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Authorship, dates of publication, status and types of Spix and Agassiz's Brazilian fishes

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Abstract

Spix & Agassiz's "Selecta genera et species piscium Brasiliensium" has been published in two fascicles, in June 1829 and January 1831. The plates had been prepared in part under Spix's supervision and the text has been written by Agassiz, but Agassiz is the sole author for nomenclatural purposes. Some types are still extant (Table 3). Nomenclatural problems related to names proposed in this book are discussed: *Hypopthalmus*, *Sorubim*, *Osteoglossum*, *Pacu* and *Anodus* are authored by Cuvier, 1829, *Pirarara* Agassiz, 1829 has priority over *Phractocephalus* Agassiz, 1829, *Osteoglossum vandellii* Cuvier, 1829 has priority over *O. bicirrhosum* Cuvier, 1829, *Pacu* Agassiz, 1829 is a junior homonym but not a synonym of *Pacu* Cuvier, 1829, *Pacu* Cuvier, 1829 is an objective synonym of *Curimata* Bosc, 1817, *Rhaphiodon* Agassiz, 1829 has priority over *Cynodon* Agassiz, 1829, *R. gibbus* Agassiz, 1829 is type species of *Rhaphiodon*.

Introduction

Louis¹ Agassiz was born on 28 May 1807 at Môtier (46°58' N 7°05' E) in the French-speaking part of Switzerland. Between 1817 and 1821 he studied at the Lycée de Bienne; from 1822 to 1824 at the Académie de Lausanne; from 1824 to 1826 at the University of Zürich (all in Switzerland); from 1826 to 1827 at the University of Heidelberg and from 1827 to 1830 at the University of München [Munich], where he was awarded the degree of doctor of medicine in 1830, having already obtained a doctor of philosophy degree at Erlangen in 1829. From 1830 to 1831, he worked on fossil fishes in his father's home in Concise (46°51' N 6°43' E) in Switzerland and from 1831 to 1832 in Paris at the Jardin des Plantes under Cuvier. From 12 November 1832 to November 1841 he was professor at the Collège de Neuchâtel (Switzerland), and from its foundation in October 1841 to March 1846 at the Académie de Neuchâtel (the former name of the university). In 1846, he left Neuchâtel for Paris and London and arrived in Boston in October 1846. His work and its impact on new world natural sciences during his life and long after his death on 14 December 1873 are well documented. The biographical details given here are taken from E. AGASSIZ (1885, 1887²) and MARCOU (1896). LURIE (1960) provides additional data on Agassiz's life, but is of very limited use for his European period and is in places inaccurate for this period.

In 1828, while Agassiz was still a student, Carl Friedrich Philipp von Martius^{3,4} (1794–1868) asked him to prepare a report on the fishes of Brazil. Martius had spent the years 1817–20 exploring this country with Johann Baptist von Spix (1781–1826), Spix being the zoologist and leader of the expedition and Martius the botanist. They had already published several books on the results of this expedition, but Spix died before the completion of the zoology (see FITTKAU, 1983 a, b). Agassiz accepted the work and this resulted in the first monograph on Brazilian fishes, both marine and freshwater, since MARCGRAVE (1648); it contains descriptions of numerous new species and genera.

The specimens collected by Spix (except those subsequently given to Agassiz) were housed in Zoologische Staatssammlung München until their destruction during a British bombing raid on the night of 24–25 April 1944 (TEROFAL, 1983). The fish collections had been packed and were in the entrance

of the building of the Bayerische Akademie der Wissenschaften [Academy of Sciences of Bavaria]: they were to be moved to a safe place out of the town in the forthcoming days but the entire museum was destroyed and the whole fish collection burned (HOOGMOED & GRUBER, 1983: 321).

At the request of C. Dufour and J.-P. Haenni, I undertook a revision of the fish collections now housed in the Musée d'Histoire Naturelle de Neuchâtel. As could be expected, types of several species described by Agassiz or received in exchange from contemporary scientists turned up (KOTTELAT, 1983, 1984). The collection contains 83 jars of Brazilian fishes, some of them being types or putative types of the fishes described from the Spix collection. These had been received by Agassiz from Martius (E. AGASSIZ, 1887: 62, 72). The bulk of Agassiz's private collection has been bought by the Musée d'Histoire Naturelle de Neuchâtel in 1834 (MARCOU, 1896: 55; [GODET], 1899; GODET, 1907) and Agassiz also left some specimens when he went to the New World. As a result of the discovery of these types, I became interested in the status of some of the Brazilian fish names, although it soon turned out that several problems concerning the dates of publication, the authors and the nomenclatural status of several names had not been definitively solved. WHITEHEAD & MYERS (1971) examined some of these problems; my conclusions supplement, or occasionally disagree with, their opinions. Data which duplicate those of Whitehead & Myers have been omitted, unless necessary for the argument.

Material and conventions

I follow WHITEHEAD & MYERS (1971) in referring to SPIX & AGASSIZ (1829–31) as “Brazilian fishes”. The International Code of Zoological Nomenclature (1985 edition) is referred to as the Code. Documents referred to as AEN are “Archives de Louis Agassiz; Fonds de l'Institut de Géologie de l'Université de Neuchâtel, Suisse”; they have been catalogued by SURDEZ (1974) and they can be consulted in the Archives de l'Etat, Château, CH-2000 Neuchâtel, Switzerland. Other abbreviations used are: MHNG Muséum d'Histoire Naturelle, Genève; MHNN Musée d'Histoire Naturelle, Neuchâtel; SL standard length; TL total length; ZSM Zoologische Staatssammlung München.

Spix & Agassiz's Brazilian fishes

Since a limited number of this book was printed and it has not been reprinted and is quite difficult to find (there is a microfiche edition), it is useful to give a description of its general appearance. It was distributed as an unbound series of sheets (28×36 cm), as follows:

- a. Half title page: *Selecta genera et species piscium Brasiliensium* [Selected genera and species of Brazilian fishes]. This page forms a single sheet.
- b. Title page: *Selecta / genera et species / piscium / quos / in itinere per Brasiliam / annis MDCCCXVII–MDCCCXX / jussu et auspiciis / Maximiliani Josephi I. / Bavariae regis augustissimi peracto / collegit et pingendos curavit / Dr. J. B. de Spix, / ... / digessit, descripit et observationibus anatomicis illustravit / Dr. L. Agassiz, / praefatus est et edidit itineris socius / Dr. F. C. Ph. de Martius. / Monachii, / typis C. Wolf. / 1829* [Selected genera and species of fishes, as Dr. J. B. von Spix collected them and had them drawn during his journey in Brazil in the years 1817–1820 by order and under protection of Maximilian Joseph I., very august king of Bayern (Bavaria). Classification, descriptions and anatomical plates by Dr. L. Agassiz. Work prefaced and published by travel companion Dr. F. C. Ph. von Martius. Printed in München (Munich) by C. Wolf. 1829]. This work was published in München [in Latin Monaco] and not in [Principauté de] Monaco, as is occasionally given in some bibliographies.
- c. Dedication to Cuvier: *Viro illustrissimo L. B. de Cuvier summo zoologo qui praeclaro ingenio totam naturam quae est quaeque fuit amplexus e terrae aequorique penetralibus ubiorem animalium historiam eduxit disposuit stabilivit hoc opus ab amico defuncto inchoatum D. D. D. L. Agassiz et C. F. Ph. de Martius* [To the most illustrious Baron (L. B. = Le Baron) de Cuvier, the eminent zoologist who, thanks to his brilliant intelligence, embracing the whole nature as it is and as it has been, extracted from the profoundness of the earth and the sea, arranged and consolidated an enriched history of animals, L. Agassiz and C. F. Ph. von Martius have dedicated this work which a defunct friend had begun]. Items b and c form a single sheet.

- d. List of subscribers; 2 pages; 1 sheet.
e. Preface, by Martius; page I–XVI; 4 sheets.
f. Obituary of Spix, by Martius; pages I–II; 1 sheet.
g. Conspectus (table of contents); pages 1–4; 1 sheet.
h. Explanations of anatomical plates; pages 5–6; 1 sheet.
i. Text: 138 pages as follow: 20 sheets of 4 pages (1–80), 1 sheet of 2 pages (81–82), 11 sheets of 4 pages (83–136), 1 sheet of 2 pages (137–138).
j. 7 plates representing scenes of fisheries; lettered A–G. Plates A–D are signed “lith[ograph] v[on] Nep[omuk] v[on] Ott” and plates E–G are not signed. The copy in Neuchâtel public library is uncoloured; the one in Basel university library is coloured.
k. 84 hand-colour plates representing fishes, numbered 1–76, also 8a, 13a, 24a, 50a, 50b, 56a, 56b, 69a.
l. 6 anatomical plates, lettered A–F; plate B is signed “S[ebastian] Minsinger del W[ilhelm] Siegrist sc.”
m. One plate representing Spix.

Dates of publication

As WHITEHEAD & MYERS (1971) point out, an exact dating of the “Brazilian fishes” is essential because of conflicts with names in CUVIERS’s *Règne animal* (1829), which was published not later than 31 March 1829 (BOESEMAN, 1962).

Document AEN 118/2.1 is a prospectus for the various books on Brazil published by Martius. This prospectus is in French on one side and German on the other. The French side bears the title “Ouvrage sur le Brésil publié par Mr. le Dr. de Martius”. Book 6 is given as:

Spix et Agassiz, Pisces, pet. en fol. Prem. Cah. avec 53 planch. color. Pr. 129 Frcs.

La fin de cet ouvrage va paraître incésamment [sic]...

[Spix and Agassiz, Pisces, small folio. First fascicle with 53 coloured plates, price 129 francs. The end of this work will appear at once...]

