

# On the type localities of some freshwater fishes collected by SPIX and MARTIUS in Brazil (1817-1820).

## Über die Typuslokalitäten einiger von SPIX und MARTIUS in Brasilien gesammelter Süßwasserfische (1817-1820).

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**Summary:** Two centuries after the famous journey of the German naturalists SPIX and MARTIUS through Brazil their travel report has been reviewed with special attention on fishes and the respective localities where these have been collected. New insights could be obtained on the specimens they collected, among those for several species described subsequently by AGASSIZ as new species. The original type localities could be identified for *Prochilodus argenteus*, *Platystoma corruscans*, *Doras humboldti*, *Serrasalmo piranha*, *Rhinelepis aspera* and *Pachyurus squamipennis* in Januária at the middle São Francisco River, and for *Anchoa tricolor*, *Rhaphiodon vulpinus*, *Tetragonopterus chalceus*, *Cathorops spixii*, *Brycon amazonicus*, *Sorubim infraoculare*, *Pinirampus pirinampu* and *Potamorhina latior* opposite Prainha at the lower Amazon.

**Key words:** AGASSIZ, Amazon, Sao Francisco river, subsequent determination of type localities

**Resumo:** Dois séculos após a famosa viagem dos naturalistas alemães SPIX e MARTIUS pelo Brasil, seu relato de viagem foi revisado com atenção especial sobre os peixes e as respectivas localidades de onde estes foram coletados. Novas percepções puderam ser obtidas sobre os espécimes que eles coletaram, dentre elas para várias espécies descritas subsequentemente por AGASSIZ como espécies novas. As localidades-tipo originais puderam ser identificadas para *Prochilodus argenteus*, *Platystoma corruscans*, *Doras humboldti*, *Serrasalmo piranha*, *Rhinelepis aspera*, e *Pachyurus squamipennis* em Januária, médio rio São Francisco, e para *Anchoa tricolor*, *Rhaphiodon vulpinus*, *Tetragonopterus chalceus*, *Cathorops spixii*, *Brycon amazonicus*, *Sorubim infraoculare*, *Pinirampus pirinampu*, e *Potamorhina latior* em frente à Prainha, no baixo Amazonas.

**Palavras-chave:** AGASSIZ, Amazonas, rio São Francisco, determinação posterior de localidades-tipo

**Zusammenfassung:** Zwei Jahrhunderte nach der berühmten Reise der beiden deutschen Naturforscher SPIX und MARTIUS durch Brasilien wurde deren Reisebericht mit besonderem Augenmerk auf die Fische und die Orte, an welchen diese gesammelt wurden, durchgesehen. Die ursprünglichen Typuslokalitäten konnten für *Prochilodus argenteus*, *Platystoma corruscans*, *Doras humboldti*, *Serrasalmo piranha*, *Rhinelepis aspera*, und *Pachyurus squamipennis* bei Januária am mittleren Rio São Francisco und für *Anchoa tricolor*, *Rhaphiodon vulpinus*, *Tetragonopterus chalceus*, *Cathorops spixii*, *Brycon amazonicus*, *Sorubim infraoculare*, *Pinirampus pirinampu* und *Potamorhina latior* gegenüber von Prainha am unteren Amazonas identifiziert werden.

**Schlüsselworte:** AGASSIZ, Amazonas, Sao-Francisco-Fluss, nachträgliche Festlegung von Typuslokalitäten

### 1. Introduction

After having finished an expedition through Brazil lasting four years, Johann Baptist von SPIX, zoologist and leader of the expedition, and Carl Friedrich MARTIUS, botanist, arrived back to Munich on December 10<sup>th</sup>, 1820. During

their journey they have sent collected material to their hometown from several harbors on their itinerary. These shipments contained thousands of specimens of plants, animals, minerals and ethnographical items. Right after their return the two travellers started to work on the identification of their specimens and published, in part

in collaboration with other specialists, several papers very quickly. SPIX had already started to work on the collection of fishes, including the preparation of plates, when he passed away in May 1826, at the age of only 45 years. Together with MARTIUS he had published the first volume of their travel report 'Reise in Brasilien auf Befehl Sr. Majestät Maximilian Joseph I. Königs von Baiern in den Jahren 1817 bis 1820 gemacht und beschrieben', hereinafter called 'Journey', and had already prepared the first two chapters of the second volume (p. 415-468) together with MARTIUS (SCHÖNITZER 2011). After the early death of his fellow traveller, probably due to a tropical disease which SPIX had brought home, MARTIUS suddenly found himself to be the only one responsible for the enormous task of finishing the 'Journey' and finding possibilities to have the zoological specimens collected by SPIX to be investigated and get the results published. While MARTIUS could refer to his own memory and the field notes of both, himself and SPIX, to finish the 'Journey', he, the botanist of the team, needed support from a third party to work on SPIX' fishes. In 1828 he could win Louis AGASSIZ, in this moment still a student, for this task. Only one year later AGASSIZ published the first part of the 'Brazilian Fishes' (SPIX & AGASSIZ 1829) including plates prepared by SPIX. For the second part, published in 1831, AGASSIZ had modified some of SPIX' plates and added new ones (WHITEHEAD & MYERS 1971).

From 1817 till 1820 SPIX and MARTIUS have performed a tremendous trip through Brazil during which they have collected tens of thousands of specimens from countless zoological and botanical groups. They started in Rio de Janeiro, went down to São Paulo along the Mata Atlântica, from there to Belo Horizonte and the headwaters of the Tocantins river and back to the coast at Salvador. During this first part of their journey they got a glimpse of the upper Paraná basin and had several encounters with the rio São Francisco. The basin of the latter is located between the La Plata drainage to the west and south and the Amazon to the north, flowing into the Atlantic Ocean between Salvador and Recife.

During their stay in Salvador the two travellers took the fatal decision to go north to São Luiz do Maranhão through the hinterland, a decision they regretted more than once. While crossing the Caatinga, a semi-arid region where it had not been raining for several months, the two travellers fell seriously ill and several times nearly died due to the lack of water. In São Luiz they could finally end the part of their journey to be done on horseback. Thereon they went up the Amazon by ships and boats, finally reaching Manaus and the Amazon rainforest. Here, in the capital of the state of Amazonas, they separated for the first time. MARTIUS went up the rio Negro, while SPIX reached what today is territory of Colombia, travelling over the Amazon and its tributaries.

After so many impressions, adventures and encounters it is neither surprising that their narrative filled nearly 1400 pages in three volumes, nor that SPIX' sudden death left MARTIUS facing a problem when he had to finish the two outstanding volumes without being able to discuss about the content with his fellow traveller.

After having examined the three volumes of the 'Journey', in this paper we are dealing with two entirely different situations. In the first case, São Francisco river, SPIX indicated the locality, but provided a list of common names of fishes only. In the second case, Canal of Uruará, a list of scientific names was given, but the exact locality remained unknown. The objective of this work is to investigate the respective missing parts in search of a possibility to match fishes with localities and thus, define the original type localities for several species collected by SPIX and MARTIUS. 200 years later, and after the destruction of nearly all original specimens during a British bomb raid in World War II (TEROFAL 1983; NEUMANN 2006), some of the respective species may require the designation of a neotype and for this purpose it would be most convenient to know the original type locality. The recent case of *Rhamdia quelen* demonstrates well how important it may become even two centuries later to know the original type locality of lost historical material in order to avoid taxonomic confusion (KOERBER & REIS 2020).

It is remarkable that so far no researcher has treated the scientific names of fishes provided in the third volume of the ‘Journey’. One possible reason may have been the following comment of KOTTELAT (1988): “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.” This misleading statement may have kept away ichthyologists from even reading the ‘Journey’ in search for information about fishes.

Obviously, today, in times of searchable PDF files, it is a lot easier to find this kind of information in the three volumes without having to completely read all 1388 pages. An advantage KOTTELAT did not have back in 1988.

