

Fighting faunistic chaos: confirmations and new records for Uruguayan Characidae (Ostariophysi: Characiformes).

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Abstract

The faunistic record must ideally rely on physical evidence, notably concerning species that are difficult to identify due to taxonomic characters not observable by simple visual inspection. Based on material deposited in the Museo Nacional de Historia Natural, Montevideo, we here confirm the presence of *Aphyocharax rathbuni*, *Oligosarcus robustus*, *Psalidodon erythropterus*, and *Pseudocorynopoma stanleyi* in Uruguay. These species were until now informally recorded for this country in social media, aquarium hobbyist's websites, technical reports, online repositories, etc. We briefly discuss about "species recording" as scientific work and the usual fails detected in the previous mentions of the treated species: absence or poorly documented voucher, the improper use of photographs and/or no mention of bibliographical sources of information.

Introduction

The family Characidae is the most diverse of the ichthyofauna of the Neotropical Region, with 1236 valid species described until now (Fricke et al. 2021a), distributed in freshwater systems from Texas (U.S.A.) to the North Patagonian Region in Argentina (Nelson et al. 2016; Liotta 2005). The first record of the family for Uruguay was the description of *Tetragonopterus interruptus* Jenyns, 1842 (currently *Cheirodon interruptus*) and the mention of *Hydrocyon hepsetus* Cuvier, 1829 (actually attributed to *Oligosarcus jenynsii*, see comments in Koerber & Serra 2020). At present day at least 50 species have been recorded for the country (Litz & Koerber 2014; Koerber & Litz 2014, 2016; Koerber et al. 2020; Koerber & Serra 2020; Serra et al. 2018), but the presence of some of them are doubtful or poorly documented and need confirmation (Serra et al. 2018), especially taking into account the high specific diversity and the low morphological interspecific variability in some genera. The genera *Astyanax*, *Psalidodon*, or *Andromakhe* are outstanding examples of those conditions, which make the identifications at species level challenging (Terán et al. 2020). The problem becomes even more complex when records that are initially published in networks of different types of databases are taken as valid without a thorough analysis of its origin, making the species recording chaotic. In the present work we present the first confirmed records of four characiform fishes for Uruguay, with comments about its previous mentions in websites, social media and technical reports.

Material and Methods

Specimens are housed in the collection of Museo Nacional de Historia Natural (MHNM), Montevideo, Uruguay. Measurements (nearest mm) are straight-line distances taken with a digital caliper. Standard length (SL) is measured from tip of snout to hypural joint. Collection abbreviations according to Fricke & Eschmeyer (2021). Identifications were based on Steindachner (1882), Fowler (1940), Géry (1977), Britski et al. (1999), Willink et al. (2003), Soneira et al. (2010), Almirón et al. (2015), Menezes & Ribeiro (2015), Ribeiro & Menezes (2015), Terán et al. (2016), Brito et al. (2018), and Malabarba et al. (2020).

The distributions mapped from previous records have been based on the following references:

Aphyocharax rathbuni: Ringuelet et al. 1967; Chernoff et al. 2000; Ibsch et al. 2002; Alvarez 2003; Willink et al. 2003; Liotta 2005; Farrell & Cancino 2007; Iwaszkiw et al. 2010; SEAM 2011; Hablützel 2012; Tagliacollo et al. 2012; Florentino et al. 2016; Scipioni et al. 2016; EBY 2019; VanCompernelle & Pett 2020

Oligosarcus robustus: Garcia et al. 2003; Nunes & Hartz 2006; Corrêa & Piedras 2009; Ferrer et al. 2015; Ribeiro & Menezes 2015

Psalidodon erythropterus: Cordiviola de Yuan & Pignalberi 1981; Liotta 2005; Ostrowski de Núñez & Quintana 2008; Soneira et al. 2010; Insaurralde et al. 2012; Almirón et al. 2015; Rossini et al. 2016; Scipioni et al. 2016; Bauni et al. 2017; VanCompernelle & Pett 2020