On the reverse side is the same text in German, with the price 105 Fl. [Gulden (see KLIMPERT, 1896)]. This prospectus is not dated.

It is clear that the book was published and distributed in more than one part. By chance, AEN 118/3 is an unbound copy (unfortunately not complete) containing items a–c, and i (from page 1 to 114) still in the original wrapper of the second fascicle, whose title is reproduced here as Figure 1.

SPIX ET AGASSIZ PISCES BRASILIENSES,

EDIDIT MARTIUS.

FASCICULUS II. ET ULTIMUS.

CONTINET:

Praefat. (4 fol. pag. III–XVI.) Memor. Spixii, Conspect. et Tab. explicat. (2 fol. p. I. II. et 1–6.)
Text. (fol. 22–35. pag. 83–138.)

Icones: Piscatio: 3 Tab. E. F. G.

Pisces 36 Tab. 46–50. 50 a. 50 b. 51–56. 56 a. 56 b. 57–69. 69 a. 70–76.

Anatomes 6 Tab. } A. B. (duplex) ad Fasc. 1.

” } C. D. E. F.

Icon Spixii

Monachii Januar 1831.

Fig. 1. Title of the original wrapper of fascicle 2; document AEN 118/3.

©Zoë J. S. ... The statement "Fasciculus II, et ultimus" [second and last fascicle] clearly indicates that only two fascicles are involved. Therefore, the following parts must be considered as published on 31 January 1831 [Code, art. 21 (c) (i)]: d–h, i pp. 83–138, j pls E–G, k pls 46–76, 50a, 50b, 56a, 56b, 69a, l, m.

The statement concerning anatomical plates means that all six plates were published with the second fascicle, but that plates A and B correspond to text in fascicle one; plate B is folded (duplex). In a letter to Agassiz dated 2 March 1831, Martius wrote that a copy had been sent to Cuvier eight days earlier (document in Houghton Library, Harvard University, Cambridge, MA, bMS Am 1419 [480]).

All the other parts were thus published in fascicle one, including the title page, which bears the date 1829.

In a letter dated 29 December 1828 to his sister Cécile (E. AGASSIZ, 1887: 61), Agassiz informed her that the first volume was completed, that the printing had already begun and that 40 (50 in E. AGASSIZ, 1886: 46) coloured plates were already finished. In a letter dated 14 February 1829 to his father (E. AGASSIZ, 1887: 74) he wrote that the book would appear soon and that the already completed part had been presented on November 1828 to a meeting of German naturalists and physicians. It is not clear what this "presented" means but such a presentation does not render any binominal name available.

In a letter dated 22 May 1829 to his brother (E. AGASSIZ, 1887: 82) Agassiz informed him that he had received his doctor degree at Erlangen on 23 or 24 April 1829. We know (E. AGASSIZ, 1887: 82) that Martius ("publisher" of the book) wanted Agassiz to get this degree so that this title could be printed on the title page (as indeed it was); this probably in order to insure better sales.

In a letter to his father dated 4 July 1829 (E. AGASSIZ, 1887: 82) Agassiz wrote that he had sent him a copy of the first fascicle. His father received it on 31 August 1829 (E. AGASSIZ, 1887: 87). This book took a long time to get from München to Concise, as it had been sent by Martius to Marie-Philippe Mercier (1781–1831), a botanist in Genève [Geneva] (see BRIQUET, 1940), with herbarium specimens, and then sent to the Agassizs. My efforts to trace Mercier's correspondence in the Conservatoire Botanique, Genève and Archives de l'Etat, Genève, were fruitless. Cuvier had already received his copy and written to Agassiz on 3 August 1829 (E. AGASSIZ, 1887: 86).

As we can see from Agassiz's correspondence, he laid great value on this book, his first important work. Since there is no mention in his letter of 22 May 1829 to his brother of it having been published already (E. AGASSIZ, 1887: 82), we may conclude that it was not yet published. Thus the date of publication must have been after 22 May but before 4 July 1829. This agrees with WHITEHEAD & MYERS' (1971) argument; they favoured the last week in June 1829. It is clear, therefore, that Cuvier's Règne animal has about two to three months priority over the "Brazilian fishes".

A review of the first fascicle of "Brazilian fishes" appeared in July 1829 issue of Isis (ANON. [OKEN ?], 1829).

Authorship and availability of names

As the title page indicates, Spix collected the specimens and supervised the execution of the drawings, whilst Agassiz arranged the species in systematic order, described them and prepared the anatomical plates. However, it seems that several plates were drawn by Joseph Dinkel under the supervision of Agassiz (E. AGASSIZ, 1887: 70), since Agassiz wrote in a letter to Cuvier (which he probably never sent) (E. AGASSIZ, 1887: 82) that several of Spix's plates were inaccurate and that they had been redrawn (E. AGASSIZ, 1887: 80).

WHITEHEAD & MYERS (1971) supposed that Spix had written a part of the text and that Agassiz completed it. In fact, it appears that Agassiz wrote the whole of the text. Several manuscript drafts of the book still exist, written by Agassiz partly in French, German and Latin; there are also some annotations by Karl Friedrich Schimper (1803–1867), then a good friend of Agassiz and who studied with him. Document AEN 118/1.1 is the manuscript of the conspectus and AEN 117 is the manuscript of the text. The latter includes several drafts of the first fascicle, some text having been written on sketches for the anatomical plates (Fig. 2). Very often, the text is quite different from the final version (Fig. 3). Earlier drafts of the second fascicle are not present, but for the whole book a clean and final draft is present, again in Agassiz's hand. It does not differ from the published text. Whatever Spix wrote, it can only have been rough notes (although he named the species for the plates).

XIV. Osteoglossum Vandelli

Ichthyosoma Grij.

Caput parvum, compressissimum, minus medium; ossa
suborbitalia latissima omnino buccas obtegentia; opercula
et prooperculum latissima, maxima, sub 2 et interopercu-
luma minima ~~extrema non videnda~~. Oculi ad
rostri apicem. ~~Totae nasales, 4, paribus paribus~~ (5 ~~maxillimum~~
maximum, obliquum. (pp. 1. ob = 2/3 g. kal)) ~~et~~ undique
dentibus obtusum. ~~Mandibula~~ ossa intermaxillaria minora
tantum partem anteriorem et medianam maxilla
superioris ~~conformant~~. ~~Labia~~ ossa maxillaria
superiora angustissima, longissima, totum ~~labium~~
maxilla superiora ~~conformant~~, dentibus
acutis conicis, parvis eodem approximatis, aequalibus
per seriem unicam dispositis armata sunt ~~et~~



XIV. Osteoglossum Vandelli. Ichthyosoma Grij.

(14)

Caput parvum, compressissimum, minus medium; ossa
suborbitalia latissima buccas omnino obtegentia; opercula
et prooperculum latissima, maxima, suboperculum et inter-
operculum minima ~~extrema non videnda~~. Oculi ad rostri
apicem. Totae nasales quatuor paribus paribus. (5 ~~max-
illimum~~ maximum, obliquum, recte oblique descendente, undique
dentibus obtusum). Mandibula apice acutis armata.
Ossa intermaxillaria minora tantum partem anteriorem
et medianam maxilla superioris, ossa maxillaria superiora
angustissima, longissima, totum labium maxilla superioris
conformant. ~~Opercula~~ acutis conicis, parvis, approximatis,
aequalibus per seriem unicam dispositis armata sunt;
mandibula vami graciles, proelongi eodem modo dentibus
armati, ad dysphygia tantum series dentium duplex,
internam retrorsum vergetam, vomer et pars anterior ossis
palatini dentibus acutis confertis ~~armati~~ ^{oppositis}, pars posterior

Fig. 3B. Draft of the same text; document AEN 117.

Pteris latialis quam maxime retrosum posita
et analis latior, haec cum caudali ang.

2. Osteoglossum bicirrhosum Lab. XIV.

Wm. Lloyd Garrison

$4\frac{1}{2}$ and $5\frac{1}{2}$
and $6\frac{1}{2}$.

Archi, dusci ad symphysis omi medialis
fines pectorales, altera lateralis proventis.
Capit an clavo $5\frac{1}{2}$ apote $4\frac{1}{2}$ anda parum longiore
per Corpus ad anum usque.

Tachyura bicolor Sp.

*Cepit rubra molis, capitis habita parvula supra
planum flava recta cum dorso continua, lateraliter
imperfectissima et quatuor lateribus finem granulis
perforatis, pro operculo et duabus albis subrotundis
obscuram; aperturam operculi granulatam
quod operculum parvum deinde potest hic nunc square*

144.)

Membrana branchiostegæ radius 10. Corpus compressum.
Spirula squamis maximis reticulatis lectum.

Abdomen carinatum. ^{areolis et} Pica (parvatis) quam maxime
structum posita, et areolis latissimis, illa cum
caudali conjuncta. confluent.

1. Osteoglossum bicirrhosum. Vand. Lab. XIV.

Crocidus modestus ad symphyseon ostium mandibularium.
Epide, ore clauso 1: $5\frac{1}{2}$, ore aperto 1: $6\frac{1}{2}$; corpus
compressissimum; cauda parum longiore quam corpus
ad anum usque; pinis pectoralibus ultra ventrales
productis.

Echnodoma bicinctatum Spiz.

Caput ratiore; motis corporis habita parum, supra plenum
et linea recta cum dorso continuum, lateraliter compress^{um}
Primum et quatuor latius ossibus hemis granulat^{is}, nemp^e
operculo postice rotundato et cute late emergente postice
aucto, prooperculo trigono et duobus posterioribus
ossibus suborbitalibus omnia oblectum; 8 suprat^r-post^r
l. 1 "m^m circa Sahama), et pluribus oculis mucosis

quorum superior
 (trigonum), inferior

Fig. 3 C. Draft of the same text; document AEN 117.