## 2. Remarks on the timeline

To get a comprehensive picture how differently the fishes have been dealt with in the three volumes of the ‘Journey’, it is advisable to understand the chronology of related events and dates of publication of both, the ‘Journey’ and the two fascicles of the ‘Brazilian Fishes’:

Return to Munich	1820, Dec.
<i>Journey</i> , vol. 1	1823
Spix’ death	1826, May
<i>Journey</i> , vol. 2	1828
Agassiz started working	1828
<i>Brazilian Fishes</i> , fasc. 1	1829, Jun.
<i>Brazilian Fishes</i> , fasc. 2	1831, Jan.
<i>Journey</i> , vol. 3	1831

The second part of the ‘Journey’ was published in 1828, the same year AGASSIZ just started to work on SPIX’ fish specimens. Due to this timeline volume 2 could not yet contain any scientific names of new species of fishes collected during the expedition and obviously MARTIUS, the botanist, elaborated the last section of this 2<sup>nd</sup> part based only on field notes of both and his own memory, without having been able yet

to refer to results of AGASSIZ’ activities. This and the fact that AGASSIZ mainly rejected the latinized vernacular names proposed by SPIX – even though some are available from the plates of the first part which were already printed – is a strong indication that SPIX largely relied on those local names when working with or referring to these fishes.

That the 3<sup>rd</sup> part of the ‘Journey’ contained scientific names is owed to the fact that it was published two years after the publication of the first fascicle of the ‘Brazilian Fishes’. By including names like *Platystoma lima*, *Pimelodus spixii* and *Engraulis tricolor*, MARTIUS confirmed by indication that in the moment of submitting this last manuscript of the ‘Journey’ he already knew AGASSIZ’ first fascicle, because for these species SPIX, on his plates, had proposed *Sorubim infra-oculare*, *Pimelodus albidus* and *Engraulis piquitinga*, respectively. The names used in the footnote of vol. 3, page 1025, have all been proposed by AGASSIZ independently from the information left by SPIX, placing the names used by the latter in synonymy of his own, AGASSIZ’, names.

## 3. Methods

The original German publication of the ‘Journey’ has been translated by the author as literally as possible, yet reduced to the fragments important for the present cases. Some remarks have been added in square brackets.

Following WHITEHEAD & MYERS (1971) and KOTTELAT (1988) the work of SPIX & AGASSIZ (1829, 1831) is referred to as ‘Brazilian Fishes’. The three volumes of SPIX’ and MARTIUS’ travel report is referred to as ‘Journey’. The translations from the ‘Journey’ are cited by volume and pages of the original text, e.g. [2: 533-534].

Although journals and editors generally encourage authors not to cite unpublished theses, in some cases this was necessary as the common names of fishes used along the shores of the São Francisco River could only be found in theses, while published papers or books are usually restricted to the usage of scientific names.

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## 4. Analysis

### 4.1. São Francisco river (translated from the 'Journey')

[2: 533-534]

When we hang a red scarf into a remote bay of that pond, which was teeming with schools of this fish, we could pull out two of them, which, mocked by the color, had bitten immediately. The Piranha (*Myletes macropomus*, Cuv.) is a fish of the size of a carp and armed with a throat full of the sharpest teeth.

... The richness in zoological curiosities determined Dr. Spix to stay in Capao for a longer time,...

[2: errata on page ,885]

page: 533 | line: 4 | instead: *Myletes macropomus*, Cuv. | read: *Serrasalmo piranha*, Spix

[2: 538]

...but we were not missing some pleasant distractions, to which we have been invited by the cheerful inhabitants of Salgado. Fishing with big nets, yielding the numerous genera of fish of the stream (8.), varied with hunting caimans, otters and ostriches.

[2: 558, footnote]

(8.) The fishes of the Rio de S. Francisco at Salgado have the following names there: Pacú, Sorubim, Dourado, Gongo or Cascudo, Madrinjam, Pirá-Tamanduá, Piranha Ordinaria and Roduleira, Acari, Mandí, Mandi-açu, Mandipintado, Grumatam (Curumatam), Gorubina, Piau, Pocomó, Trahira, Bagre, Sarapó. Only few of those have yet been described in zoological papers, and are recognizable with certainty. We used to catch these fishes in the company of Salgado's inhabitants using big nets, which were carried by one into the stream, and thereafter pulled out slowly on both ends.

[2: 582]

...Malhada. To this place we had dispatched our unnecessary luggage over the stream,...

[2: 584]

Because of its unhealthful location, among all settlements along the Rio de S. Francisco, Malhada is badly infamous, and we decided to remain only as long as needed to round off our

group again, and to get provisioned with the necessities for the travel to Bahia.

[2: 585]

Here we dedicated very special precautions to our collections, the yield of our travels since Villa Rica. Because the local woods are too dense and heavy, we packed everything in boxes made of pine wood ... and as a precaution wrapped those in cowhide. The whole considerable luggage made a troop of twenty pack animals necessary, with which in this year it was a difficult task to make a travel of more than hundred miles, because of the water shortage in the swath of land to cross.

... and so, accompanied by four newly hired drovers, in the evening of Sept. 29<sup>th</sup> we departed for the journey to Bahia...

[2: 619, referring to a thunderstorm in Cachoeira]

As the open boat filled half with water within short time, we had to see with deep sorrow, how, still being in the harbor, the fruits of our efforts were close to destruction. Only when few days later in Bahia we had the opportunity to open our boxes, we had to learn that these few fatal hours had destroyed a part of our collections, in particular the herbaria.

[2: 684]

Under their leadership together with Mr. Weyel we visited the so called Lagoa de Almada, a small lake, which is located some one and a half legoas Northeast of Almada, and is connected with the Rio Itahype by a small canal.

[2: 685]

This lake's abundance of fish induces the residents to get supplies here from time to time. They use to dry fish over the fire (Piabanhas, Acaris, Piaus etc.) opened lengthwise, disposed of the guts and slightly salted.

[2: 708]

... Bahia ... we hence prepared our departure by handing over the so far collected naturalia in a considerable quantity of boxes to Mrs. Meuron and Schlüter, to send these to Hamburg.

[2: 744]

From here we took the way back, in which we came here, and on March 25<sup>th</sup>, after an exhausting journey, we arrived again to Villa Nova da Rainha. The pleasure about the success of the

enterprise was very much embittered by the state in which we have found our pack animals ... we found ... some already dead, all the remaining so ill, that we had to decide to leave them behind here under supervision of the Arieiro [tenant] until their recovery.

... In four days of travel we made the way back to Joazeiro.

[2: 754-755]

During our stay the stream had very low water, due to the preceding long drought in the southern areas, and this year had not trespassed its riverbed at all.

... In the state of low water, as we found it at Joazeiro, it may have been only two thousand feet wide. The water of the stream seemed to be of a more impure taste as at Salgado; its color was dirty, yet more greenish than there. We frequently enjoyed a refreshing bath in the stream, what is not as dangerous here, as in Minas, because crocodiles and the terrible Piranha appear less frequently here. In general the river is less animated, than in the southern areas; the most tasteful fish only go down to Sento-Sé in big schools...

[2: 763]

In Joazeiro... during a stay of several weeks...

[2: 767]

After we had left Rezeisto do Joazeiro and its hospitable inhabitants, we directed our way, off the highroad, towards Melanzias...

[2: 769]

The path rises rather imperceptibly, and despite that here we arrived close to the watershed of two mighty streams, the Rio de S. Francisco and the Rio Parnahyba, still no vast and high mountain ridge appeared.

#### 4.1.1. Details on this locality [Salgado]

The place which SPIX and MARTIUS knew as Salgado in the state of Minas Gerais today is called Januária (SCHÖNITZER 2015). The village changed its name in 1884 (SAMPAIO 2013), decades after it was mentioned in the 'Journey'. Januária is located at the middle São Francisco river and was the first of three locations where SPIX and MARTIUS crossed this

river. They have crossed the river a second time at Malhada, where they decided to remain only as long as needed. Here they arranged carefully all their previous collections in boxes and shipped everything to Bahia. Their third encounter with the São Francisco river was at Joazeiro, from where, despite their stay for several weeks, no comment on fishes has been made. Taking in account the fact that we have learned about a list of 19 fishes caught at Januária and that no fish was mentioned from either Malhada or Joazeiro, it is assumed that all species from the São Francisco river reported on in the 'Brazilian Fishes' have been collected at Januária.

#### 4.1.2. Species from this locality

##### Pacú

In the case of 'pacu' as a common name it seems obvious that SPIX referred to *Prochilodus argenteus* and/or *P. nigricans* as he even proposed *Pacu* as the name of a new genus for these species. Despite SPIX' proposal, AGASSIZ decided to erect *Prochilodus* as a new genus. In his prologue to the 'Brazilian Fishes' MARTIUS (1831) mentioned that 'pacu' as a common name refers to both, *Prochilodus argenteus* and *P. nigricans*, being the latter not distributed in the São Francisco river basin (CASTRO & VARI 2004).