Pseudocorynopoma stanleyi: Malabarba et al. 2020

Results

Aphyocharax rathbuni Eigenmann, 1907

figs. 1,2

Examined material: Uruguay: Artigas: MHNM 4431, 2 ex., 28.7-29.5 mm SL, Rincón de Franquia, aprox. 30°12'S 57°34'W, col. M. Caligari & E. Caligari, 16/II/2019; MHNM 4434, 1 ex, 27.2 mm SL, Rincón de Franquia, 30°13'42"S 57°36'58"W, col. G. Sanguinetti & N. Power, 23/II/2020; MHNM 4792, 3 ex, 22.5-25.6 mm SL, Rincón de Franquia, 30°13'42"S 57°36'58"W, col. W.S. Serra, G. Sanguinetti, M. García, M. Caligari, G. Núñez & G. Sosa, 31/X/2021; MHNM 4794, 7 ex, 22.4-25.5 mm SL, Rincón de Franquia, 30°13'42"S 57°36'58"W, col. W.S. Serra, G. Sanguinetti, M. García, M. Caligari, G. Núñez & G. Sosa, 31/X/2021.

This species differs from other congeners of the genus by the following combination of characters: adipose fin and base of caudal and anal fins red, pelvic, pectoral and dorsal fins without red coloration, absence of black or dark brown coloration on middle caudal-fin rays, red coloration on the posterior region of the body not extended dorsal to the lateral midline of the body, 4-5 premaxillary and 1-3 maxillary tooth, 19-21 anal fin rays and lateral line incomplete with 6-8 perforated scales (Steindachner 1882; Fowler 1940; Gery 1977; Britski et al. 1999; Willink et al. 2003; Almirón et al. 2015; Terán et al. 2016; Brito et al. 2018).

The specimens herein reported present all these characters and come from northern Uruguay, associated to the Uruguay River and one of its affluents, the Cuareim River (fig. 7). The species was collected in canals and wetlands, where it appears to be very scarce, forming schools with *Aphyocharax anisitsi* Eigenmann & Kennedy, 1903.



fig. 1
Aphyocharax rathbuni before and after fixation: MHNM 4431, 29.5 mm SL, Rincón de Franquia, aprox. 30°12'S 57°34'W, Artigas, Uruguay.



fig. 2
Aphyocharax rathbuni from Rincón de Franquia (Artigas, Uruguay), maintained in aquarium, not preserved. Pictures posted by German Sanguinetti in the Facebook group of "Peces Argentinos", on February 25th of 2020.

The previously known distribution of *A. rathbuni* extended through Paraná, Paraguay and Mamoré River basins, in Argentina, Bolivia, Brazil and Paraguay (Britski et al. 1999; Hablützel 2012; Fricke et al. 2021b). *Aphyocharax rathbuni* has been informally mentioned for Uruguay for at least nine years (oldest publication date in Google Search: 28.mar.2012), with numerous aquarium blogs and websites repeating the text “endémique du bassin du Rio Paraguay au Paraguay, du fleuve Paraná en Uruguay, au Brésil, et en Argentine” (Aquaportal) in different languages, but none of these sites mentions the source of that information. The Fishbase website (2021) in their “Point map” tool of the “Species Summary”, points out eight Uruguayan records mined from Gbif.org, which mined the data from the ichthyological database of the “Swedish Museum of Natural History”. The records of this last database are from nine geographical points in Uruguay and Cuareim river basins in Salto and Artigas departments with one to 13 specimens each one, none of them published in scientific journals yet. Curiously, only four lots of *A. anisitsi*, all from Salto, were accessed from the same expeditions, while our observations *in situ* indicates that *A. anisitsi* is extremely abundant in all northern Uruguayan area, making those identifications of *A. rathbuni* doubtful. Nión et al. (2016) mentioned *A. rathbuni* in their book “Peces del Uruguay: Lista sistemática y nombres comunes”, probably based on these records but without any information about sources or vouchers. In social media (“Peces Argentinos” Facebook’s group) some photos of the species taken in northern Uruguay, were posted by aquarium hobbyist in the last two years (fig. 2), showing its highly probable presence in the country. The specimens here analyzed confirm with vouchers the presence of *A. rathbuni* for Uruguay and Uruguay River basin.

***Oligosarcus robustus* Menezes, 1969**

fig. 3

Examined material: Uruguay: Cerro Largo: MHNM 4429, 2 ex., 109.0-124.5 mm SL, Río Yaguarón, 32°31'01"S 53°27'27"W, col. W.S. Serra, G. Furtado & A. Balao, 30-31/III/2018; MHNM 4430, 1 ex., 91.8 mm SL, Cañada de las Pajas, Paso de las Mercedes, 32°30'34"S 53°31'04"W, col. W.S. Serra, G. Furtado & A. Balao, 1/IV/2018. Treinta y Tres: MHNM 4427, 1 ex., 87.2 mm SL, Laguna Arnaud, 33°15'00"S 54°22'55"W.