When different names are used in the text and on the plates, two different interpretations of the Code seem possible; by chance, the result is the same:

- first interpretation is that both names are available, the one on the plate by indication, the one in the text by description;
- second interpretation is that names used in the text are available; names used on the plates are listed as synonyms in the text and, as synonyms, are only available if they have been treated as available names before 1961. In that case, the author and date is Agassiz, 1829.

In both cases, they are simultaneous synonyms and the one to be retained is the one selected by the first reviser. According to the English text of the glossary of the Code (p. 264), the first reviser is the first author to subsequently cite names, etc. [The French glossary (p. 290) is not very explicit on the subsequent character of the first reviser, but it seems to be implicitly recognized].

Such pairs of names appear in the first fascicle only. For specific names, the first subsequent reviser is Agassiz himself, in the Conspectus [table of contents] distributed with the second fascicle in 1831. There Agassiz cited both names and chose one of them (cited first) to have precedence over the other(s) (cited in brackets), in accordance with the requirements of the Code [art. 24 (b)]. As could be expected, the names retained by Agassiz are always those that he had introduced in the text, the only exception being *Osteoglossum bicirrhosum* (see below). The generic names are discussed in the next chapter.

For some taxa, the author is given as “Cuvier, in litt.”, presumably because Cuvier had seen Spix’s plates (E. AGASSIZ, 1887: 80) and had sent his comments to Martius. LURIE (1960) mentioned these comments and WHITEHEAD & MYERS (1971) published them. From these comments, it is clear that Cuvier did not provide descriptions and that Agassiz’s descriptions have been prepared without Cuvier’s help, although Agassiz did pay attention to the proposed names (or to the suggested suppression of some barbarisms, that is names derived from Brazilian or Indian names [it is worth remembering that for the Ancients, Barbarians were foreigners, not obligatorily savage and cruel, and that barbarism thus means “in a foreign language”, or in the particular case “non Latin”]). These “Cuvier” names are available in zoology in as much as Agassiz (in “Brazilian fishes”) published them. In terms of zoological nomenclature, Agassiz is the author of these names since Cuvier was not the author of both the names and the conditions which make them available.

CUVIER (1829) used some of Spix’s manuscript names in his “Règne animal” and some of them should have priority over Agassiz’s ones since this book appeared at the latest date on 31 March 1829 (BOESEMANN, 1962) while “Brazilian fishes” appeared at the earliest after 22 May 1829. WHITEHEAD & MYERS (1971) have shown that Spix’s names as used by Cuvier are nomina nuda, since they are without description, or are simply not available, and the citation of an unpublished illustration does not qualify as an indication. This is only partly correct; as shown below, *Hypophthalmus*, *Sorubim*, *Osteoglossum*, *Anodus* and *Pacu* are available from CUVIER (1829). As the dates of publication are known, one can also decide the priority of names appearing in CUVIER & VALENCIENNES’s *Histoire naturelle des poissons* prior to January 1831 (see BAILEY, 1951, for authorship and dates of publication of this work).

Several of Spix and Martius’ new zoological and botanical names are available (by description or indication) from the narrative of their expedition (SPIX & MARTIUS, 1823, 1828, 1831). I checked the three volumes and found that fishes are not involved: several are described, but none with a latinized name.

An additional source of confusion is the custom at that time of indicating the author of the combination and not of the name. Agassiz, like others, paid attention to authors of names whereas the current Code and practice concern names of taxa. For example, *Prochilodus argenteus* Agassiz (p. 63) does not mean that Agassiz is the author of *argenteus*, but that he considered himself as the author of a new combination of *Pacu argenteus* of Spix.

The status of all these names, as well as that of a few generic names of American and African fishes proposed by Agassiz in footnotes have been examined. New generic names proposed in “Brazilian

fishes" are listed on Table 1; the type species of each has been traced. All specific names used in the text are listed in Table 2 in order of their appearance in the text. Short comments on nomenclature are given as footnotes. Major nomenclatural problems encountered and/or solved are dealt with in the next chapter below.

Table 1. New generic names in Spix & Agassiz's "Brazilian fishes" with their type species. Five of Spix's names available from Cuvier's Règne animal are also included. Abbreviations: S: Spix; A: Agassiz. When two different names have been used in the text and on the plates, the one retained in the conspectus is listed first.

Genus	Type species	Designation
<i>Acanthicus</i> A, in S & A, 1829	<i>A. hystrix</i> A, in S & A, 1829	by monotypy
<i>Rhinelepis</i> A, in S & A, 1829	<i>R. aspera</i> A, in S & A, 1829	by monotypy
<i>Glanis</i> A, in S & A, 1829 ⁵	<i>Silurus bagre</i> Linnaeus, 1766	present designation
<i>Ceratorhynchus</i> A, in S & A, 1829 ⁶	<i>Silurus militaris</i> Linnaeus, 1758	original designation
<i>Cetopsis</i> A, in S & A, 1829	<i>Silurus coecutiens</i> Lichtenstein, 1819	BLEEKER, 1862: 16 ⁷
<i>Centrochir</i> A, in S & A, 1829	<i>Doras crocodili</i> Humboldt, in Humboldt & Valenciennes, 1821 ⁸	by monotypy
<i>Hypophthalmus</i> Cuvier, 1829	<i>H. edentatus</i> A, in S & A, 1829	BLEEKER, 1862: 15
<i>Pirarara</i> A, in S & A, 1829	<i>Pirarara bicolor</i> A, in S & A, 1829	by monotypy
<i>Phractocephalus</i> A, in S & A, 1829		
<i>Sorubim</i> Cuvier, 1829	<i>Silurus lima</i> Bloch, in Schneider, 1801	BLEEKER, 1862: 10
<i>Platystoma</i> A, in S & A, 1829		
<i>Osteoglossum</i> Cuvier, 1829	<i>Osteoglossum vandellii</i> Cuvier, 1829	by monotypy
<i>Ischnosoma</i> Cuvier, 1829		
<i>Glossodus</i> A, in S & A, 1829 ⁹	<i>G. forskalii</i> A, in S & A, 1829	by monotypy
<i>Anodus</i> Cuvier, 1829	<i>A. elongatus</i> A, in S & A, 1829	EIGENMANN & EIGENMANN, 1899
<i>Pacu</i> Cuvier, 1829	<i>Salmo edentulus</i> Bloch, 1794	present designation
<i>Prochilodus</i> A, in S & A, 1829	<i>P. argenteus</i> A, in S & A, 1829	EIGENMANN, 1918: 424
<i>Pacu</i> A, in S & A, 1829		
<i>Leporinus</i> A, in S & A, 1829	<i>L. novemfasciatus</i> A, in S & A, 1829	EIGENMANN, 1910: 426 ¹⁰
<i>Schizodon</i> A, in S & A, 1829	<i>S. fasciatus</i> A, in S & A, 1829	EIGENMANN, 1910: 425 ¹¹
<i>Rhaphiodon</i> A, in S & A, 1829	<i>R. gibbus</i> A, in S & A, 1829	CAMPOS, 1945: 472
<i>Cynodon</i> A, in S & A, 1829		
<i>Xiphorhynchus</i> A, in S & A, 1829 ¹²	<i>Salmo falcatus</i> Bloch, 1794	by monotypy
<i>Salminus</i> A, in S & A, 1829 ¹³	<i>Hydrocyon brevidens</i> Cuvier, 1819	by monotypy
<i>Xiphostoma</i> A, in S & A, 1829 ¹⁴	<i>X. cuvieri</i> A, in S & A, 1829	EIGENMANN, 1910: 446 ¹⁵
<i>Micropteryx</i> A, in S & A, 1831 ¹⁶	<i>Caranx dumerili</i> Risso, 1810	JORDAN & GILBERT, 1883
<i>Corniger</i> A, in S & A, 1831	<i>C. spinosus</i> A, in S & A, 1831	by monotypy
<i>Pachyurus</i> A, in S & A, 1831	<i>P. squamipennis</i> A, in S & A, 1831	by monotypy

Nomenclature

Hypophthalmus Cuvier, 1829

Hypophthalmus is usually considered as authored by Agassiz, in Spix & Agassiz, 1829. However, CUVIER (1829: 293) described a group of catfishes:

"Quelques uns se font remarquer par une tête déprimée; des yeux placés très bas sur ses côtés, et une adipeuse extrêmement petite; ils ressemblent beaucoup aux Schilbés (4)."

Table 2. Names and authorship of species described in Spix & Agassiz's "Brazilian fishes". Abbreviations: A: Agassiz, S: Spix. When different new specific names are used in the text and on the plates, the one retained in the conspectus is listed first. If the same specific name is used with different generic names, the name used on the plate is listed in brackets.