Also, *Pacu* is mentioned in AGASSIZ' text and shown on SPIX' plate 38 as a generic name and today considered to be a synonym at genus level of *Prochilodus* Agassiz, 1829 (CASTRO & VARI 2004). The same authors have designated MZUSP 28778 from the São Francisco river as a neotype for *P. argenteus* Spix & Agassiz, 1829.

##### Sorubim

'Sorubim' today refers in scientific use to the pimelodid genus *Sorubim*, which is not represented by any species in the São Francisco river basin (LITTMANN 2007). MARTIUS (1831) stated that the local name 'sorubim' refers to "Platystomatis species". In fact the species included by AGASSIZ in his new genus *Platystoma* are referred to the plates prepared by SPIX as members of *Sorubim*:



*Sorubim caparary* Spix, 1829 is a synonym of *Platystoma corruscans* Spix & Agassiz, 1829, a species distributed in the São Francisco and Paraná basins (BUTRAGO-SUÁREZ & BURR 2007) and today placed in the genus *Pseudoplatystoma*.

*Sorubim jandia* Spix, 1829 and *S. pirauaca* Spix, 1829 are synonyms of *Platystoma planiceps* Spix & Agassiz, 1829, today placed in *Sorubimichthys*, a monotypic genus distributed in the Amazon and Orinoco basins (LUNDBERG et al. 1989; LUNDBERG & LITTMANN 2003) without known records from the São Francisco basin.

GODINHO & GODINHO (2003), THÉ (2003), GUTBERLET et al. (2004), PINTO-COELHO (2006), ALVES & POMPEU (2010) and CHIM (2018) indicate ‘surubim’ as a common name used for *Pseudoplatystoma corruscans* in the São Francisco river basin.

MENEZES (1953) lists both, ‘sorubim’ and ‘surubim’, as common names for LÜTKEN’S (1875a) *Platystoma orbignianum* Val., today considered to be a junior synonym of *Pseudoplatystoma corruscans*. With different, yet similar spellings MARTIUS (1860, 1863) lists “soroby, soruivy, saruivy, sorubim, çorovy – pisces in variis regionibus diversi, e genere *Platystomatiss*” and provides the cross-reference “surubi vide sorubim”.

It seems plausible that SPIX, by using the common name ‘sorubim’ for a fish caught in the São Francisco river, referred to *Pseudoplatystoma corruscans* (Spix & Agassiz, 1829). BUTRAGO-SUÁREZ & BURR (2007) have designated MCP 14071 from the São Francisco river as neotype.

### Dourado

Many authors have confirmed that ‘dourado’ is the common name of members of the genus *Salminus* (e.g. LIMA 2006; LIMA & BRITSKI 2007; GELLER et al. 2019), which are highly valued as food fish across South America. *Salminus bilarii* Valenciennes, 1850 and *S. franciscanus* Lima & Britski, 2007 are sympatric in the São Francisco river basin (LIMA & BRITSKI 2007). At generic level AGASSIZ (in SPIX & AGASSIZ 1829) erected *Salminus* as a subgenus of *Hydrocyon* in a footnote, but neither in his text, nor in the plates prepared under SPIX’ supervision a reference to a species of the genus *Salminus* is included.

Therefore, it cannot be clarified to which species from the São Francisco river SPIX referred with the common name ‘dourado’.

### Gongó or Cascudo

THÉ (2003) and CHIM (2018) stated in their respective accounts on fish species from the São Francisco river basin that the vernacular name ‘gongó’ is applied to *Franciscodoras marmoratus*, a doradid endemic to that basin (SABAJ & FERRARIS 2003). As many others, this species seems to have several common names, being also called ‘cumbaca’, ‘serrudo’ or ‘helicóptero’ (CHIM 2018).

SPIX and MARTIUS used ‘cascudo’ as an alternative name to ‘gongó’. In Brazil ‘cascudo’ is widely used for species of the subfamily Hypostominae (MENEZES 1953; WEBER 2003), and as the diminutive form ‘cascudinhos’ for the tiny hypoptopomatines (REIS & SCHAEFER 1998). Nevertheless, ‘cascudo’ is also applied to *Lithodoras dorsalis*, another doradid species (FERREIRA et al. 1996; SABAJ & FERRARIS 2003).

As both common names, ‘gongó’ and ‘cascudo’, are being applied for doradids, the first even exclusively in the São Francisco river basin, the only three members of Doradidae from this basin (*vide* SABAJ & FERRARIS 2003) could all be suitable candidates for SPIX’ reference: *Franciscodoras marmoratus*, *Oxydoras niger* and *Platydoras costatus*, the latter doubtfully occurring in this basin.

SABAJ & FERRARIS (2003) state the maximum sizes of these three species as 36, 100 and 24 cm, respectively. In the ‘Brazilian Fishes’ for *Doras humboldti* Spix & Agassiz, 1829, a possible synonym of *Oxydoras niger*, the authors provided the information that their single specimen preserved in spirit was 20.5 inches long and that further dry specimens varied between 6 and 24 inches. KOTTELAT (1988) pointed out that AGASSIZ for the measurements had applied the Parisian inch, which was equivalent to one twelfth of a foot (32.48/12=2.707 cm). The lengths of 55.5 cm for the wet and 65.0 cm for the longest dry specimen basically exclude the two smaller doradid species from consideration.

Thus, it seems likely that by using the combination of ‘gongó’ and ‘cascudo’ as alternative

common names for the same species, in the 'Journey' SPIX and MARTIUS referred to *Doras humboldti*, for which in the description the type locality is indicated as "fluvio S. Francisci mediae Brasiliae". No extant type specimens are known for this species and the original specimens most likely were lost in World War II.

#### Madrinjam

MARTIUS (1863) listed "matrixam, matrinxão – piscis affinis Dourado (Rio de S. Francisco), vox africana?", and 32 years later he had changed his earlier spelling. Several other authors unequivocally provided references for many different common names which sound very similar to 'madrinjam':

MENEZES (1953): matrinchã, matrinchã, and matrinchão for *Brycon lundtii* from the São Francisco river basin.

NOMURA (1984): matrinchã and matrinchão for *Brycon hilarii* from the São Francisco river.

Ferreira et al. (1996): matrinxã for *Brycon cephalus* from Santarém

GODINHO & GODINHO (2003): matrinchã for *Brycon orthotaenia* from São Francisco river.

PINTO-COELHO (2006): matrinchã for *Brycon orthotaenia*.

ALVES & POMPEU (2010): matrinchã for *Brycon orthotaenia* from São Francisco river.

CHIM (2018): matrinxã, matrinchã for *Brycon orthotaenia* from São Francisco river.

In this context MARTIUS' comment that these names are used for a fish similar to the 'dourado' is remarkable as today the genera *Brycon* and *Salminus* are treated as closest relatives, with Bryconinae and Salmininae being the only sub-families of Bryconidae (FRICKE et al. 2020). The various writings of the common names used for species of the genus *Brycon* culminate in the scientific name of *Brycon matrinchao* Fowler, 1941.

As no species of *Brycon* was mentioned in the 'Brazilian Fishes', we cannot be sure which of the three species that possibly occur in the São Francisco river basin was referred to by SPIX, *Brycon hilarii*, *B. nattereri* or *B. orthotaenia*.

#### Pirá-Tamanduá

MENEZES (1953), FERRARIS (2003), LÜTKEN (1875a, 1875b) and CHIM (2018) congruently

use 'pirá tamanduá' for *Conorhynchos conirostris* (Cuvier, 1829), a pimelodid species endemic to the São Francisco river basin (FERRARIS 2003, 2007), which was not mentioned in the 'Brazilian Fishes'. The Tupí-Guarani language knows 'tamanduá' as part of the common names for the anteaters of the suborder Vermilingua.

#### Piranha Roduleira and Ordinaria

The use of 'and' is an indication that this refers to two different species and thus, these common names need to be treated separately.

