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NOTES ON GEOGRAPHIC DISTRIBUTION

New records and confirmations of freshwater fish (Teleostei, Ostariophysi) from Uruguay after flood pulses from the Paraná and Uruguay rivers

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Abstract. Based on fish monitoring programs in the Uruguay River held during the 2023–2024 flood pulse, we report for the first time the presence of the following four species in the Uruguay river basin: *Hemiodus orthonops* Eigenmann & Kennedy, 1903; *Cynopotamus kincaidi* (Schultz, 1950); *Brycon hilarii* (Valenciennes, 1850); and *Cnesterodon raddai* Meyer & Etzel, 2001. Furthermore, three other species mentioned in literature but without formal records in scientific collections were confirmed for Uruguay: *Schizodon borellii* (Boulenger, 1900), *Tetragonopterus argenteus* Cuvier, 1816; and *Hoplerythrinus unitaeniatus* (Spix & Agassiz, 1829).

Key words. *Brycon hilarii*, *Cnesterodon raddai*, *Cynopotamus kincaidi*, fish distribution, fish diversity, *Hemiodus orthonops*

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INTRODUCTION

Knowledge of freshwater fish distribution and biology in Uruguay has steadily increased over the last 20 years (e.g. López-Rodríguez et al. 2019; Bessonart et al. 2021; Loureiro et al. 2023a). However, rare species with restricted geographic distributions, or that are infrequently collected, are by far understudied and lesser known; doubt exists about the presence of some species that have been cited as occurring in Uruguay but lack scientific records in fish collections, while other species are newly reported as research advances in the territory (e.g. Zarucki et al. 2010; Serra et al. 2020, 2024; Pais et al. 2021; Loureiro et al. 2023b). Ichthyological research efforts in Uruguay have focused on "snapshot" samplings covering wide geographical areas and in the revision of scientific collections (e.g. Zarucki et al. 2010; Serra et al. 2013). However, long-term monitoring programs of fish have more recently been implemented (although almost exclusively in Uruguay River Basin), which allow for recording of variability in species' distribution over time. This is highly important because temporal-scale flood pulses represent key moments for the dispersion and reproduction of several fish species in Neotropical river ecosystems (e.g. Winemiller and Jepsen 1998). This may imply that several rare fish species have seldom been reported from Uruguay. Intensive fish-monitoring programs during the flood pulse of 2023–2024 have resulted in the collection of four fish species not previously known from the Uruguay River (all were previously known from Paraná river basin). Furthermore, during this flood-pulse event, three additional species without registered records in collections were confirmed from Urugay. We report these discoveries here.

METHODS

All fish samples used in this report have been deposited in the scientific collection of Facultad de Ciencias, Montevideo Uruguay (Institutional code ZVC-P). *Hemiodus orthonops* Eigenmann & Kennedy, 1903, *Tetragonopterus argenteus* Cuvier, 1816, *Cynopotamus kincaidi* (Schultz, 1950), *Brycon hilarii* (Valenciennes,

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1850), and *Schizodon borellii* (Boulenger, 1900) were collected during monitoring programs developed by Comité Científico, Comisión Administradora del Río Uruguay (CARU) carried out in March 2024. These fishes were collected using standard 1.5 Nordic Survey nets deployed overnight in moderate to slow water current areas between 1 and 4 m depth in the confluence of the Río Negro and Uruguay rivers (–33.4330, –58.4232), upstream of Fray Bentos City (–33.1138, –58.2854), and downstream from Salto Grande Dam (–31.3088, –57.9733).

Cnesterodon raddai Meyer & Etzel, 2001, *B. hilarii*, and *S. borellii* were further collected in the confluence of Queguay and Uruguay rivers (–32.0851, –58.1088) in monthly and seasonal fish monitoring from ongoing research projects from Laboratorio de Ecología Fluvial, Centro Universitario Regional Litoral Norte using seine nets and standardized multi-mesh gillnets between October 2023 and February 2024. Additionally, *Hoplerythrinus unitaeniatus* (Spix & Agassiz, 1829) was collected by recreational fishing using an artificial lure in a small floodplain lake in the "Rincón de Franquía" habitat/species management area (–30.1906, –57.6395) within the Sistema Nacional de Áreas Protegidas (National System of Protected Areas). All the distribution maps were made using QGIS 3.40. software (QGIS Development Team 2024) using Hydrodsheds Base layer (Lehener et al. 2008).