<i>Acanthicus hystrix</i> A, in S & A, 1829		<i>Anodus elongatus</i> A, in S & A, 1829	
<i>Rhinelepis aspera</i> A, in S & A, 1829		<i>Anodus latior</i> A, in S & A, 1829	
<i>Loricaria rostrata</i> A, in S & A, 1829		<i>Prochilodus [Pacu] argenteus</i> A, in S & A, 1829	
<i>Hypostoma etentaculatum</i> A, in S & A, 1829		<i>Prochilodus [Pacu] nigricans</i> A, in S & A, 1829	
<i>Cetopsis coecutiens</i> Lichtenstein, 1819		<i>Leporinus novemfasciatus</i> A, in S & A, 1829 ²⁴	
<i>Cetopsis [Silurus] candiru</i> S & A, 1829		<i>Schizodon [Curimata] fasciatus</i> A, in S & A, 1829	
<i>Doras humboldti</i> A, in S & A, 1829	} 17	<i>Chalceus angulatus</i> A, in S & A, 1829	
<i>Corydoras edentatus</i> A, in S & A, 1829		<i>Chalceus [Characinus] amazonicus</i> A, in S & A, 1829	
<i>Hypophthalmus edentatus</i> A, in S & A, 1829		<i>Tetragonopterus chalceus</i> A, in S & A, 1829	
<i>Hypophthalmus nuchalis</i> A, in S & A, 1829		<i>Serrasalmo aureus</i> A, in S & A, 1829	
<i>Pimelodus spixii</i> A, in S & A, 1829	} 18	<i>Serrasalmo nigricans</i> A, in S & A, 1829	
<i>Pimelodus albidus</i> A, in S & A, 1829		<i>Myletes [Tetragonopterus] aureus</i> A, in S & A, 1829	
<i>Pimelodus rigidus</i> A, in S & A, 1829		<i>Myletes bidens</i> A, in S & A, 1829	
<i>Pimelodus pirinampu</i> A, in S & A, 1829		<i>Raphiodon [Cynodon] gibbus</i> A, in S & A, 1829	
<i>Pimelodus ctenodus</i> A, in S & A, 1829		<i>Raphiodon [Cynodon] vulpinus</i> A, in S & A, 1829	
<i>Pirarara [Phractocephalus] bicolor</i> A, in S & A, 1829		<i>Xiphostoma cuvieri</i> A, in S & A, 1829	
<i>Sorubim infraoculare</i> A, in S & A, 1829 ¹⁹		<i>Saurus longirostris</i> A, in S & A, 1829	
<i>Sorubim planiceps</i> A, in S & A, 1829	} 20	<i>Saurus intermedius</i> A, in S & A, 1829	
<i>Platystoma pirauaca</i> A, in S & A, 1829		<i>Saurus truncatus</i> A, in S & A, 1829	
<i>Platystoma spatula</i> A, in S & A, 1829		<i>Rhombus ocellatus</i> A, in S & A, 1831 ²⁵	
<i>Sorubim jandia</i> A, in S & A, 1829		<i>Rhombus solaeformis</i> A, in S & A, 1831	
<i>Platystoma corruscans</i> A, in S & A, 1829		<i>Solea brasiliensis</i> A, in S & A, 1831	
<i>Sorubim carapary</i> A, in S & A, 1829		<i>Monochir maculipennis</i> A, in S & A, 1831	
<i>Platystoma truncatum</i> A, in S & A, 1829		<i>Plagusia brasiliensis</i> A, in S & A, 1831	
<i>Heterobranchus sextentaculatus</i> A, in S & A, 1829		<i>Gymnothorax rostratus</i> A, in S & A, 1831	
<i>Sudis pirarucu</i> A, in S & A, 1829 ²¹		<i>Gymnothorax ocellatus</i> A, in S & A, 1831	
<i>Erythrinus saluus</i> A, in S & A, 1829		<i>Anarrhichas leopardus</i> A, in S & A, 1831	
<i>Erythrinus unitaeniatus</i> A, in S & A, 1829 ²²		<i>Labrus crassus</i> A, in S & A, 1831	
<i>Erythrinus macrodon</i> A, in S & A, 1829	} 23	<i>Julis dimidiatus</i> A, in S & A, 1831	
<i>Erythrinus trahira</i> A, in S & A, 1829		<i>Xyrichtys uniocellatus</i> A, in S & A, 1831	
<i>Erythrinus microcephalus</i> A, in S & A, 1829		<i>Scarus frondosus</i> A, in S & A, 1831	
<i>Erythrinus brasiliensis</i> A, in S & A, 1829		<i>Cichla labrina</i> A, in S & A, 1831	
<i>Osteoglossum vandellii</i> Cuvier, 1829		<i>Cichla monoculus</i> A, in S & A, 1831	
<i>Osteoglossum bicirrhosum</i> Cuvier, 1829		<i>Cybius maculatum</i> (Mitchill, 1815)	
<i>Glossodus forskalii</i> A, in S & A, 1829		<i>Micropteryx cosmopolita</i> (Cuvier, 1829)	
<i>Engraulis sericeus</i> A, in S & A, 1829		<i>Caranx latus</i> A, in S & A, 1831	
<i>Engraulis bahiensis</i> A, in S & A, 1829		<i>Caranx lepturus</i> A, in S & A, 1831	
<i>Engraulis grossidens</i> A, in S & A, 1829		<i>Caranx macrophthalmus</i> A, in S & A, 1831 ²⁶	
<i>Engraulis janeiro</i> A, in S & A, 1829		<i>Caranx punctatus</i> A, in S & A, 1831	
<i>Engraulis tricolor</i> A, in S & A, 1829		<i>Argyreosomus vomer</i> (Linnaeus, 1758)	
<i>Engraulis piquitinga</i> A, in S & A, 1829		<i>Vomer brownii</i> Cuvier, 1816	
<i>Clupanodon aureus</i> A, in S & A, 1829		<i>Coryphaena immaculata</i> A, in S & A, 1831	
<i>Megalops thrissoides</i> (Bloch, in Schneider, 1801)		<i>Ephippus gigas</i> Cuvier, 1829	
<i>Pristigaster martii</i> A, in S & A, 1829		<i>Gerres linaetus</i> (Humboldt, in Humboldt & Valenciennes, 1821) ⁸	
		<i>Pagrus argyrops</i> (Linnaeus, 1758)	
		<i>Mesoprius uninottatus</i> Cuvier, in Cuvier & Valenciennes, 1828	
		<i>Mesoprius aurovittatus</i> A, in S & A, 1831	
		<i>Corniger spinosus</i> A, in S & A, 1831	

His footnote (4) reads:

“Spix en fait son sous-genre *Hypophthalmus*, dont il a deux espèces: *Hyp. edentatus*, IX, *Hyp. nuchalis*, XVII.”

Hypophthalmus is clearly available from Cuvier’s description. As we know that Cuvier had material of this genus (see comments in WHITEHEAD & MYERS, 1971: 485), it is clear that he based his description on the specimens and is alone responsible for the conditions which make *Hypophthalmus* available.

No specific names are available from CUVIER (1829). SPIX & AGASSIZ (1829) were the first to use available specific names with *Hypophthalmus*: *H. edentatus* and *H. nuchalis*. BLEEKER (1862: 15) designated *H. edentatus* as the type species.

Pirarara Agassiz, in Spix & Agassiz, 1829 Phractocephalus Agassiz, in Spix & Agassiz, 1829

Both *Pirarara* and *Phractocephalus* are available names. *Phractocephalus* has been commonly used, but BLEEKER (1862: 11) clearly placed *Phractocephalus* as a synonym of *Pirarara*. As Bleeker was the first author to mention both names and to place one in the synonymy of the other, he is the first reviser. *Pirarara* is the name which should be used instead of *Phractocephalus*. Since BLEEKER’s (1862) action, the name *Pirarara* has not been used again, except in synonymies et chresonymies. BOESEMANN (1983) lists 4 references using *Pirarara* against 58 using *Phractocephalus*. The name *Phractocephalus* has been widely used and its replacement by the senior synonym *Pirarara* cannot be in the interest of the stability of nomenclature. *Phractocephalus* being an important food fish, conservation of this name seems justified and the case has been submitted to the International Commission on Zoological Nomenclature; awaiting the ruling of the Commission, *Phractocephalus* is the name to use for this genus [Code art. 80(a)].

Sorubim Cuvier, 1829 Platystoma Agassiz, in Spix & Agassiz, 1829

Platystoma is described by Agassiz in the text of “Brazilian fishes” while *Sorubim* appears in combination with several specific names on the plates. Both are available, but *Platystoma* Agassiz cannot be valid as it is preoccupied by *Platystoma* Meigen, 1803 (p. 227), a genus of insects.

Agassiz would be the author of *Sorubim* if that name had not already been established by CUVIER (1829: 293), who diagnosed a group of catfishes:

“Parmis ceux à six barbillons, les plus remarquables ont le museau déprimé et large, autant et plus que le brochet [Esox] (1)”.

His footnote (1) reads:

“*Sil. lima* Bl. Schn.; – *Sil. fasciatus*, Bl. 366, et diverses espèces nouvelles. Spix fait de cette division son genre *Sorubim*.”

As a result, *Sorubim* is clearly available, Cuvier is the author and two nominal species are included. BLEEKER (1862: 10) designated *Silurus lima* Bloch, in Schneider, 1801, as the type species.

Osteoglossum Cuvier, 1829

Ischnosoma Cuvier, 1829

Osteoglossum vandellii Cuvier, 1829

Osteoglossum bicirrhosum Cuvier, 1829

Agassiz (p. 46) used the heading “*Osteoglossum* Vandelli. *Ischnosoma* Spix”. This means that he considered *Ischnosoma* a junior synonym of *Osteoglossum*, presumably based on Cuvier’s manuscript notes (see WHITEHEAD & MYERS, 1971: 487) stating:

“*Ischnosoma bicirrhosum*: Vandelli a décrit et représenté ce poisson sous le nom d’*Osteoglossum*”.

From Valenciennes (in CUVIER & VALENCIENNES, 1847: 289, 294) it is clear that this Vandelli description was in manuscript. CUVIER (1829: 328) actually published the first description of *Osteoglossum* and his work appeared a few months before “Brazilian fishes”.

Cuvier included a single species in his genus *Osteoglossum*. This is explicit by his statement:

“On en connaît une espèce assez grande du Brésil (*Osteoglossum Vandellii*, n., ou *Ischnosoma bicirrhosum*, Spix, xxv.)”. [We know a single, quite large species from Brazil (*Osteoglossum Vandellii*, n. [nobis = mine], or *Ischnosoma bicirrhosum*, Spix, [plate] xxv)].