#### Piranha Roduleira

MENEZES (1953), NOMURA (1984) and LÜTKEN (1875a, 1875b) congruently mention 'piranha rodoleira' for *Pygocentrus piraya* (Cuvier, 1819), a serrasalmid endemic to the São Francisco river basin (FINK 1993, JÉGU 2003). A junior synonym, *Serrasalmo piranha* Spix & Agassiz, 1829, has been described as new in the 'Brazilian Fishes' with 'Sao Francisco river and the neighboring lakes, ponds and brooks' as type locality (WIRASINHA 1998). The minor difference in the spellings of 'roduleira' or 'rodoleira' may have been caused by either SPIX understanding his co-fishers wrong or MARTIUS mistaking 'o' for 'u' from SPIX' handwriting. *Serrasalmo piranha* is not included in the list of still extant specimens of the SPIX collection presented by KOTTELAT (1988), and FRICKE et al. (2020) provide no information on type specimens. Thus, the two dry specimens mentioned in the original description must be considered lost.

#### Piranha Ordinaria

As the translation of 'piranha ordinaria' is 'ordinary piranha' or 'common piranha', this name may apply to any serrasalmid species from any locality. Besides *Pygocentrus piraya* only *Serrasalmus brandtii* Lütken, 1875 occurs in the São Francisco river basin. Nevertheless, it cannot be verified if SPIX has referred to one of these or both.

#### Acari

This seems to be another 'simple' case as there is a direct reference to *Rhinelepis aspera* Spix & Agassiz, 1829 included in the original description.

Together with the type locality “flumine S. Francisci” the authors provide information that “in linguae brasiliensi Acary dictus”. MARTIUS (1860, 1863) confirmed this information and added that ‘roncador’ is the common name in Portuguese. MENEZES (1953) stated that ‘acarí’ as used in the ‘Journey’ refers to a species of Loricariidae. NOMURA (1984) lists ‘acarí’ as a common name for several species of the genera *Hypostomus* and *Pterygoplichthys*, but also for *Rhinelepis aspera*. In THÉ (2003) ‘cascudo acarí’ is used for *Rhinelepis aspera*, too. FRICKE et al. (2020) consider the “holotype (unique): destroyed in World War II”.

### Mandí

‘Mandí’ and ‘bagre’, the first from the Tupí-Guaraní language and the latter from Portuguese and Spanish, are unspecific names meaning ‘catfish’. Both are widely used throughout South America for many siluriform species, mostly for members of the families Pimelodidae and Hep-tapteridae, but also for Ariidae, Auchenipteridae and others. Therefore, it is unclear to which species from the São Francisco river SPIX referred when using either of these common names.

### Mandi-açú

NOMURA (1984), GODINHO & GODINHO (2003), ALVES & POMPEU (2010), LÜTKEN (1875a, 1875b) and CHIM (2018) congruently use ‘mandí-açú’ as the common name of *Duopalatinus emarginatus* (Valenciennes, 1840), a pimelodid endemic to the São Francisco basin (LUNDBERG & LITTMANN 2003). Another species mentioned in the ‘Journey’ without having been treated in the ‘Brazilian Fishes’.

### Mandi-pintado

Another widely used common name for a variety of catfishes such as pimelodids and hep-tapterids. ‘Mandí’ is a catch-all name (see above) and ‘pintado’ means ‘painted’ and is applied to many species with a regular striped coloration pattern on the body flanks or the fins or both. ‘Mandí-pintado’ is e.g. used for species from the *Pimelodus maculatus* group. Again, it is unclear to which species from the São Francisco river SPIX referred by using this common name.

### Grumatam (Curumatam)

MARTIUS (1831) was convinced that “Some of these species, like... Curumata (*Schizodon fasciatus*),... are widely distributed throughout a large part of this empire” (WIRASINHA, 1998). In his later works he not only listed several variable spellings of ‘curumatá’, but also recognized that this common name is used for very different species of fishes:

MARTIUS (1860): curumata v. corumatan – piscis *Schizodon*.

MARTIUS (1863: 44): curumatá – especie de peixe, *Schizodon*.

MARTIUS (1863: 446): corumatan, corimatá, corimbata, curumatá – pisces varii, *Anodus* Spix, *Schizodon* Ag.

MARTIUS (1863: 447): curimatá Marcgr. I. 156. Piso II. 70 corimatâ, corimbata, curumatâ, corumatan piscis *Salmo Curumata* Bloch. *Pacu argenteus* Spix. *Schizodon*.

MARTIUS (1863: 447): curumata v. corumatan – piscis v. Curimatá. Martius (1863: 542): corumata (*Schizodon* Agass.).

Today ‘curumata’ is used for curimatids and both, ‘curimatá’ or ‘grumatá’, for prochilodontids (REIS, pers. comm.). However, MARTIUS has been very consistent in assigning these names to *Schizodon*. If they really witnessed a species of *Schizodon* having been called ‘grumatam’ or ‘curumatam’ by local people when fishing at the São Francisco river, it most likely has been *Schizodon knerii* (Steindachner, 1875). It is not just the only member of this genus in that basin (GARAVELLO & BRITSKI 2003), but was formally described nearly five decades later. *Schizodon fasciatus* Spix & Agassiz, 1829 occurs in the Guianas and throughout the upper and central Amazon in Peru, Colombia and Brazil (GARAVELLO & BRITSKI 2019), but not in the São Francisco.

Therefore, I was unable to clarify to which species from the Rio São Francisco SPIX referred to with the common names ‘grumatam’ or ‘curumatam’.

### Gorubina

MENEZES (1953) stated that ‘gorubina’ is probably a ‘corruption’ [in the sense of adultera-



tion] of ‘corvina’, the common name used for sciaenids in most parts of South America and the vernacular name for the sciaenid *Pachyurus francisci* (Cuvier, 1830) described from the São Francisco river. In addition to this species, CASATTI (2001) also recognized *Pachyurus squamipennis* Agassiz, 1831 as a valid species endemic to that river basin.

In SPIX & AGASSIZ (1831) the original type locality erroneously is provided as ‘Habitat in Oceano Atlantico’, an error which was later corrected by JORDAN & EIGENMANN (1889) who stated that “This genus is composed of freshwater Sciaenoids inhabiting the rivers of Brazil”.

Earlier STEINDACHNER (1879) had synonymized *Pachyurus lundii* Reinhardt, 1855 from the Rio das Velhas, an affluent of São Francisco river, with *P. squamipennis* and thus confirmed the distribution in this basin for the latter. STEINDACHNER regretted that the specimens housed in the collection of Munich were dry and completely decolorized. The material seen by STEINDACHNER is among the specimens lost in World War II and currently no types are known. Combining the statements made by the above authors it is concluded that the mentioning of ‘gorubina’ by SPIX and MARTIUS corresponds to *Pachyurus squamipennis* Agassiz, 1831.

### Piau

‘Piau’ as such or with additional suffixes is the local name for *Leporinus*, *Megaleporinus* or other members of the Anostomidae. It cannot be defined to which species from the São Francisco river SPIX referred to exactly with this common name.

### Pocomó

Referring to ‘pocomó’ MARTIUS (1863) stated “piscis Silurida, Hypostomus?”. MENEZES (1953) listed SPIX’ ‘pocomó’ as a synonym to ‘pacamão’, which he assigned to Lütken’s *Auchenipterus lacustris* and *Pseudopimelodus charus*. NOMURA (1984) listed ‘pacamão’ for *Cephalosilurus fowleri* as to be used for this species from the Rio São Francisco and CHIM (2018) ‘pacamã’ for *Lophiosilurus alexandri*, both pseudopimelodid species from that basin.

If SPIX’ ‘pocomó’ in fact is used synonymously for ‘pacamão’ or ‘pacamã’, all cited authors only agree that it is applied for a siluriform fish, with a tendency towards pseudopimelodids, and it cannot be verified which species was named ‘pocomó’ by SPIX.

### Trahira

Another case apparently simply to solve in this context as ‘trahira’ is applied to most species of the genus *Hoplias*. Here there is little doubt that SPIX referred to *Erythrinus trahira* since he proposed this as scientific name for the species on his plate XVIII. Nevertheless, AGASSIZ published this species formally as *Erythrinus macrodon*, using SPIX’ name as a synonym, making *Erythrinus trahira* unavailable from the ‘Brazilian Fishes’ following article 11.6 of the Code for zoological nomenclature (ICZN 1999).

A unique specimen of *Erythrinus macrodon* Spix & Agassiz, 1829 in lot MHNN 773, doubtfully the holotype and more likely a syntype of this species (NEUMANN, pers. comm.), currently is treated as a synonym of *Hoplias malabaricus* (Bloch, 1794). AGASSIZ indicated both, lake Almada in the state of Bahia and São Francisco river, as type localities. It is uncertain from which of the two locations the still existing potential syntype or doubtful holotype was obtained.