RESULTS

***Hemiodus orthonops* Eigenmann & Kennedy, 1903**
Figures 1A, 2

New records. URUGUAY — Río Negro • mouth of Río Negro River on Uruguay River; –33.4330, –58.4232; 20.III.2024; Comité Científico CARU leg.; 1 spec., 85.2 mm standard length (SL), ZVC-P 15911.

According to Salvador (2023) and Fricke et al. (2025), *H. orthonops* was previously distributed in the Paraguay river basin and the lower Paraná River, so this is the first record from the basin of the Uruguay River. This species is classified as Least Concern by the International Union for Conservation of Nature (IUCN) (Salvador 2023).

Identification. The specimen was identified by its elongate, cylindrical body, exclusive presence of spatulated teeth on upper jaw, and conspicuous round spot on the middle of the flank just posterior to the dorsal fin (Almirón et al. 2015).

***Schizodon borellii* (Boulenger, 1900)**
Figures 1B, 3

New records. URUGUAY — Río Negro • Uruguay River, Playa Ubici, Fray Bentos; –33.11380, –58.28537; 14.III.2024; Comité Científico CARU leg.; 1 spec., 168.5 mm SL, ZVC-P 15912 — Paysandú • Paysandú, Mouth of Queguay River on Uruguay River; –32.0851, –58.1088; Wiston Albieni, Ivana Silva, Anna Feris, and Iván González-Bergonzoni leg.; 9.XII.2024; 1 spec., 240 mm SL, ZVC-P 16089.

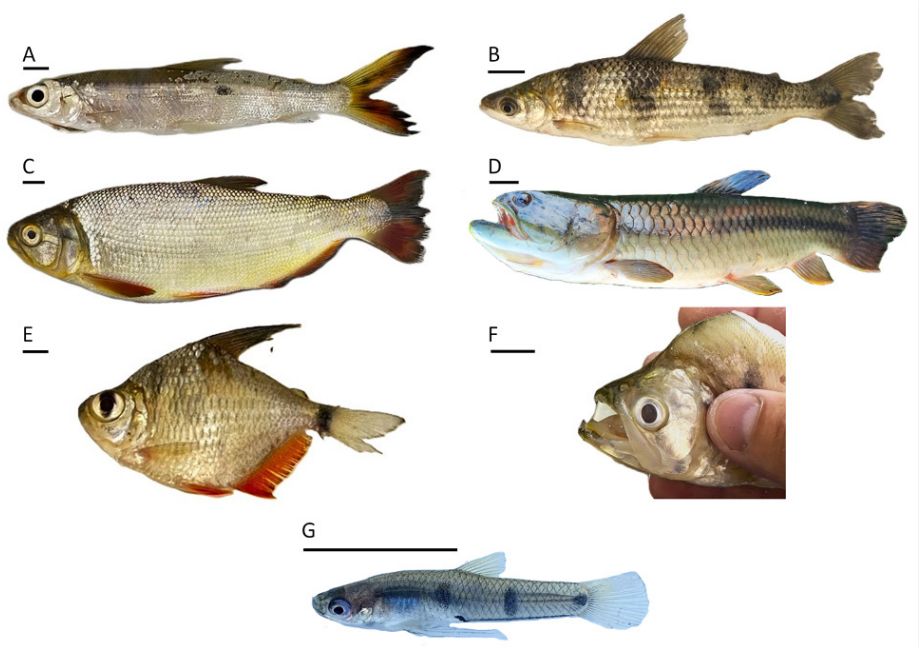

Figure 1. Photos corresponding to freshly caught voucher specimens deposited in fish collections of the new species registered for Uruguay. **A.** *Hemiodus orthonops*. **B.** *Schizodon borellii*. **C.** *Brycon hilarii*. **D.** *Hoplerythrinus unitaeniatus*. **E.** *Tetragonopterus argenteus*. **F.** *Cynopotamus kincaidi*. **G.** *Cnesterodon raddai*. Scale bars: 10 mm.