This means that Cuvier named the new species *O. vandellii* and considered that the *I. bicirrhosum* on Spix’s unpublished plate was the same species. Thus *Osteoglossum* and *O. vandellii* are available names. This is particularly obvious in the case of the generic names as the heading of the chapter was “Les Ostéoglosses”, clearly showing that Cuvier wanted to use the name *Osteoglossum*. By analogy and considering the context and practices of that time, this also applies to the specific names. Cuvier (and later Cuvier & Valenciennes) often mentioned names existing only on labels, in manuscripts or on unpublished drawings. In some ways, this is analogous with our present practice of listing “material examined”; one of the “specimen” of *O. vandellii* was the unpublished illustration labelled *I. bicirrhosum* by Spix.

Ischnosoma and *I. bicirrhosum* are first published in synonymy and are available only if they have been treated as available before 1961 [Code art. 11 (e); see also example thereafter]. The next use of *Ischnosoma* and *bicirrhosum* by Agassiz (in Spix & Agassiz, 1829) makes them available; but they must be considered as authored by Cuvier (1829) [Code, art. 50 (g)].

These four names being available from CUVIER (1829), we have two sets of simultaneous synonyms. The decision of the first reviser is decisive [Code art. 24 (a), (b)]. For the specific names, the first reviser is Agassiz (in SPIX & AGASSIZ, 1831: conspectus) who retained *O. vandellii*.

The combination *Osteoglossum vandellii* has never been used again for this fish. As it is an important food fish, conservation of the name seems justified. This request has been submitted to the International Commission on Zoological Nomenclature; awaiting the ruling of the Commission, *O. bicirrhosum* is the name to use for this species [Code art. 80 (a)].

Ischnosoma too has not been used again. The first reviser is GÜNTHER (1868: 378) who retained *Osteoglossum*.

KANAZAWA (1966) considered Vandelli, in Cuvier (1829), to be the author of *Osteoglossum*. As there was no published description by Vandelli or indication that Cuvier’s description in fact was by Vandelli, this is not acceptable. He considered Cuvier’s *Osteoglossum vandellii* as a nomen nudum and Vandelli (in Spix & Agassiz, 1829) as author of *O. bicirrhosum*. If Agassiz mentioned Vandelli as the author of *O. bicirrhosum*, he did so on the basis of a misinterpretation of Cuvier’s notes. As for other species, the various manuscript versions of “Brazilian fishes” in AEN shows that Agassiz prepared the description alone. Agassiz used Spix’s specific name *bicirrhosum* and associated it with Vandelli because Cuvier had written that Vandelli had described *Ischnosoma bicirrhosum* in the genus *Osteoglossum* (see notes in WHITEHEAD & MYERS, 1971). This does not mean that Vandelli intended to describe it as *O. bicirrhosum*; we know that Vandelli intended to name it *O minus* (see Valenciennes, in CUVIER

© & VALENCIENNES, 1847: 289, 294). As Vandelli is author of neither the name nor the description, he cannot be the author of *O. bicirrhosum* as postulated by KANAZAWA (1966).

Further, it is clear from Valenciennes (in CUVIER & VALENCIENNES, 1847: 289) and KANAZAWA (1966) that both the material and description available to Lacepède, Cuvier, and later Valenciennes were Alexandre Rodriguez Ferreira's (1756–1815), which Vandelli sent to Lacepède (see also MYERS, 1964). If Vandelli simply sent them to Lacepède, I see no reason why he should be considered the author of anything and Ferreira author of nothing. According to CARVALHO (1983), Vandelli stole the manuscript. Ferreira's manuscript is not the one later published by Miranda-Ribeiro (FERREIRA, 1903) which describes *Arapaima gigas*.

Pacu Cuvier, 1829

Pacu Agassiz, in Spix & Agassiz, 1829

Prochilodus Agassiz, in Spix & Agassiz, 1829

Both *Prochilodus* and *Pacu* would be available from “Brazilian fishes” had not CUVIER (1829: 309) already made *Pacu* available by a short description ended by a footnote: “Ce sont les *Pacu* Spix. Ses *Anodus* en diffèrent seulement par une bouche plus fendue”. These short statements made both *Pacu* and *Anodus* available. As there is no indication that Spix is responsible for any part of the description, Cuvier alone is the author. Cuvier's description appearing under the French heading “Les Curimates”, *Pacu* cannot be considered a name first published in synonymy of *Curimata* Bosc, 1817.

No type species has been designated for *Pacu* Cuvier. The following nominal species were originally included: *Salmo edentulus* Bloch, 1794, *Salmo unimaculatus* Bloch, 1794, *Salmo taeniurus* Valenciennes, in Humboldt & Valenciennes, 1817, *Salmo curima* Cuvier, 1829, *Curimata gilberti* Quoy & Gaimard, 1824 and *Curimata cyprinoides* Linnaeus, 1766. These species are currently placed in *Curimata*, *Hemiodus* and *Semaprochilodus*.

Although Cuvier used Spix's *Pacu*, *Pacu* Cuvier and *Pacu* Agassiz are not the same. *Pacu* Agassiz originally included two species, *P. argenteus* and *P. nigricans*, both described by Agassiz, and is a synonym of *Prochilodus* Agassiz, in Spix & Agassiz, 1829. EIGENMANN (1910) designated *P. argenteus* as the type species of *Prochilodus*. As *Prochilodus* was intended as a replacement name for *Pacu* Agassiz, *P. argenteus* is also type species of *Pacu* Agassiz.

Pacu Agassiz and *Prochilodus* are simultaneous synonyms. The first revisers, MÜLLER & TROSCHEL (1844: 84), retained *Pacu* Agassiz and considered *Prochilodus* to be a junior synonym. Since MÜLLER & TROSCHEL (1845), *Pacu* Agassiz has not been used again as a valid name; it must be rejected as it is a junior homonym of *Pacu* Cuvier. *Prochilodus* has been placed on the Official List of Generic Names in Zoology (Opinion 772; see also GÉRY, 1963).

In order to avoid confusion, *Pacu* Cuvier is also better not used. As there has been no type species designation until now, I designate *Salmo edentulus* Bloch, 1794 as the type species of *Pacu* Cuvier, 1829. Since *Salmo edentulus* is the type species of *Curimata* Bosc, 1817 by designation under the plenary powers of the International Commission of Zoological Nomenclature (Opinion 772), *Pacu* Cuvier is a junior objective synonym of *Curimata*.

In addition, “pacu” is the vernacular name for completely different fishes (*Colossoma* Eigenmann & Kennedy, 1903, *Mylossoma* Eigenmann & Kennedy, 1903 and *Myleus* Müller & Troschel, 1844). Its use as a generic name could only lead to numerous confusions, the species of all the genera mentioned in this discussion being among the most important Amazonian food fishes.

As shown above (see discussion of *Pacu*), *Anodus* is available from CUVIER (1829). Cuvier did not include species. His *Anodus* is obviously the same as described in “Brazilian fishes”, which included the following nominal species: *Curimata amazonum* Humboldt, in Humboldt & Valenciennes, 1817, *C. taeniurus* Valenciennes, in Humboldt & Valenciennes, 1817, *Salmo edentulus* Bloch, 1794, *A. elongatus* Agassiz, in Spix & Agassiz, 1829 and *A. latior* Agassiz, in Spix & Agassiz, 1829. EIGENMANN & EIGENMANN (1899) designated *A. elongatus* as the type species.

Rhaphiodon Agassiz, in Spix & Agassiz, 1829

Cynodon Agassiz, in Spix & Agassiz, 1829

Rhaphiodon is described by Agassiz in the text while, *Cynodon* appears in combination with two specific names on the plates. Agassiz proposed *Rhaphiodon* as *Cynodon* was already used in botany, but this does not preclude its use in zoology [Code art. 1 (c)]. Both names are simultaneously available. The first revisers, MÜLLER & TROSCHEL (1844), retained *Rhaphiodon* and considered *Cynodon* to be a junior synonym. Two species were originally included: *R. vulpinus* Agassiz, in Spix & Agassiz, 1829 and *R. gibbus* Agassiz, in Spix & Agassiz, 1829. EIGENMANN (1910) designated *R. vulpinus* as the type species of *Rhaphiodon* and *R. gibbus* as the type species of *Cynodon*. Since *Rhaphiodon* is a [unnecessary] replacement name for *Cynodon*, the type species of both must be the same [Code art. 67 (h)]. Eigenmann’s action is not acceptable as he simultaneously selected two different species as type species of a single genus.

CAMPOS (1945: 472) incorrectly placed *Rhaphiodon* as a synonym of *Cynodon* and considered *C. gibbus* to be the type species by original designation. Although his statement is wrong, he is ipso facto author of the first valid type species designation [Code, art. 69 (a) (iv)]. *Rhaphiodon gibbus* is the type species of both *Rhaphiodon* and *Cynodon*.

CAMPOS (1945: 473) considered that *R. gibbus* and *R. vulpinus* were not congeneric and created *Rhaphiodonichthys* (type species: *Rhaphiodon vulpinus*) for the last named species. But he overlooked *Hydropardus* Reinhardt, 1849 (type species: *H. rapax* Reinhardt, 1849 = *Rhaphiodon vulpinus*) which has priority over *Rhaphiodonichthys*.

TRAVASSOS (1946) reviewed the case of *Rhaphiodon* and *Cynodon* and concluded that *Cynodon* is a synonym of *Rhaphiodon* for various reasons (not all correct) and accepted EIGENMANN’s (1910) type species designation of *R. vulpinus* as the type species of *Rhaphiodon* (as stated above, this designation cannot be accepted and the next first reviser, i.e. CAMPOS, 1945, is decisive). He also thought that *R. gibbus* and *R. vulpinus* were not congeneric; thus *Rhaphiodonichthys* Campos was considered to be a synonym of *Rhaphiodon* and Travassos created *Camposichthys* (type species: *R. gibbus*).