### Bagre

Same as under ‘mandi’.

### Sarapó

ALVES & POMPEU (2010), CHIM (2018), GODINHO & GODINHO (2013), MENEZES (1953), NOMURA (1984) and PINTO-COELHO (2006) all agree that ‘sarapó’ is applied to either gymnotiform species in general or, more specifically, to members of the genera *Eigenmannia*, *Gymnotus* and/or *Sternopygus*. No specimen or species of Gymnotiformes is mentioned in the ‘Brazilian Fishes’ and thus, the identity of the ‘sarapó’ remains unclear.

## 4.1.3. Conclusions

The above results allow the following conclusions:

The common names Dourado, Madrinjam, Pirá-Tamaudá, Piranha Ordinaria, Mandí, Mandi-açu, Mandi-pintado, Grumatam, Piau, Pocomó, Bagre and Sarapó cannot be assigned with any certainty to species treated in the 'Brazilian Fishes'.

From SPIX' listing of common names, the species *Prochilodus argenteus*, *Platystoma corruscans*, *Doras humboldti*, *Serrasalmo piranha*, *Rhinelepis aspera* and *Pachyurus squamipennis* are readily identifiable without doubts. All of them have explicitly been described from the São Francisco river. In the case of *Pachyurus squamipennis* the original type locality apparently is erroneous. For these species the type locality is hereby defined as or corrected to: São Francisco river, Januária, Minas Gerais, Brazil, DMS 15°29'37"S, 44°21'25"W; DDD -15.493611, -44.356944 (both taken from Google Maps). For *Serrasalmo piranha* this locality also includes 'Capao', a ranch close to Januária on the other side of the river.

From this group of taxa identified above, for *Prochilodus argenteus* and *Platystoma corruscans* neotypes have been designated and consequently the respective locality of a neotype now is the valid type locality.

If in the future neotypes will be designated for *Doras humboldti*, *Serrasalmo piranha*, *Rhinelepis aspera* or *Pachyurus squamipennis*, the respective specimen should be collected from the São Francisco river at or near Januária.

*Erythrinus macrodon*, identified from its common name Trahira, has been described from two different type localities: Lake Almada, province of Bahia, and São Francisco river. Following article 73.2.3. of the Code (ICZN 1999) "if the syntypes originated from two or more localities..., the type locality encompasses all of the places of origin".

The reference of SPIX and MARTIUS so far seems to be the only known record for *Oxydoras keneri* in the Sao Francisco river basin. There are opinions that the specimens described as *Doras humboldti* may have been collected somewhere else, maybe in the Amazon basin (SABAJ, pers. comm.). Nevertheless, until nothing has been published on this scenario the originally published type locality is to be treated as the valid one.

The list of common names clearly indicates that SPIX and MARTIUS have collected at least twelve species together with local fishermen or received the specimens from these. The exact identity of those taxa unfortunately remains unclear as they did not appear in the 'Brazilian Fishes'. It is unlikely that during their entire stay they could not convince their local co-fishers to hand over some specimens. Thus, one may expect that they did obtain specimens of more species, but those were not treated by AGASSIZ in Munich more than a decade later. One occasion, in which possibly specimens may have been deteriorated or lost, is the thunderstorm they experienced in Cachoeira [2: 619]. The comment that this affected 'in particular the herbaria', indirectly confirms that also other specimens were affected. Most likely the destroyed specimens were dry ones, like the mentioned herbaria, while specimens in containers with spirits might got diluted but unlikely would have been destroyed within days – unless the alcohol used for the initial preservation was not strong enough (NEUMANN, pers. comm.). In the 'Brazilian Fishes' at least 17 dry specimens, representing 14 species, are mentioned by AGASSIZ, confirming SPIX and MARTIUS used drying of fish specimens as preservation method during their travels before shipping those in dry condition to Munich.

Another possibility is that more specimens did actually arrive to Munich, but have not been available there any longer when AGASSIZ started his work. OKEN (1819) complained bitterly that while SPIX and MARTIUS were still travelling, the specimens which had arrived to Munich were in part rotting and molding in a wet, acid basement. He observed that dried specimens were just stacked like firewood in a corner and left there, as no qualified staff did take care of the collections after their arrival in Munich. OKEN'S observation were done after the collection sent from Bahia had arrived to Munich. This version is confirmed by the fact that on their way home, SPIX received rumors in Lisbon that their collections already received in Munich have not been curated well with the required diligence (SCHÖNITZER 2011).

## 4.2. Canal of Uruará (translated from the Journey)

[3:1010]

The Eastern banks of the Xingú, on which we were, are slightly higher than the Western, where two rivers, the Jaraucú and the smaller Guajará, with several mouths creep towards the Amazon, and through one of the bifurcations so common in these waters are connected with the Xingú just above its mouth, nearly in front of Porto do Móz.

... After having crossed the stream from the Villa, the pilot found it advisable to land close to the mouth of the Aquiqui (Akeky), and expect the night there.

[3: 1014-1015]

...or to remain within the canals, which connect the waters of the Aquiqui with the bifurcation of the Guajará.

[3: 1015]

We nearly had to regret not to have gone this safer way, as two days of permanent efforts by the crew had only brought us westward some eight legoas [1 legoa = approx. 5 km], as the Eastern wind blew very weakly. It only increased after a thunderstorm came up in Northeast, without reaching us, and we went upstream at a higher speed...

... Mauary (Magoary)...

With sunrise we had reached another mouth of these interconnected canals, called Faros de Mauary or Mauary-ajura-para, and entering there we proceeded during the whole day between the mainland and a shallow island.

[3:1016]

In the morning of September, 16<sup>th</sup> we had left behind the so called Ilhas de Uruará, and entered a different canal, formed by the bifurcation of the small river Uruará, which transforms the shallow part of the southern mainland into an island.

[3: 1022-1023]

The way through the narrow Canal of Uruará, which is usually estimated with seven legoas, was successfully completed by the evening of Sept, 16<sup>th</sup>, when we arrived back to the very Amazon. To spend the night on its banks or

sandbars (Prayas), where already uncovered, is always preferable than in the canals. The open view over a part of the enormous stream and the light breeze of air, which chases off at least part of the Mosquitos, are advantages, joined by the more productive fishery: very rarely the Indians casted their fishing rods or pulled a big net through part of the stream, without yielding an abundant catch of big and small fish.

[3: 1025]

A very different way of fishing ... we should see during the late evening of September, 16<sup>th</sup>. It consists of nothing less than leaving the fish on dry aground by suddenly bailing out the water from small creeks. Our vessel anchored at a tongue, through which a very small ditch reaches down to the Amazon.

... The reach to an agreement, what of the prey to take away, what to leave behind, seemed to give bigger trouble than the work itself; as over that they disputed a long time, everyone praising the quality of his favorite fish, and at the end our proposal was convenient for them to take everything and that those not serving as food shall be thrown into the barrel of spirits for the collection. \*)

[3: 1025, footnote]

Here we caught: one species of Sorubim, *Platyostoma Lima*, (Pisces bras. p. 15.), which beside the delicious Pirinambú (*Pimelodus Pirinambú*, ibid. p. 8.) was selected for the main dish; furthermore: *Pimelodus Spixii* (p.7. f.1.), *Engraulis tricolor* (p.23. f.1.), *Anodus latior* (p.41.),...

[3: 1026, continued footnote]

... *Tetragonopterus chalcens* (p. 33 f.1.), *Chalceus amazonicus* (p. 35.) and the Pira-andira, *Julis dimidiatus* (p. 53.)

[3: 1027]

On September, 17<sup>th</sup> and 18<sup>th</sup> we followed our way on the Amazon, along the southern shore, upstream.

[3: 1030]

In the morning of September, 18<sup>th</sup> we had the banks of Cuzary, slopes of potter's clay some six feet high, at our side.

... About noon we reached the Villa de Santarem, located two legoas above the mouth at the Eastern bank ...

#### 4.2.1. Details on the locality of ‘Canal do Uruará’

Although this locality is not registered in the otherwise very detailed map provided with the ‘Journey’, we could still spot it in both, the historical map and modern satellite figures, by following their path through the lower Amazon comparing their narrative with their map.