This species differs from other congeners of the genus by the following combination of characters: 16-18 transverse scale rows above lateral line, 75-85 perforated scales in the lateral series, 28-32 horizontal scale rows around caudal peduncle, maxillary, premaxillary and dentary teeth unicuspidate and tip of pectoral fins surpassing the origin of pelvic fins (Menezes 1969; Menezes & Ribeiro 2015; Ribeiro & Menezes 2015).

Analyzed specimens present all these characters and come from eastern and northeastern Uruguay, associated to the Merín Lagoon basin (fig. 7). The previously known distribution of *O. robustus* extended through Patos-Merín Lagoon basin and Tramandaí system in Rio Grande do Sul, Brazil (Ribeiro & Menezes 2015).

The species was first recorded for the country by Menezes (1969), who analyzed three specimens (MZUSP [ex DZSASP] 4679 to 4681, paratypes) from Salto Chico (Salto Department). Menezes (1987: 29) re-determined these lots as *Oligosarcus oligolepis* (Steindachner, 1867), an extremely similar species distributed in La Plata, Uruguay, Paraguay and lower Paraná river basins (Fricke et al. 2021b). Teixeira de Mello et al. (2005) mentioned *O. robustus* as a new record for Uruguay in a congress abstract, but they did not provide any information about vouchers or precise localities. Aside from these, Soutullo et al. (2009) mentioned it in a technical report as a conservation priority for the SNAP (Sistema Nacional de Áreas Protegidas), but lacking distributional or voucher data. In later versions of the list (Loureiro et al. 2013) the species was not included. The specimens here analyzed confirm with vouchers the presence of *O. robustus* for the Uruguayan territory.

***Psalidodon erythropterus* (Holmberg, 1891)**

fig. 4

Examined material: Uruguay: Colonia: MHNM 3922, 2 ex, 64.2-74.3 mm SL, Nueva Palmira, aprox. 33°52'S 58°25'W, col. CARU-CARP, 5/VI/2016. San José: MHNM 3501, 1 ex., 63.7 mm SL, mouth of Arroyo Mauricio, 34°42'28"S 56°41'42"W, col. W.S. Serra, 28/III/2014. Soriano: MHNM 3909, 2 ex. 67.5-73.3 mm SL, Uruguay River between La Concordia and La Agraciada, col. CARU-CARP, 3/VI/2016.

This species differs from other congeners from the La Plata River and Patos-Merín Lagoon basins by the following combination of characters: 11-13 transverse scale rows above lateral line, 49-54 perforated scales in the lateral series and one maxillary tooth with 5 or 7 cusps (Soneira et al. 2010).

The analyzed specimens present all these characters and come from southwestern Uruguay, associated to the La Plata and Uruguay rivers (fig. 7). The previously known distribution of *P. erythropterus* extended through Paraguay, lower Paraná and La Plata River basins in Argentina and Paraguay (Holmberg 1891; Soneira et al. 2010; Insaurralde et al. 2012).

Psalidodon erythropterus was first mentioned (as *Astyanax erythropterus*) and illustrated for Uruguay River area in a technical report published by the Comisión Administradora del Río de la Plata and the Comisión Administradora del Río Uruguay (CARP-CARU 2016), where the authors comment that the species “has yet to be formally recorded as part of the Uruguayan fauna”. Specimens mentioned in that report (MHNM 3909 and MHNM 3922) are incorporated as part of the present work. Moreover, another report (López-Rodríguez et al. 2019) lists one specimen from Uruguay River in Río Negro Department, collected in autumn 2019, but lacking any other data. Our examination of the specimens mentioned in the first report plus one specimen from San José Department, confirm the presence of *P. erythropterus* for the Uruguayan territory.



fig. 3
Oligosarcus robustus before and after fixation: MHNM 4430, 91.8 mm SL, Cañada de las Pajas, Paso de las Mercedes, 32°30'34"S 53°31'04"W, Cerro Largo, Uruguay



fig. 4
Psalidodon erythropterus before and after fixation: MHNM 3501, 63.7 mm SL, mouth of Arroyo Mauricio, 34°42'28"S 56°41'42"W, San José, Uruguay. Upper picture flipped.