In summary, if two genera are accepted (see HOWES, 1976; GÉRY, 1986b), they are:

a) *Rhaphiodon* Agassiz, in Spix & Agassiz, 1829 (type species: *R. gibbus* Agassiz, in Spix & Agassiz, 1829, by subsequent designation by CAMPOS, 1945: 472)

synonyms: *Cynodon* Agassiz, in Spix & Agassiz, 1829 (type species: *R. gibbus* Agassiz, in Spix & Agassiz, 1829, by subsequent designation by CAMPOS, 1945: 472)

Camposichthys Travassos, 1946 (type species: *R. gibbus* Agassiz, in Spix & Agassiz, 1829, by original designation)

b) *Hydropardus* Reinhardt, 1849 (type species: *H. rapax* Reinhardt, 1849 = *Rhaphiodon vulpinus* Agassiz, in Spix & Agassiz, 1829, by monotypy)

synonym: *Rhaphiodonichthys* Campos, 1945 (type species: *Rhaphiodon vulpinus* Agassiz, in Spix & Agassiz, 1829, by original designation)

Table 3: Specimens of species described in "Brazilian fishes" still in ZSM, MHNN and MHNG, with Agassiz's size indications and potential type status. All specimens in alcohol unless otherwise stated. New species are marked by asterisks (*).

Species	Material ¹⁰	Agassiz's comments	Type status
* <i>Cetopsis candiru</i>	MHNN 735, 1 ex., 126 mm SL, 145 mm TL MHNN 737, 1 ex., 147 mm SL, 170 mm TL MHNN 736, 1 ex., 204 mm SL, 230 mm TL MHNG 210.5, 1 ex., 135 mm SL, 157 mm TL ³²	several specimens, 135, 162 and 217 mm ³¹	syntypes
* <i>Hypobthalmus edentatus</i>	MHNN 706, 2 ex., 193–209 mm SL, 240–245 mm TL ³³	2 ex., 271–325 mm	potential syntypes ³⁴
* <i>Sorubim planiceps</i>	MHNN 811, 1 ex., 458 mm SL, 560 mm TL	a dry specimen, 677 mm	potential syntype ³³
* <i>Sudis pirarucu</i>	ZSM 26725, 3 tongue-bones ³⁵		
* <i>Erythrurus macrondon</i>	MHNN 773, 1 ex., 226 mm SL, 280 mm TL ³⁶	1 ex., 298 mm	potential holotype
* <i>Engraulis tricolor</i>	MHNN 1142, 6 ex., 55–62 mm SL, 63–73 mm TL	several specimens	syntypes
* <i>Clupanodon aureus</i>	MHNN 1159, 1 ex., 175 mm SL, 213 mm TL	2 ex., 217 mm	syntype
* <i>Schizodon fasciatus</i>	MHNN 781, 1 ex., 167 mm SL, 200 mm TL	2 ex., 162–230 mm	potential syntype ³⁴
* <i>Tetragonopterus chalcus</i>	MHNN 785, 1 ex., 82 mm SL, 108 mm TL ³⁷	1 ex., 102 mm	potential holotype
* <i>Myletes aureus</i>	MHNN 787, 1 ex., 115 mm SL, 140 mm TL MHNN 788, 2 ex., 119–126 mm SL, 147–153 mm TL	3 ex., 135–189 mm	potential syntypes ³⁴
* <i>Myletes bidens</i>	MHNN 789, 1 ex., 150 mm SL, 182 mm TL MHNN 2216, 1 dry ex., 191 mm SL, 222 mm TL	2 ex., 135–189 mm	lectotype ³⁸ paralectotype ³⁴
* <i>Rhaphiodon vulpinus</i>	MHNN 822, 1 ex., 315 mm SL, 335 mm TL	one mutilated specimen, 292 mm ³⁹	potential holotype
* <i>Xiphostoma cuvieri</i>	MHNN 823, 1 ex., 335 mm SL, 392 mm TL	1 ex., 433 mm	potential holotype
* <i>Saurus longirostris</i>	MHNN 793, 1 ex., 186 mm SL, 211 mm TL	2 ex., 189 and 230 mm	potential syntype ³⁴
* <i>Saurus truncatus</i>	MHNN 795, 1 ex., 145 mm SL, 161 mm TL	2 ex., 162 and 189 mm	syntype
* <i>Solea brasiliensis</i>	MHNN 804, 1 ex., 272 mm SL, 316 mm TL	2 ex., 325 mm	syntype
* <i>Monochir maculipennis</i>	MHNN 685, 2 ex., 50–109 mm SL, 78–140 mm TL	2 ex., 81–162 mm	syntypes
* <i>Plagusia brasiliensis</i>	MHNN 691, 1 ex., 150 mm TL	1 ex., 183 mm ⁴⁰	potential syntype ³⁴
* <i>Gymnothorax ocellatus</i>	MHNN 1193, 1 ex., 335 mm TL	2 ex., 325–379 mm	syntype
* <i>Julis dimidiatus</i>	MHNN 563, 1 ex., 153 mm SL, 173 mm TL	several specimens, 171 mm	syntype
* <i>Scarus frondosus</i>	MHNN 581, 1 ex., 178 mm SL, 210 mm TL	5 ex., 135–325 mm	syntype
<hr/>			
Species	Material ¹⁰	Agassiz's comments	Type status
* <i>Cichla labrina</i>	MHNN 599, 1 ex., 120 mm SL, 145 mm TL	2 ex., 122–189 mm	lectotype ^{34, 41}
* <i>Cichla monoculus</i>	MHNN 2188, 1 dry ex., 318 mm SL, 373 mm TL	1 ex., 352 mm	potential syntype ⁴²
* <i>Micropteryx cosmopolita</i>	MHNN 339, 2 ex., 115–116 mm SL, 127–132 mm TL	several specimens, 135–162 mm	—
* <i>Caranx latus</i>	MHNN 455, 1 ex., 180 mm SL, 223 mm TL	1 ex., 162 mm	potential syntype ³⁴
* <i>Caranx punctatus</i>	MHNN 334, 2 ex., 125–135 mm SL, 141–153 mm TL	2 ex., 149–162 mm	syntypes
* <i>Argyreosus vomer</i>	MHNN 336, 1 ex., 141 mm SL, 185 mm TL	several specimens, various sizes	—
* <i>Vomer brownii</i>	MHNN 338, 1 ex., 110 mm SL, 140 mm TL	1 ex., 176 mm	—
* <i>Coryphaena immaculata</i>	MHNN 449, 1 ex., 357 mm SL, 450 mm TL	1 ex., 568 mm	potential syntype ³⁴
* <i>Mesoprion uninotatus</i>	MHNN 76, 2 ex., 150–170 mm SL, 185–210 mm TL	several specimens, 189–244 mm	—
* <i>Mesoprion aurovittatus</i>	MHNN 73, 1 ex., 122 mm SL, 142 mm TL	2 ex., 217 mm	potential syntype ³⁴
* <i>Corvina adusta</i>	MHNN 312, 1 ex., 133 mm SL, 168 mm TL	1 ex., 271 mm	potential syntype ³⁴
* <i>Batrachus punctatus</i>	MHNN 390, 1 ex., 187 mm SL, 225 mm TL	2 ex., 271 mm	potential syntype
* <i>Mugil brasiliensis</i>	MHNN 507, 4 ex., 151, 186, 190, 241 mm SL, 188, —, 230, 300 mm TL	2 ex.	potential syntypes ³⁴

EIGENMANN (1909: 256) created the family-group name Cynodontinae (type genus *Cynodon*) for accommodation of the genera under review here. TRAVASSOS (1946: 136) replaced it by Rhaphiodontinae. This family-group name has been widely and variously used at subfamily (for example GÉRY, 1977) or tribal level (HOWES, 1976).

Cynodontidae having been rejected in 1946, and Rhaphiodontinae having met “general acceptance”, it is to be retained [Code art. 40(b)]. It must then take author and date as follows: Rhaphiodontinae Travassos, 1946 (1909) (Code Recommendation 40A).

Specimens

All the labelled specimens of species described in “Brazilian fishes” and still extant in the Agassiz collection in Neuchâtel are listed in Table 3. The size given by Agassiz is indicated, as well as the potential type status.

115/2.5 3.

Verzeichnis der Fische der zoologischen Sammlung in München. (mit Ausnahme der Dubletten)
— August 1829. — von L. Agassiz aufgestellt.

<u>I. Knochentiere</u>	<u>Rhinobatus</u> Rhinobatus	2
α. <u>Cyclostomata</u> .	<u>Torpedo</u> Narke	1
<u>Amia</u> <u>brachialis</u>	Galvanii	1 + 1/2
<u>Petromyzon</u> <u>Planeri</u>	spec. nov. bras.	1
<u>Amia</u> <u>fasciata</u>	<u>Raja</u> <u>clavata</u>	1 + 2 1/2
<u>R. Rajastomata</u>	<u>Muraena</u>	1 1/2
<u>Trachurus</u> <u>lanceolatus</u>	<u>oxyrinchus</u>	1
<u>Trachurus</u> <u>lanceolatus</u>	<u>Rubus</u>	1 + 1 1/2
<u>Trachurus</u> <u>lanceolatus</u>	spec. nov. bras.	1
<u>Trachurus</u> <u>lanceolatus</u>	spec. nov. bras.	2
<u>Trachurus</u> <u>lanceolatus</u>	spec. nov. bras.	1
<u>Carcharias</u> <u>Valpes</u>	<u>Trigon</u> <u>pastinaca</u>	1 1/2
<u>Lamna</u> <u>cornutus</u>	<u>Myliobates</u> <u>Aquila</u>	1 + 1 1/2
<u>Zygona</u> <u>Siburo</u>	<u>flagellum</u>	1
<u>Zygona</u>	X. Mit Louis (Braun).	