The following localities mentioned in the text also appear in the map published with the ‘Journey’ (Fig. 1): Porto do Móz (1), Aiquiqui (2), Guajará (3), Magoary (4), the Uruará river (5), Cuzary (6) and Santarém (7). The chronological order of these places and the distances between them do fit perfectly with the text of the ‘Journey’ and allow to re-locate the ‘canal do Uruará’ (X), mentioned as the locality where the fish collecting took place.

A canal, connecting the lower Uruará River with the Amazon, is traceable in the satellite images offered by Google Earth (Figs 2, 3). Albeit alluvial deposits and the landscape may have changed in this area since the travel of SPIX and MARTIUS, the original site mentioned in the ‘Journey’ for the footnote [3: 1025] very probably was at or near the modern Vira Sebo community at the mouth of the Uruará canal to the Amazon river. As it is mentioned that they have reached the mouth of the Uruará canal into the Amazon river by evening, it is assumed that they spend the night very close to this point due to the quickly upcoming darkness.

#### 4.2.2. Species from this locality and their current taxonomic status

##### *Platyostoma lima*

Valid as *Sorubim lima* (Bloch & Schneider, 1801), Pimelodidae.

The only species in this list not described by SPIX and AGASSIZ or AGASSIZ as new to science. *Sorubim infraoculare* Spix, 1829, a name available only from plate 15, has been placed in the synonymy of *Sorubim lima* by AGASSIZ, a status unchallenged by subsequent authors.

No types are known for *Sorubim infraoculare*.

Type locality for *Sorubim infraoculare*: equatorial rivers of Brazil.

##### *Pimelodus pirinambú*

Considered valid as *Pinirampus pirinampu* (Spix & Agassiz, 1829), Pimelodidae.

Types: no types known.

Type locality: Brazilian rivers.

##### *Pimelodus spixii*

Considered valid as *Cathorops spixii* (Agassiz, 1829), Ariidae.

Types: neotype MZUSP 49345.

Type locality: originally from ‘equatorial Brazil’, now Marajó Bay, Pará State, from neotype.

##### *Engraulis tricolor*

Considered valid as *Anchoa tricolor* (Spix & Agassiz, 1829), Engraulidae.

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**Fig. 1:** Extract of the respective area from the detailed map contained in the Atlas of SPIX & MARTIUS showing localities mentioned in the ‘Journey’: Porto do Móz (1), Aiquiqui (2), Guajará (3), Magoary (4), the Uruará river (5), Cuzary (6), Santarém (7) and the canal of Uruará (X).

**Abb. 1:** Auszug der betreffenden Gegend aus der sehr detaillierten Karte des Atlases von SPIX & MARTIUS mit Abbildung von Orten, welche in der ‘Reise’ genannt werden: Porto do Móz (1), Aiquiqui (2), Guajará (3), Magoary (4), der Fluß Uruará (5), Cuzary (6), Santarém (7) und der Kanal von Uruará (X).

**Figs 2, 3:** Satellite views on the canal connecting the lower rio Uruará with the Amazon at different scales showing some localities mentioned in the text: Ilhas de Uruará (1), Uruará river (2), Uruará canal (3) and the mouth of the latter into the Amazon at Comunidade de Vira Sebo (4), the herein defined type locality. Satellite images provided by Maxar Technologies at Google Earth, taken by screenshot on January 15th, 2021. Bars equate to 3 km.

**Abb. 2, 3:** Satellitenansichten in verschiedenen Maßstäben des den unteren Rio Uruará mit dem Amazonas verbindenden Kanals, mit Darstellung einiger der im Text genannten Orte: Uruará-Inseln (1), Uruará-Fluss (2), Kanal von Uruará (3) und dessen Mündung in den Amazonas bei der Siedlung Vira Sebo (4), der hierin festgelegten Typuslokalität. Satellitenbilder zur Verfügung gestellt von Maxar Technologies auf Google Earth, entnommen als Bildschirmdruck am 15. Januar 2021. Balken entsprechen jeweils 3 km.







Types: 6 syntypes in MHNN 1142.  
Type locality: Bahia and Pará, Brazil.

Anodus latior

Considered valid as *Potamorhina latior* (Spix & Agassiz, 1829), Curimatidae.

Types: no types known.  
Type locality: rivers of equatorial Brazil.

Tetragonopterus chalcus

Considered valid as *Tetragonopterus chalcus* Spix & Agassiz, 1829, Characidae.

Types: 1 syntype in MHNN 785.  
Type locality: rivers of equatorial Brazil.

Chalcus amazonicus

Considered valid as *Brycon amazonicus* (Agassiz, 1829), Bryconidae.

Types: neotype INPA 3415.  
Type locality: originally from ‘Amazon River’, now Rio Trombetas, Pará state, from neotype.

Pirá-andirá

For being the sole common name in the list of species obtained at this locality, this is the only case that requires some analysis. There are several indications that the assignment of ‘Pirá-andirá’, meaning ‘bat fish’ in Tupí-Guaraní, as a common name for *Julis dimidiatus*, today *Halichoeres dimidiatus* (Agassiz, 1831), was an error of MARTIUS:

In the ‘Brazilian Fishes’ the locality of this species is given as “habitat per mare Atlanticum”, living in the Atlantic sea, identifying *Julis dimidiatus* correctly as a marine species. Nevertheless, it must be admitted that the same was stated erroneously by AGASSIZ for e.g. species of *Pachyurus* and *Cichla*, which occur in freshwater.

In his later works on the indigenous languages, MARTIUS (1860, 1863), when referring to ‘Pirá-andirá’, only stated “piscis vespertilio” and “piscis vespertilio, ob rostrum illi vespertilionis simile”, ‘bat fish’ and ‘bat fish, with a face similar to the one of bats’. No mention of any species or group of fish. Three decades after publishing the third volume of the ‘Journey’ he might have recognized his earlier error.

The freshwater outflow of the Amazon into the Atlantic Ocean, 214,000 m<sup>3</sup>/s (REIS et al. 2016), is voluminous enough to genetically separate the population of the marine species *Halichoeres cyanocephalus* which occurs along the Brazilian coast south of the Amazon from the one in the Caribbean sea (ROCHA 2003). The same author (ROCHA 2004) recognized the Brazilian population as a distinct species and revalidated the southern *Halichoeres dimidiatus* (Agassiz, 1831) from the synonymy with the northern *H. cyanocephalus*. If the amount of freshwater of this so called ‘Amazon plume’ is such an efficient barrier to separate species of *Halichoeres* in their marine environment, it is very unlikely that these fish could have been found in the pure freshwater of the Amazon as far upstream as close to Santarém.

FREIRE & FILHO (2009) indicated seven alternative common names for *Halichoeres dimidiatus*. ‘Pirá-andirá’ is not mentioned for this or any other species of the genus *Halichoeres*.

Based on the above given reasons it can be considered that ‘Pirá-andirá’ is not a common name for *Julis dimidiatus* and it remains doubtful which species was referred to in SPIX’ field notes, copied and elaborated by MARTIUS for the ‘Journey’.

One hint was provided by MARTIUS (1863) himself when explaining that ‘Pirá-andirá’ is used for ‘bat fish, because of the snout similar to the one of bats’. In the plates of SPIX’ paper on monkeys and bats of Brazil (1823) several of the illustrated species of bats show snouts with pronounced canine teeth, as it is typical for the hematophage vampire bats occurring in Brazil.

Even though ‘snout’ and ‘mouth’ are not necessarily the same, NOMURA (1984) assigns ‘Pirá-andirá’ as a common name to *Acestrorhynchus microlepis* and *Raphiodon vulpinus*. MAGALHÃES (1931) provided reference for “...pirá andirá. Como sinonimo admitte-se o nome de *Cynodon vulpinus*, de Spix”.

Additionally to the mentioned acestrorhynchid species, ‘Pirá-andirá’ has also been listed as a common name for species of the genus *Hydrolycus* by MAGALHÃES (1931), FERREIRA et al. (1996) and TOLEDO-PIZA (2003). No author

could be found who mentioned *Cynodon gibbus*, the other cynodontid species described by SPIX and AGASSIZ, related to the common name 'Pirá-andirá'. All species of the Cynodontidae for which 'Pirá-andirá' is used as a common name share canine teeth which are the main characteristic of vampire bats.

Thus, the only species that matches with all these criteria as i) being distributed in the lower Amazon, ii) being called 'Pirá-andirá' and iii) having been treated by SPIX and AGASSIZ, is *Rhaphiodon vulpinus*, which was described from 'Brasiliae fluvius' as type locality. A unique specimen in MHNN 822 is currently considered to be the holotype or a syntype of an originally larger series of type specimens.