***Pseudocorynopoma stanleyi* Malabarba, Chuctaya, Hirschmann, Oliveira & Thomaz, 2020**

figs. 5, 6

Examined material: Uruguay: Cerro Largo: MHNM 1024, 1 ex., 44.3 mm SL, Arroyo Corrales, 33°01'33"S 54°06'47"W, E. Messner, 27/II/1962; MHNM 1075, 3 ex., 32.3-45.5 mm SL, cañada cerca de Arroyo Coronilla, al sur de Río Branco, aprox. 32°36'07"S 53°20'48"W, col. E. Messner, 15/IV/1962; MHNM 1090, 2 ex., 48.6-51.9 mm SL, cañada en Camino entre Río Branco y Dragón, col. E. Messner, 16/IV/1962; MHNM 4368, 1 ex., 51.2 mm SL, Paso Sarandí, 32°26'25"S 53°36'46"W, Arroyo Sarandí de Barceló, col. W.S. Serra, G. Furtado & A. Balao, 1/IV/2018; MHNM 4428, 1 ex., 51.2 mm SL, Río Yaguarón, 32°31'01"S 53°27'27"W, col. W.S. Serra, G. Furtado & A. Balao, 30-31/III/2018. Lavalleja: MHNM 2745, 1 ex., 50.3 mm SL, Arroyo Polanco, 33°52'07"S 55°07'11"W, col. L.H. Amato, 25/X/1980; MHNM 4418, 1 ex., 37.5 mm SL, Arroyo Polanco, 33°52'07"S 55°07'11"W, 1981. Rocha: MHNM 928, 8 ex., 43.8-50.3 mm SL, Ruta 16, “2° arroyo que cruza la carretera (Castillos)”, aprox. 34°09'S 53°50'W, col. E. Messner; MHNM 932, 1 ex., 52.4 mm SL, Ruta 16, “2° arroyo que cruza la carretera (Castillos)”, aprox. 34°09'S 53°50'W, col. E. Messner; MHNM 1307, 2 ex., 39.6-41.9 mm SL, afluente de Laguna Negra, cruza Camino de los Indios, aprox. 33°54'S 53°43'W, col. E. Messner, 9/IX/1962. MHNM 2743, 1 ex., 35.5 mm SL, Arroyo del Pescado, 33°58'24"S 53°45'04"W, col. E. Messner; MHNM 2747, 4 ex., 45.5-68.1 mm SL, Playa de la Angostura, Laguna Negra, aprox. 34°04'S 53°38'W, col. Skuk, Rodríguez & Amato, 20/I/1982; MHNM 4424, 1 ex., 34.3 mm SL, nameless stream, 34°09'41"S 53°50'27"W, col. W.S. Serra & G. Furtado, 17/XII/2020; MHNM 4425, 3 ex., 52.0-56.1 mm SL, Paso del Bañado, Ruta 16 km 18.400, 34°07'37"S 53°50'18"W, col. W.S. Serra & G. Furtado, 17/XII/2020; MHNM 4426, 4 ex., 26.6-54.2 mm SL, Paso del Bañado, Ruta 16 km 18.400, 34°07'37"S 53°50'18"W, col. W.S. Serra & G. Furtado, 17/XII/2020. Treinta y Tres: MHNM 1039, 1 ex., 52.8 mm SL, “A° Malo, A° Yermal y otro de Río Olimar Grande”, aprox. 33°S 54°W, col. E. Messner.

This species differs from other congeners of the genus by the following combination of characters: 32-36 branched anal fin rays, presence of an intermediate lobe in the distal margin of the anal fin of males, and males with absence of black spots at the distal tip of the pectoral fin and the tip of the anterior lobe of the anal fin (Malabarba et al. 2020). Specimens analyzed present all these characters and come from eastern and northeastern Uruguay, associated to Merín Lagoon basin (fig. 7). The previously known distribution of *P. stanleyi* extended through Patos-Merín Lagoon basin and Tramandaí system in Rio Grande do Sul, Brazil (Malabarba, et al. 2020).