Fig. 4. Upper part of first page of document AEN 115/2.5, entitled “Verzeichnis der Fische der zoologischen Sammlung in München (mit Ausnahme der Dubletten). August 1829. Von L. Agassiz aufgestellt”. The number of specimens is identified in the following way, as exemplified by *Raja clavata*: 1 specimen in alcohol, two specimens and five half specimens dry.

Surprisingly, the Neuchâtel collection contains specimens of many species for which Agassiz indicated that he had only one specimen. There could be several explanations for this: (a) Agassiz received this single specimen; (b) Agassiz had it on loan and never returned it; (c) there was more than one specimen in the collection. The first explanation seems very unlikely, the other two are possible, but I favour the third one and propose the following scenario:

Agassiz prepared descriptions of the species illustrated on Spix's plates. He added a few other species (those whose plate number include letters: 8a, 13a, etc.) selected from many not illustrated but present in Spix's collections. He had new plates prepared for them. The title of the book (*Selecta genera et species...*) and document AEN 115/2.5, which is a list of the fishes in the zoological collection in München, hand-written by Agassiz on 22 August 1829 (Fig. 4), are evidence for this. The list is entitled "Verzeichnis der Fische der Zoologischen Sammlung in München (mit Ausnahme der Dubletten)" [inventory of the fishes in the zoological collection in Munich (with exception of the duplicates)]. It includes all the names of the fishes described in 1829, most of those which would be described in 1831 and several species labelled as "spec. nov. bras." [new species from Brazil]; they belonged to the genera *Torpedo*, *Raja* (3 spp.), *Malthe*, *Gadus*, *Gobius* (2 spp.), *Sciaena*, *Muraena* (2 spp., but the two new *Gymnothorax* described by Agassiz are not listed), *Scorpaena*, *Sparus* and *Xyrichthys*.

Not only species but the actual specimens were selected to be illustrated and described. Thus, when Agassiz mentioned a given number of specimens, this should be understood as the number of specimens on which he based the description and not as the total number of specimens at hand. When he received specimens it was sometimes material he had used for description and sometimes duplicates. As there was no type concept at that time, the specimens used for the descriptions did not receive more attentive care than the others and a curator would have no reason to send one in preference of the other as gift or exchange (unless one was in a better condition).

Only the specimens actually used for description, mentioned by Agassiz or used as models of illustrations, can be considered as types. Most of the specimens in MHNN correspond to Agassiz's indications and could be the material used for the descriptions. The rest are probably from the "Dubletten", the existence of which is shown by the München list mentioned above. Some of them are possibly the models used for the illustration; the illustrations may also be composite, based on several specimens of a single species.

It is impossible to say exactly which specimens are types and which are not. A clue to the identity of the possible type specimens is the size given by Agassiz (not in all cases) in Zoll (inches). Several different kinds of Zoll have been used in Germany; Agassiz indicated (p. 4) that he used the Parisian one, which was one twelfth of a foot (32.48 cm, see KLIMPERT, 1896). Unfortunately, Agassiz did not indicate anywhere what kind of length he used (standard length, total length, fork length). Some MHNN specimens correspond to the lengths given by Agassiz in either standard length or total length. Surely he did not use both! Generally, the length indicated by Agassiz corresponds to the total length of the specimen. I conclude that he consistently used total lengths. The size of the drawings is of limited use as the fishes are not reproduced to natural size and the magnification is not indicated; there is also a possibility that they are based on more than one specimen. Some might have been discarded after completion of the illustration. Types used as models for the plates can be recognized only by resemblance.

When the MHNN specimen is approximately the same length as the single specimen mentioned by Agassiz, I tentatively consider it to be a potential holotype. When it is a different length, I suggest that it might be the model or part of the models used for the drawing and that there was more than one specimen.

This is a wide interpretation of Recommendation 72B of the Code. In my opinion, definitive recognition as a type should be decided by competent specialists for the various groups. As no holotype were formally designated, and as it is possible that there were more than one specimen, revisers should follow Recommendation 73F of the Code and designate a lectotype rather than assuming a holotype.

Material of 34 of the 92 species described in "Brazilian fishes" is still extant. Of the 50 species described in 1829 we still have 14 (28%) while we have 19 (45%) of the 42 described in 1831. This might be

explained by the fact that the first part of the book was written in München while the second part was prepared in Concise (E. AGASSIZ, 1887) to where Agassiz took material from München.

The Agassiz collection in Neuchâtel also includes specimens of several species of small size not listed in “Brazilian fishes” and labelled as coming from Brazil; their origin is unknown. As very few collections from Brazil reached Europe at that time, it is possible that they also belonged to the Spix collection and were received from München.

While in Neuchâtel, Agassiz arranged exchanges with several scientists and institutions. Among the copies of Agassiz’s letters (document AEN 6/1), is a copy of a letter to François-Jules Pictet (known as Pictet-de-la-Rive, 1809–1872) in Genève to whom Agassiz proposed an exchange of specimens of fishes “des grandes rivières du Brésil”. Two Brazilian fishes received from Agassiz in 1836 appear in the registers of the Muséum d’Histoire Naturelle, Genève. One (*Myletes bidens*, MHNG 210.1) cannot be found (it apparently disappeared in the period 1920–1940) and the other (*Cetopsis candiru*) is shown on Table 1. It is possible that other specimens were received by other institutions, but I could trace none.

Sven Kullander (in litt.) called my attention on KAUP’s (1860) description of *Hoplarchus pentacanthus* and *H. planifrons* which were based on specimens in the München collection, and which probably were from the Spix & Martius expedition.

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Notes

¹ Following Swiss custom, he only used one of his Christian names, Jean Louis Rodolphe.

² The French translation by Auguste Mayor (1887) of E. AGASSIZ (1885) has been used throughout this paper. Mayor (1815–1904) was a cousin of Louis Agassiz.

³ This is the name which appears on most books. In “Brazilian fishes” it appears as Friedrich Carl Philipp von Martius.

⁴ As there is great inconsistency and numerous mistakes in the use of nobiliary particles in nomenclatorial literature, the French, German and Latin rules are briefly summarized:

French: The particle *de* is used only to join the name to the Christian name, or its initials, a title, etc. (example: Le Baron *de* Cuvier). It is omitted if the name is used alone (example: Cuvier a décrit...), except: 1°) in front of monosyllabic names or bisyllabic names ending with a silent *e*; 2°) in front of names beginning with a vowel or a silent *h*. The particle *d’* is always used (see GRÉVISSE, 1980, for details, exceptions and particular cases). In the authorship of a name, the particle *de* has thus to be omitted.

Latin: The particle *de* is used only to join the name to the Christian name, title, etc. (example: Johannes *de* Spix). It is omitted if the name is used alone and in the authorship of a name (example: *Pirarara* Spix and not *Pirarara de* Spix). This rule is consistently used by Agassiz in “Brazilian fishes”.

German: The use of the particle *von* seems not very consistent and there are regional and time variations. But at the beginning of last century, it was the same as the rule for Latin given above. For example ANON [OKEN ?] (1829) wrote: “Martius hat vorher die Abbildungen an Cuvier geschickt” and not “von Martius hat vorher...”

I would recommend that these rules be followed in order to avoid confusion or barbarisms (like a “J. B. de von Spix” which already appeared at several opportunities).

⁵ Agassiz proposed *Glanis* with a short diagnosis as a replacement name for the “barbarian” Bagres of Cuvier. Cuvier’s Bagres is not a latinized name and BAILEY & STEWART (1983) showed that the correct name is *Bagre* Cloquet, 1816 and the type species is *Silurus bagre* Linnaeus, 1766 by absolute tautonymy, a point of view followed by the International Commission on Zoological Nomenclature (OPINION 1403).

Cuvier’s Bagres being not an available name, *Glanis* has not obligatorily the same type species. Agassiz did not include any nominal species and this name has not been used for these fishes until now. In order to avoid any further problem, I designate *Silurus bagre* Linnaeus, 1766 as its type species. *Glanis* is thus an objective junior synonym of *Bagre* Cloquet, 1816, as was intended by Agassiz.

As first proposed, *Glanis* was not in the nominative singular, but it is available in the nominative singular [Code art. 11 (g) (i)].

Glanis Gronovius, 1854 (p. 135, type species *G. imberbis* Gronovius, 1854, by monotypy) and *Glanis* Agassiz, 1856 (type species *G. aristotelis* Agassiz, 1856, by monotypy) are junior homonyms of *Glanis* Agassiz, in Spix & Agassiz, 1829.

⁶ GÜNTHER (1864: 191) stated that *Ceratorhynchus* had been proposed by AGASSIZ (1833–43) in his “Recherches sur les poissons fossiles” (see JEANNET, 1928, 1929, for the exact dates of publication of the various parts). Günther did not give page references. I checked the whole series without finding any trace of this name.

As first proposed, *Ceratorhynchus* was not in the nominative singular, but it is available in the nominative singular [Code art. 11 (g) (i)].

⁷ Originally included species: *S. coecutiens* and *C. candiru* Agassiz, in Spix & Agassiz, 1829.