#### 4.2.3. Conclusions

From the above obtained results the following conclusions can be drawn:

The locality referred to in volume 3, footnote on page 1025 of the 'Journey', is specified as the mouth of the Uruará canal to the Amazon River at the Vira Sebo community (Figs 2, 3), village of Canaã, city of Prainha, Pará state, Brazil. DMS 01°53'33"S, 53°29'17"W; DDD -1.892554, -53.487991 (both taken from Google Maps).

This locality is hereby ascertained as the original type locality for the following species with still existing type specimens: *Anchoa tricolor*, *Rhaphiodon vulpinus* and *Tetragonopterus chalcus*.

For two of the above mentioned species, *Cathorops spixii* and *Brycon amazonicus*, neotypes have been designated and thus, the localities of the respective neotype specimens became the now valid type localities.

If in the future neotypes shall be designated for *Sorubim infraoculare*, *Pinirampus pirinampu* or *Potamorhina latior*, the respective specimen shall be collected at or near the above defined type locality of Vira Sebo.

Regardless the fact that *Anchoa tricolor* has been described from two different type localities, Bahia and Pará, this species is still included above in the second conclusion as following article 73.2.3. of the Code (ICZN 1999) "if the syntypes originated from two or more

localities..., the type locality encompasses all of the places of origin".

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#### References

- ALVES C.B.M., & P.S. POMPEU. 2010. A fauna de peixes da Bacia do Rio das Velhas no final do século XX, pp. 167-189. In: Peixes do Rio das Velhas: passado e presente (ALVES, C.B.M., & P.S. POMPEU, eds). SEGRAC, Belo Horizonte.
- BUITRAGO-Suárez, U.A., & B.M. BURR. 2007. Taxonomy of the catfish genus *Pseudoplatystoma* Bleeker (Siluriformes: Pimelodidae) with recognition of eight species. *Zootaxa* 1512, 1-38.
- CASATTI, L. 2001. Taxonomia do gênero Sul-Americano *Pachyrurus* Agassiz, 1831 (Teleostei: Perciformes: Sciaenidae) e descrição de duas novas espécies. *Comunicações do Museu de Ciências da PUCRS* 14(2), 133-178.
- CASTRO, R.M.C., & R.P. VARI. 2004. Detritivores of the South American fish family Prochilodontidae (Teleostei: Ostariophysi; Characiformes). A phylogenetic and revisionary study. *Smithsonian Contributions to Zoology* 622, 1-189.
- CHIM, E.N. 2018. Zooarqueologia da Lapa Granda de Taquaraçu. Unpublished MSc. thesis, Museo do Arqueologia e Etnologia, Universidade de São Paulo. Available at [www.researchgate.net/publication/336723555\\_Zooarqueologia\\_da\\_Lapa\\_Granda\\_de\\_Taquaracu](http://www.researchgate.net/publication/336723555_Zooarqueologia_da_Lapa_Granda_de_Taquaracu)
- FERRARIS C.J. 2003. Genus and species incertae sedis in Siluriformes, p. 254. In: CLOFFSCA – Check list of the freshwater fishes of South and Central America (REIS, R.E., S.O. KULLANDER, & C.J. FERRARIS, eds). Edipucrs, Porto Alegre.
- FERRARIS, C.J. 2007. Checklist of catfishes, recent and fossil (Osteichthyes: Siluriformes), and catalogue of siluriform primary types. *Zootaxa* 1418, 1-628.

- FERREIRA, E.J.G., J. ZUANON, & G.M. DOS SANTOS. 1996. A list of commercial fish species from Santarém, State of Para, Brazil. *Naga – The ICLARM Quarterly* 19(3), 41-44.
- FINK, W.L. 1993. Revision of the piranha genus *Pygocentrus* (Teleostei, Characiformes). *Copeia* 1993, 665-687.
- FREIRE, K.M.F., & A.C. FILHO. 2009. Richness of common names of Brazilian reef fishes. *Pan-American Journal of Aquatic Sciences* 4(2), 96-145.
- FRICKE, R., W.N. ESCHMEYER, & J.D. FONG. 2020. Genera/species by family/subfamily in Eschmeyer's Catalog of Fishes. Available at [researcharchive.calacademy.org/research/ichthyology/catalog/SpeciesByFamily.asp](http://researcharchive.calacademy.org/research/ichthyology/catalog/SpeciesByFamily.asp)
- GARAVELLO, J.C., & H.A. BRITSKI. 2003. Family Anostomidae (Headstanders), pp. 71-84. In: CLOFFSCA – Check list of the freshwater fishes of South and Central America (REIS, R.E., S.O. KULLANDER, & C.J. FERRARIS, eds). Edipucrs, Porto Alegre.
- GARAVELLO, J.C., & H.A. BRITSKI. 2019. Redescription of *Schizodon dissimilis* and appraisal of the dark barred species of the genus (Characiformes: Anostomidae). *Neotropical Ichthyology* 17(3), e180035. 10 pp.
- GELLER, V.V., M.H.S. YABU, A.C.R. CASIMIRO, D.A.Z. GARCIA, A.G.J. FERNANDES, C. PRADO, M.C. LUIZ, & M.L. ORSI. 2019. Peixe da Vez: *Salminus brasiliensis* (Cuvier, 1816). *Boletim da Sociedade Brasileira de Ictiologia* 130, 53-55.
- GODINHO, H.P., & A.L. GODINHO. 2003. Águas, peixes e pescadores do São Francisco das Minas Gerais. PUC Minas, Belo Horizonte.
- GUTBERLET, J., C.S. SEIXAS, & A.P.G. THÉ. 2004. Challenges in managing fisheries in the São Francisco watershed of Brazil. Conference paper presented during "Tenth Biennial Conference of the IASCP". Oaxaca, México, August 11-13, 2004, 1-38.
- INTERNATIONAL COMMISSION OF ZOOLOGICAL NOMENCLATURE (ICZN). 1999. International code of zoological nomenclature. Fourth Edition. The International Trust for Zoological Nomenclature, London.
- JÉGU, M. 2003. Subfamily Serrasalminae (Pacus and piranhas), pp. 182-196. In: CLOFFSCA – Check list of the freshwater fishes of South and Central America (REIS, R.E., S.O. KULLANDER, & C.J. FERRARIS, eds). Edipucrs, Porto Alegre.
- JORDAN, D.S., & C.H. EIGENMANN. 1889. A review of the Sciaenidae of America and Europe. United States Commission of Fish and Fisheries, Report of the Commissioner 14(3), 343-451.
- KOERBER, S., & R.E. REIS. 2020. Evidence for the true type-locality of *Rhamdia quelen* (Siluriformes: Heptapteridae), and the geographical origin and invalid neotype designation of four of its synonyms. *Neotropical Ichthyology* 18(1), e190117. 12 pp.
- KOTTELAT, M. 1988. Authorship, dates of publication, status and types of Spix and Agassiz' Brazilian fishes. *Spixiana* 11(1), 69-93.
- LIMA, F.C.T. 2006. Revisão taxonômica e relações filogenéticas do gênero *Salminus* (Teleostei: Ostariophysi: Characiformes: Characidae). Unpublished Ph.D. thesis, Museo de Zoologia, Universidade de São Paulo.
- LIMA, F.C.T., & H.A. BRITSKI. 2007. *Salminus franciscanus*, a new species from the rio São Francisco basin, Brazil (Ostariophysi: Characiformes: Characidae). *Neotropical Ichthyology* 5, 237-244.
- LITTMANN, M.W. 2007. Systematic review of the neotropical shovelnose catfish genus *Sorubim* Cuvier (Siluriformes: Pimelodidae). *Zootaxa* 1422, 1-29.
- LÜTKEN, C.F. 1875a. Velhas-Flodens Fiske. Et Bidrag til Brasiliens Ichthyologi; efter Professor J. Reinhardtts Indsamlinger og Optegnelser. Det Kongelige Danske visenskaberne selskabs skrifter. Naturvidenskabelig og matematisk afdeling, 5te Raekk [ser. 5]. 12(2), 121-253 + 2 unnum. + I-XXI, Pls. 1-5.
- LÜTKEN, C.F. 1875b. Peixes do Rio das Velhas: Uma contribuição para a Ictiologia do Brasil. pp. 23-164. In: Peixes do Rio das Velhas: passado e presente (ALVES, C.B.M., & P.S. POMPEU, eds, 2010). SEGRAC, Belo Horizonte. [Portuguese translation of Lütken 1875a]
- LUNDBERG, J.G., & M.W. LITTMANN. 2003. Family Pimelodidae (long-whiskered catfishes), pp. 432-446. In: CLOFFSCA – Check list of the freshwater fishes of South and Central America (REIS, R.E., S.O. KULLANDER, & C.J. FERRARIS, eds). Edipucrs, Porto Alegre.
- LUNDBERG, J.G., P. NASS, & F. MAGO-LECCIA. 1989. *Pteroglanis manni* Eigenmann and Pearson, a juvenile of *Sorubimichthys planiceps* (Agassiz), with a review of *Sorubimichthys* (Pisces: Pimelodidae). *Copeia* 1989, 332-344.
- MAGALHÃES, A.C. 1931. Monographia brasileira de peixes fluviaes. Romiti, Lanzara & Zanis, São Paulo.
- MARTIUS, C.F.P. 1829. Car. de Martius Lectori salutem! pp. I-XVI. In: *Selecta genera et species piscium quos in itinere per Brasiliam annis MDCCCXVII-MDCCCXX jussu et auspiciis Maximiliani Josephi I bavariae regis augustissimi*. volume 1. (SPIX, J.B., & L. AGASSIZ). C. Wolf, Munich.