Described in late 2020 and recorded with numerous lots from all Patos-Merín Lagoon basin in Rio Grande do Sul, *P. stanleyi* was expected to also be present in the Uruguayan region of the same basin, especially considering published records (Azpelicueta & García 2001; Serra et al. 2020) and numerous photographs from social media (“Peces Argentinos” Facebook’s group, e.g. Figure 6) of “*Pseudocorynopoma doriae*” from this area. Specimens here analyzed confirm with vouchers the presence of the species for Uruguayan territory.



fig. 5 *Pseudocorynopoma stanleyi* before and after fixation: MHNM 4430, 51.2 mm SL, Río Yaguarón, 32°31'01"S 53°27'27"W, Cerro Largo, Uruguay

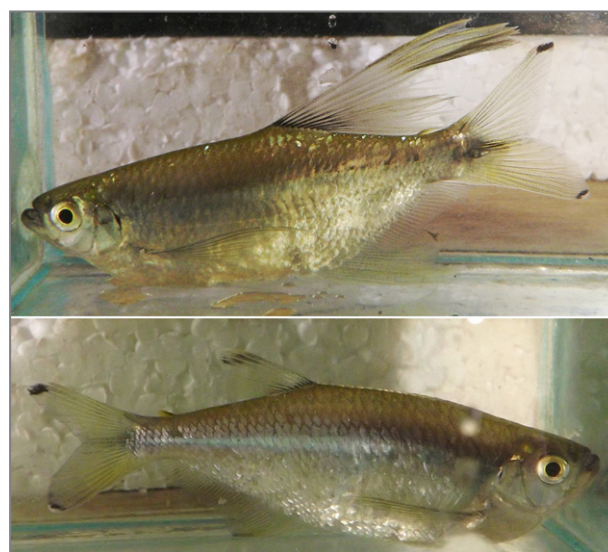


fig. 6 Male and female of *Pseudocorynopoma stanleyi* from Castillos (Rocha, Uruguay), maintained in aquarium, not preserved. Pictures posted by Andrés Balao in the Facebook group of “Peces Argentinos”, on September 21st of 2017.

Discussion

The Characidae is one of the most diverse freshwater fish families of Uruguay and several new species have been recorded in recent years (Serra et al. 2013, 2014, 2018; Zarucki et al. 2010). New findings as here reported are expected. In this sense, involvement of citizen scientists to the academical work is crucial to offset gaps in distributional information (“Wallacean shortfall”), and to detect some rare or infrequent taxa as *Aphyocharax rathbuni*, captured in places frequently sampled and thought to be well known as the protected area Rincón de Franquia.

Biological species inventory and distributional data are essential for many human activities and the first step to undertaking effective conservation actions. For a verifiable faunistic record, and not only for taxonomic work, the evidence concerning species having taxonomic characters that are not observable by simple visual inspection must rely on voucher specimens. Indeed, collections are the foundation of taxonomy and systematics (see e.g. Winston 1999; Morrone 2013; Rocha et al. 2014; Sigwart 2018). In an era of urgent need of biological data, sources of information generating lists and databases are increasingly heterogeneous in origin and quality, including databases as iNaturalist and eBird, museum collection databases, different kinds of online repositories as GBIF or GenBank, social media groups, publications in scientific magazines, books, etc. Most of them have the same Achilles heel: problems with vouchers and taxonomical changes makes them fast outdated and difficult to update. In this sense, some of the main (but not the only) shortfalls that we detect both in scientists and naturalists to record biodiversity are:

- no mention of voucher specimens, the evidence of the record that in many cases unambiguously ensures science as repeatable;

- absence or poor information associated to the vouchers, which is crucial for traceability, correction and updating of the information;
- absence of literature associated to the species names in species lists indicating the source of information;
- records based only in photographs, making impossible more detailed analyses or even basic taxonomic work;
- the belief that only publishing photographs in social media is a serious way to present new records.

Usually, these problems are not especially evident if we work with well know and conspicuous organisms that are easily identifiable at species level, as some birds or big mammals. However, it becomes important or rampant if we work with hyperdiverse and still poorly know groups as insects or fishes. For the Uruguayan freshwater fish fauna this problem is notorious even in recent years, with several species recorded or incorporated to national species list with doubtful or even without evidence. We suggest the following tips to make a correct and useful record of species for Uruguay (or any other area):

- use physical vouchers as much as possible and publish in scientific magazines at least once with its complete metadata (voucher code and number, geographical coordinates, date, collectors, etc.);
- use photographs only as a complement to the physical voucher, not as the only evidence;
- deposit at least one well preserved and identifiable voucher specimen in a public scientific collection;
- indicate at least one reference associated to the name of the species when making a compilation, allowing to trace the origin of the record.