⁸ The dates of publication of the ichthyological results of Humboldt & Bonpland’s travel are often given as 1811 or 1816. SHERBORN & WOODWARD (1901) traced them and concluded that they were published in 1821. GÉRY (1976: 51), without giving the full reference, stated that Valenciennes, in the “Histoire naturelle des poissons”, wrote that the “Recherches sur les poissons fluviatiles” appeared in 1817. In fact, this paper appeared in two fascicles, nos. 11 (pp. 145–176) and 12 (pp. 177–244). Fascicle 10 appeared in 1817 (SHERBORN & WOODWARD, 1901; the Basel University Library still has an original wrapper with the date 1817). Fascicle 12 appeared during or after 1821, as on p. 193, Valenciennes wrote: “Le travail que j’ai fait sur le genre poecilie ... était imprimé lorsque nous avons reçu le Journal de l’Académie des Sciences de Philadelphie dans lequel Mr. Lesueur ...” The work on poeciliids is in fascicle 11. Lesueur’s paper appeared in 1821. It thus seems that fascicles 11 and 12 were not published together. Fascicle 11 may have been published as early as 1817, while fascicle 12 appeared in or after 1821. *Doras crocodili* is described in fascicle 12. Fascicle 12 also included plates 45–48 a, 48 b, 49, 51, that is all those illustrating fishes. These conclusions somewhat disagree with those of GÉRY (1986 a).

⁹ Valenciennes (in CUVIER & VALENCIENNES, 1847: 323) explains that this name was based on Cuvier’s notes where the name “glossodonte” appears (see WHITEHEAD & MYERS, 1971: 487).

¹⁰ Originally included species: *L. novemfasciatus* and *Salmo friderici* Bloch, 1794.

¹¹ Originally included species: *S. fasciatus* and *S. unimaculatus* Bloch, 1794.

¹² Agassiz, in a footnote (p. 76), divided *Hydrocyon* Cuvier, 1819 into three groups of which *Xiphorhynchus* is one, but this name is preoccupied in Aves (SWAINSON, 1827: 440). It has been replaced by *Xiphorhamphus* Müller & Troschel, 1844 which is also preoccupied in Aves (BLYTH, 1843: 929). But this name appears as *Xiphorhamphus* on p. 947 and as *Xiphoramphus* on p. 929. The first spelling has generally been used by subsequent authors but I did not find any definitive first reviser action. If the first spelling is retained, then *Xiphorhamphus* is not available for the fishes under review. *Acestrorhynchus* Eigenmann, 1903 would then be the next available name. The type species of these three genera is *Salmo falcatus* Bloch, 1795.

¹³ This is Agassiz’s third group of *Hydrocyon*. There is no description, but there is one included species and it is thus an available name.

¹⁴ Preoccupied in Hemiptera (KIRBY & SPENCE, 1829: 683). The next available name is *Boulengerella* Eigenmann, 1903, whose type species is *X. lateristriga* Boulenger, 1895. WHITLEY (1951) proposed *Spixostoma* as a replacement name for *Xiphostoma*.

¹⁵ Originally included species: *X. cuvieri* and *Hydrocyon lucius* Cuvier, 1819.

¹⁶ A replacement name for *Seriola* Cuvier, 1817. Species originally included in *Seriola*: *Caranx dumerili*, *Scomber fasciatus* Bloch, 1797, *S. speciosus* Fors[s]kal, 1775.

¹⁷ Cuvier (see WHITEHEAD & MYERS, 1971) saw the plate of *C. edentatus* and wrote that it was the *Doras niger* described by Valenciennes (in HUMBOLDT & VALENCIENNES, 1821: 284). Agassiz (p. 15) acknowledged this remark by Cuvier, but stated how this species (named *D. humboldti* in the text) differs from *D. niger*. Valenciennes (in CUVIER & VALENCIENNES, 1840: 291) considered Agassiz’ species a synonym of *D. niger*, and used the names *D. humboldti* and *C. edentatus* without distinction. His synonymy has been adopted by all subsequent authors.

- ¹⁸ Preoccupied by *P. albidus* Lesueur, 1819 (p. 148). Agassiz was aware of this (see his synonymy) and proposed *P. spixii* as a replacement name.
- ¹⁹ Considered a synonym of *Silurus lima* Bloch, in Schneider, 1801, by Agassiz (p. 24).
- ²⁰ The mention in Agassiz's synonymy "*Pisces nomine Pirayapeui inscriptus*" is not a binominal name but a name (Pirayapeau) borne by the dry mounted specimen which was in München collection.
- ²¹ Agassiz considered it as a synonym of *Sudis gigas*. The later name is usually credited to Cuvier, but it first appeared in a German translation of CUVIER (1816; see WHITEHEAD, 1967b, and COWAN, 1969, for the exact dates of publication of the first edition of Cuvier's Règne animal) by SCHINZ (1822: 305). CUVIER (1816: 5, pl. 10) used only the French name "vastre géant" but did not use any Latin name. The German edition was updated and completed by Schinz who introduced the Latin name for the "vastre géant". He is thus author of the name which must be given as *Sudis gigas* Schinz, in Cuvier, 1822.
- ²² Spelt *E. 1-taeniatus* on plate 19.
- ²³ It is possible that *E. trahira* is an unjustified emendation of *Synodus tareira* Bloch, in Schneider, 1801 (p. 397), but it is as likely based on a different transcription of the same vernacular name. I consider *E. trahira* a distinct and available name.
- ²⁴ Spelt *L. 9-fasciatum* on plate 37.
- ²⁵ WHITEHEAD & MYERS (1971) wrongly stated that *R. podas* Delaroche was placed in synonymy of this species. In fact, *R. podas* as well as *R. pantherinus* Rüppell are compared with *R. ocellatus*.
- ²⁶ *Caranx macrophthalmus* Agassiz is a junior homonym of *C. macrophthalmus* Rüppell, 1830 (see DOR, 1984: 131, 334 for dating of the various parts of this work). Agassiz (in SPIX & AGASSIZ, 1831: conspectus p. 3) was aware of it; the text was probably already printed (but not yet distributed) when he wrote the conspectus. Agassiz found that Rüppell's *macrophthalmus* has smaller eyes than his, and thus retained *macrophthalmus* for his species, renaming Rüppell's *macrophthalmus* as *C. ruppellii*. This is obviously not correct in view of our present Code and *C. macrophthalmus* Agassiz is a junior homonym of *C. macrophthalmus* Rüppell.
- Caranx ruppellii* Agassiz is not proposed in the nominative form (...Ruppellianum Carangem macrophthalmum nomine Carangis RUPPELLII a nostro distinguemus) but is nevertheless available in the nominative singular [Code art. 11 (g) (i), 11 (h) (ii)]. GÜNTHER (1860) described *C. ruppellii* for specimens described by RÜPPEL (1830) as *C. petaurista* I. Geoffroy St. Hilaire, 1829 which he assumed were misidentified. *ruppelli* is an incorrect original spelling and must be corrected as *rueppellii* [Code art. 32(d) (i) (2)] which is not a junior homonym of *ruppelli* Agassiz as they differ by one letter [Code art. 57(f)].
- ²⁷ Appears as *C. adusta* in the heading of the text and as "*Sciaena adusta* in Tab. nostra" in the synonymy. The later name is on plate 70. This means that Agassiz directed the preparation of plate 70 and that he changed his opinion on the generic position after the plate had been engraved.
- ²⁸ Agassiz (p. 130) indicated „*Haemulon canna* Cuvier in litt." Cuvier's description of this species (in CUVIER & VALENCIENNES, 1830) appeared before Agassiz's one and has priority. GÜNTHER (1859: 310) indicated that Agassiz's species is not the same as Cuvier's.
- ²⁹ The illustration appeared in 1829 while the text was distributed in 1831 only.
- ³⁰ Except where noted, all these specimens have been identified by Agassiz himself under the names that the jars still bear.
- ³¹ It is not clear if Agassiz meant he had three specimens. In other cases (*Megalops thrissoides*, *Myletes aureus*), he clearly indicated that he had three specimens. I think that he had more than three and that he either indicated the lengths of a few of them or that several had approximately the same length(s).
- ³² This specimen has been illustrated by MAHNERT (1985: 12, fig. [4]).
- ³³ The 240 mm TL specimen has broken caudal fin lobes.
- ³⁴ Specimens whose sizes do not correspond with those mentioned by Agassiz may be syntypes (interpretation of the Code. Recommendation 72 B; see text for explanation).
- ³⁵ ZSM 26725 are 3 tongue-bones recently received from the Botanische Staatssammlung München; they were part of the material brought back by Spix and Martius. The label reads: "Tongue bones of Pirarucu. They are used in Estado de Para to rasp Pasta Guarana. An illustration by Martius is in herbarium with *Paulinia sorbilis*." These tongues and their use are mentioned by SPIX & MARTIUS (1831: 1098).
- ³⁶ Labelled *Macrodon microlepis*.
- ³⁷ This specimen, in a very poor state, has been examined by Jacques Géry who concluded that it might be the type of *T. chalceus*, but that the state of the specimen prohibits an accurate identification. The specimen was labelled "*Salminus* sp., coll. Agassiz, Brésil". Its original label had evidently been lost and later replaced (by Godet ?).
- ³⁸ Lectotype designated by GÉRY (1986 a).

- ³⁹ Agassiz indicated that he had a single mutilated specimen. MÜLLER & TROSCHEL (1845: 19, footnote) claimed to have examined one of the types in München. This supports my hypothesis that Agassiz occasionally selected the described specimen(s) among a larger series. The MHNN specimen corresponds particularly well to Spix's plate. The "mutilation" described by Agassiz is the usual peculiar shape of the caudal fin.
- ⁴⁰ Agassiz indicated that he had a single specimen 6".9". This might possibly mean 162×244 mm but would then completely disagree with the description and plate 50 which indicate a specimen approximately three times longer than wide (187×63 mm). Possibly Agassiz meant 6".9"; that would be 183 mm.
- ⁴¹ Lectotype designated by PLOEG (1986: 69) who assumed that the specimen had been collected by Martius. This is obviously not correct; Spix and Martius were together when they travelled in the Tocantins drainage (see itinerary in TIEFENBACHER, 1983, and, of course, SPIX & MARTIUS, 1823–31!).
- ⁴² See KULLANDER (1986: 57) for a discussion of this specimen.

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