- MARTIUS, C.F.P. 1860. Die Thiernamen in der Tupi-Sprache. Sitzungsberichte der königlich bayerischen Akademie der Wissenschaften zu München. Mathematisch-physikalische Classe. Sitzung vom 10. November 1860, 471-539.
- MARTIUS, C.F.P. 1863. Beiträge zur Ethnographie und Sprachenkunde Brasiliens. Vol. 2. Zur Sprachenkunde. Junge & Sohn, Erlangen.
- MENEZES, R.S. 1953. Lista de nomes vulgares dos peixes de águas doces e salôbras da zona seca do Nordeste e Leste do Brasil. Arquivos do Museu Nacional 42, 343-388.
- NEUMANN, D. 2006. Type catalogue of the ichthyological collection of the Zoologische Staatssammlung München. Part I: Historic type material from the "Old Collection", destroyed in the night 24/25 April 1944. Spixiana 29, 259-285.
- NOMURA, H. 1984. Dicionário dos peixes do Brasil. Editerra, Brasília.
- OKEN, L. 1819. Spix: Tiere aus Brasilien. Isis 3, 1345-1350. [title taken from SCHÖNITZER 2011]
- PINTO-COELHO, R.M. 2006. A icthiofauna do reservatório de Três Marias, rio São Francisco, Minas Gerais. Technical report. Secretária de Estado de Ciência, Tecnologia e Ensino Superior de Minas Gerais. Belo Horizonte, Minas Gerais.
- REIS, R.E., & S.A. SCHAEFER. 1998. New cascudinhos from southern Brazil: systematics, endemism, and relationships (Siluriformes, Loricariidae, Hypoptopomatinae). American Museum Novitates 3254, 1-25.
- REIS, R.E., J.S. ALBERT, F. DI DARIO, M.M. MINCARONE, P. PETRY, & L.A. ROCHA. 2016. Fish biodiversity and conservation in South America. Journal of Fish Biology, 89, 12-47.
- ROCHA, L.A. 2003. Ecology, the Amazon barrier, and speciation in western Atlantic *Halichoeres* (Labridae). Unpublished PhD thesis, Graduate School, University of Florida, Gainesville. Available at <http://plaza.ufl.edu/rocha1/publi.htm>.
- ROCHA, L.A. 2004. Mitochondrial DNA and color pattern variation in three western Atlantic *Halichoeres* (Labridae), with the revalidation of two species. Copeia 2004, 770-782.
- SABAJ, M.H., & C.J. FERRARIS. 2003. Family Doradidae (thorny catfishes), pp. 457-470. In: CLOFFSCA – Check list of the freshwater fishes of South and Central America (REIS, R.E., S.O. KULLANDER, & C.J. FERRARIS, eds). Edipucrs, Porto Alegre.
- SAMPAIO, R.M. 2013. A qualificação e a formação da identidade profissional dos agricultores familiares da região de Januária, MG. Unpublished PhD thesis, Faculdade de Ciências Econômicas, UFRGS, Porto Alegre. Available at <https://lume.ufrgs.br/handle/10183/96680>.
- SCHÖNITZER, K. 2011. Ein Leben für die Zoologie. Die Reisen und Forschungen des Johann Baptist Ritter von Spix. Allitera Verlag, Munich.
- SPIX, J.B. 1823. Simiarum et vesperilionum brasiliensium species novae, ou histoire naturelle des espèces nouvelles de singes et de chauves-souris, observées et recueillies pendant le voyage dans l'intérieur du Brésil, exécuté par ordre de S.M. le Roi de Bavière dans les années 1817, 1818, 1819, 1820. Hübschmann, Munich.
- SPIX, J.B., & L. AGASSIZ. 1829. Selecta genera et species piscium quos in itinere per Brasiliam annis MDCCCXVII-MDCCCXX jussu et auspiciis Maximiliani Josephi I bavariae regis augustissimi. volume 1. C. Wolf, Munich.
- SPIX, J.B., & L. AGASSIZ. 1831. Selecta genera et species piscium quos in itinere per Brasiliam annis MDCCCXVII-MDCCCXX jussu et auspiciis Maximiliani Josephi I bavariae regis augustissimi. volume 2. C. Wolf, Munich.
- SPIX, J.B., & C.F.P. MARTIUS. 1823. Reise in Brasilien auf Befehl Sr. Majestät Maximilian Joseph I. Königs von Baiern in den Jahren 1817 bis 1820 gemacht und beschrieben. Volume 1. M. Lindauer, Munich.
- SPIX, J.B., & C.F.P. MARTIUS. 1828. Reise in Brasilien auf Befehl Sr. Majestät Maximilian Joseph I. Königs von Baiern in den Jahren 1817 bis 1820 gemacht und beschrieben. Volume 2. M. Lindauer, Munich.
- SPIX, J.B., & C.F.P. MARTIUS. 1831. Reise in Brasilien auf Befehl Sr. Majestät Maximilian Joseph I. Königs von Baiern in den Jahren 1817 bis 1820 gemacht und beschrieben. Volume 3. M. Lindauer, Munich.
- STEINDACHNER, F. 1879. Ichthyologische Beiträge (VIII). Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe 80 (1-2), 119-191.
- TEROFAL, F. 1983. Die Fischeausbeute der Brasilien-Expedition 1817-1820 von J.B. v. Spix und C.F.V. Martius. Spixiana, Suppl. 9, 35-42.
- THÉ, A.P.G. 2003. Conhecimento ecologico, regras de uso e manejo local dos recursos naturais na pesca do alto-medio Sao Francisco, MG. Unpublished PhD. thesis, Centro de Ciências Biológicas e da Saúde, Universidade Federal do São Carlos. Available at <https://1library.org/document/zpn29woy-conhecimento-ecologico-regras-manejo-recursos-naturais-medio-francisco.html>
- TOLEDO-PIZA, M. 2003. Family Cynodontidae (Cynodontids), pp. 234-237. In: CLOFFSCA – Check

- list of the freshwater fishes of South and Central America (REIS, R.E., S.O. KULLANDER, & C.J. FERRARIS, eds). Edipucrs, Porto Alegre.
- WEBER, C. 2003. Subfamily Hypostominae (Armored catfishes), pp. 351-372. In: CLOFSCA – Check list of the freshwater fishes of South and Central America (REIS, R.E., S.O. KULLANDER, & C.J. FERRARIS, eds). Edipucrs, Porto Alegre.
- WHITEHEAD, P.J.P., & G.S. MYERS. 1971. Problems of nomenclature and dating of Spix and Agassiz' Brazilian Fishes (1829-1831). *Journal of the Society for the Bibliography of Natural History* 5, 478-497.
- WIRASINHA, V.L. 1998. English translation of J.B. Spix and L. Agassiz (1829-31) 'Selecta genera et species piscium Brasiliensium', pp. 55-224. In: *Fishes of Brazil* (PETHIYAGODA, R., & M. KOTTELAT, eds). WHT Publications, Colombo, Sri Lanka.
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