We are convinced that taking into consideration the aforementioned tips, it is possible to start solving the chaotic way that species recording is made, and prevent subsequent problems.

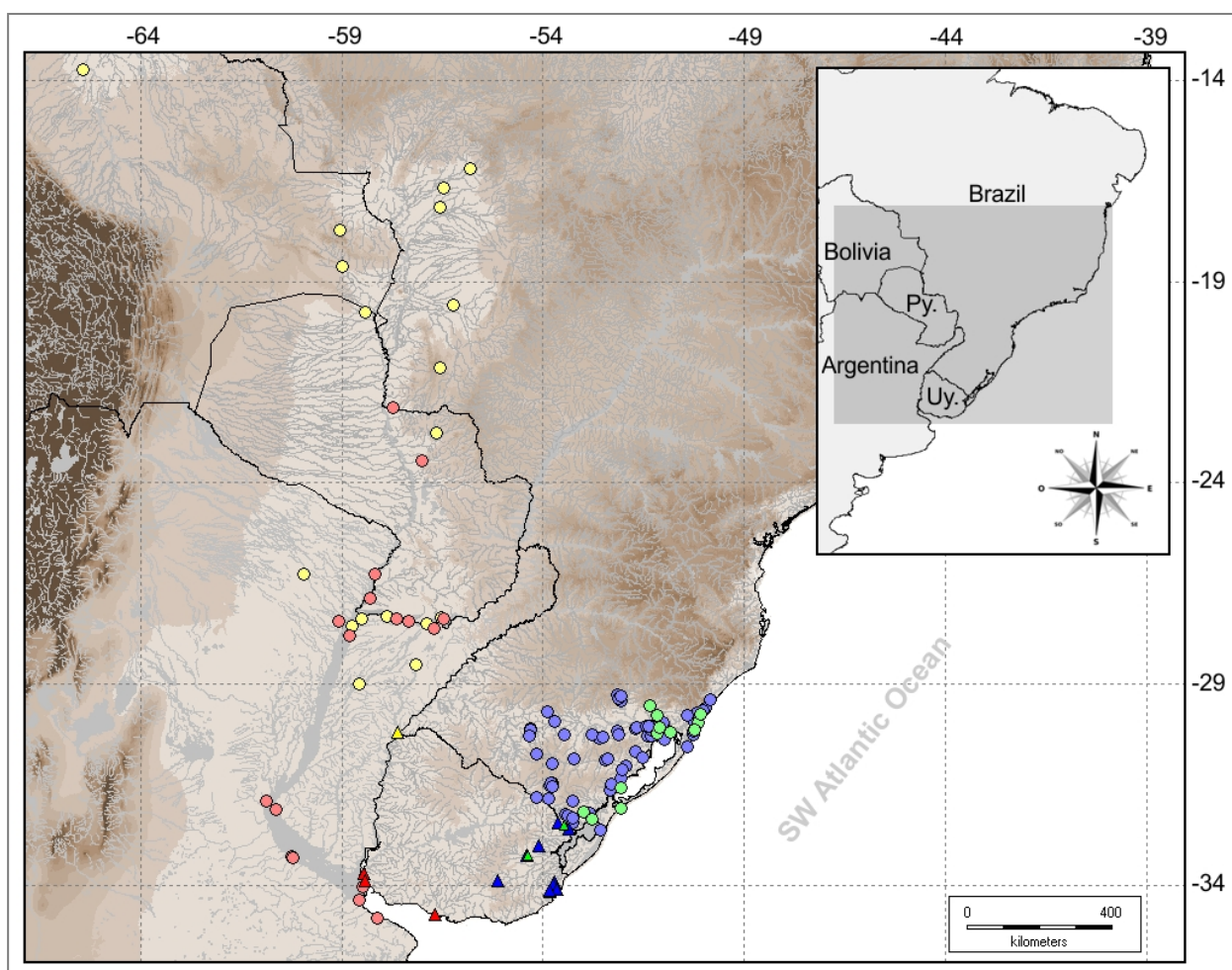


fig. 7 Distribution map of the recorded species: yellow = *Aphyocharax rathbuni*; green = *Oligosarcus robustus*; red = *Psalidodon erythropterus*; blue = *Pseudocorynopoma stanleyi*. Triangles = records from Uruguay; circles = records from outside Uruguay based on literature. Py. = Paraguay; Uy. = Uruguay.

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