As shown above all previous attempts to establish *Caturus furcatus* as a species name have been unsuccessful and resulted in unavailability due to the lack of complying with the requirements of §12.1. Only the publication of this drawing in delivery 14 made *Caturus furcatus* available with the authorship of Agassiz from 1842. As said, this case is similar but not identical to the one of *Caturus latus* because the name was not first established by a different author in a different work (Münster 1834), but had already been mentioned in the 'Recherches' earlier (Agassiz 1833). In a work published in parts including an interrupted introduction of a new name, authorship and date are to be assigned to the part in which availability was obtained (§10.1.1.).

Thus, *Caturus furcatus* Agassiz, 1842 is the correct combination of name, author, and date, while *Pachycormus furcatus* Agassiz, 1833 and *Uraeus furcatus* (Agassiz, 1834) do not exist in zoological nomenclature (tab. 1).

The initial intention for this note has been to determine the type species of *Caturus* Agassiz, 1834 and its respective date of publication. To determine the moment since when, if at all, *Uraeus gracilis*, *U. pachyurus*, *U. nuchalis*, *U. macrocephalus*, and *U. microlepidotus* became available is beyond the scope of the present work.



fig. 6. *Caturus latus* Agassiz, 1839 - Atlas 2, plate 56. Drawing of specimen BSP.AS.VII.263.

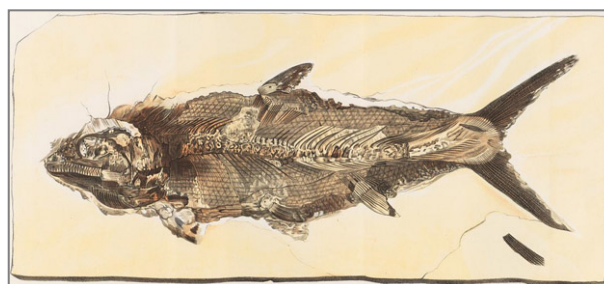


fig. 7. *Caturus furcatus* Agassiz, 1842 - Atlas 2, plate 56a. Drawing of specimen NM Uc9/83 (part and counterpart)

## Discussion

This present case is again one which can easily reawake the discussion on what can be accounted for as a description and what cannot. The Code clearly requests that "every new name published before 1931 must ... be accompanied by a description or a definition of the taxon that it denotes" (§12.1), yet without defining the minimum grade of description required. The glossary of the code offers definitions for both terms, 'definition' and 'description':

*definition* - A statement in words that purports to give those characters which, in combination, uniquely distinguish a taxon.

*description* - A statement in words of taxonomic characters of a specimen or a taxon.

Thus, at lowest level, a statement as e.g. "a fish with head, fins, scales, and tail" would be sufficient to formally 'describe' a taxon. It seems that it is much more difficult to accomplish a good definition, as here the author of any new species of animal is asked to provide a set of characters that does allow to distinguish a species from its congeners. Unfortunately the present version of The Code does not specify, that, of course, the definition's goal must be to enable fellow researchers to recognize a species from a set of species from the same genus. It must always be possible to distinguish a species from species belonging to other genera, families etc. by referring to the description/definition at the level of the genera or families, as The Code's requirements from §12.1 do apply to all levels of taxonomic units. That actually the commissioners who participated in elaborating the wording for the current version of The Code (and/or the three earlier editions) shared this position of comparability between closely related species is clearly expressed in the condition under which a neotype shall be designated. The qualifying condition from §75.3.2. requires "...a statement of the characters that the author regards as differentiating from other taxa the nominal species-group taxon...".

In a perfect world every description of an animal species would have to pass a stress test allowing fellow researchers either to determine the species of a specimen from e.g. three descriptions from the same

genus, or to match the right specimen when being confronted with the specimens of three closely related species but having only one published description available. As said, that should work in a perfect world and I admit that this is a very subjective ambition on how the mentioned set of characters should look like. Anyhow, it is not like this nowadays and we can certainly not expect such a completeness from descriptions published some two centuries ago. In judging if a description or definition is to be considered sufficient, the main difficulty is to differentiate between the requirements of taxonomy and nomenclature. Though both must be and usually are treated as separate disciplines, when it comes to the point to distinguish a species from its congeners they prove not to be so much independent from each other. Recommendation 69A of The Code is an example that especially when designating the type species for a genus both disciplines have strong ties and cannot be looked at from isolated angles: "In designating a type species for a nominal genus or subgenus, an author should give preference to a species that is adequately described or illustrated, or of which type material still exists".

Unfortunately many of the 'descriptions' published by Agassiz and other early authors do in fact not enable to distinguish a species from congeners, as their selection of characters did refer only to the two or three congeners known at the very moment of publication. A 'description' containing nothing else than 'a fish with rather big scales' as a single character was possibly useful given the case that then only three species were known and the one in question was the one with the biggest scales. Yet, the same description turns rather obsolete if later more species from that very genus have been discovered which possess even bigger scales. Therefore it is striking to note that in the glossary's definition of 'definition' the authoring commissioners decided to use the plural form 'characters'. Thus, any definition providing a single character only is no definition in the sense of The Code.

Nevertheless, §12.1 is asking for a definition or a description, without being very demanding for the latter. Analog to the example of "a fish with head, fins, scales, and tail", Agassiz's description of *Uraeus gracilis* as being "very slender, considerably big, rather big-scaled" could make *U. gracilis* available under §12.1 for all those who only go after published names without demanding that the wording does allow to "uniquely distinguish a taxon". Another critical aspect of this kind of basic 'description' from before 1931 is surely that in many cases the characters are descriptive without being suitable for comparison. "Very slender" does not provide any information on how slender the specimen examined by the author really is, for which a statement on the ratio of body measures would be necessary. "Rather big scaled" does not inform about the size of the scales in e.g. cm, the diameter of a scales in comparison with the diameter of the eye, or whatever relation an author decides to find applicable and useful for the case.

Dubois (2017) presented a very complete description of the situation and the practical problems resulting from it, making some useful proposals on how to resolve this kind of conceptual conflicts.

To be content with so little if considering the description of *Uraeus gracilis* sufficient and thus make it the type species of *Uraeus*, in this very case would threaten nomenclatural stability in a very considerable extent. As shown above, in 1833 Agassiz transferred *Uraeus gracilis* to the genus *Pachycormus*. Considering *Uraeus gracilis* Agassiz, 1832, as valid and available would turn both, *Uraeus* and the later replacement name *Caturus*, into synonymy with *Pachycormus* at genus level. "*Caturus*", as a very well established taxonomic concept used for nearly two centuries by countless authors, for dozens of species and for hundreds of specimens, would be in need of a new genus name. Consequently, if not accepting the original 'description' of *Uraeus gracilis* to be sufficient for availability, the same level of strictness must be deployed on all other species included subsequently in *Uraeus/Caturus*.

## Conclusions

To avoid the demonstrated threat of a nomenclatural chaos in paleoichthyology and following demanding pretensions on the minimum quality of any description, I do not consider Agassiz' description of *Uraeus gracilis* or of any other species placed in *Uraeus/Caturus* between 1832 and 1834 as sufficient. Based on the chronology summarized in tab. 1 and the above provided arguments of The Code, *Caturus latus* Agassiz, 1839, is hereby designated as the type species of *Caturus* Agassiz, 1834. This designation complies with recommendation 69A even twice, as it refers to an illustration with the depicted specimen being still available in Prague (fig. 6).

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