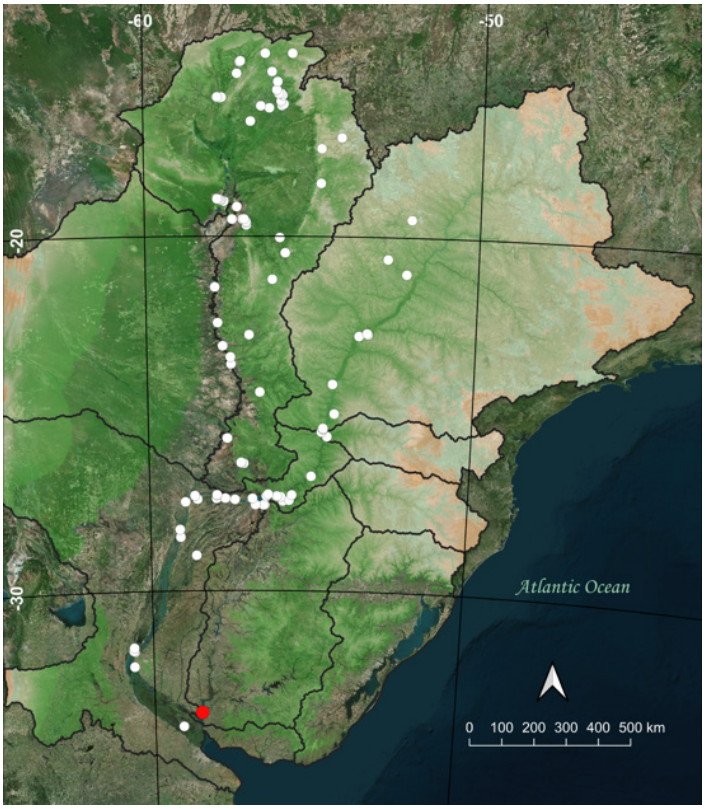

Figure 2. Distribution range for *Hemiodus orthonops*. Previous records in white and records reported here in red.

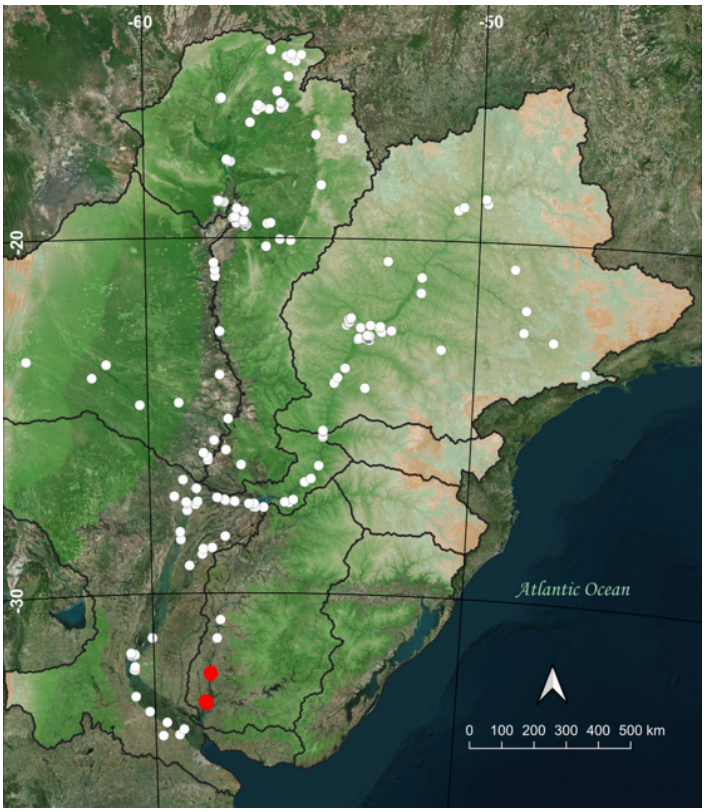

Figure 3. Distribution range for *Schizodon borellii*. Previous records in white and records reported here in red.

According to Fricke et al. (2025), this species is distributed in the upper basin of the Paraguay River. However, Almirón et al. (2015) found it in the middle and lower Paraná River, and ICMBio (2022b) also places it in the upper basin of the Paraná River and in the Ibicuí River, part of the middle basin of the Uruguay River. However, Bertaco et al. (2016) did not include it in Rio Grande do Sul state in Brazil. Apparently, this species was wrongly mentioned from Uruguay by Devicenzi (1924); Devicenzi and Teague (1942), and Devicenzi and

Legrand (1940) as *S. fasciatus* (Garavello and Britski 1990). Later, Nión et al. (2002) included it in their list of fish of Uruguay, but without any collection records. Liotta et al. (2005) mentioned the presence of *S. borellii* in the Uruguay River near Paysandú based on Ringuelet et al. (1967). This species is classified as Least Concern by the IUCN (ICMBio 2022a).

Identification. We identified *S. borellii* by the presence of multicuspid teeth which characterize the genus *Schizodon* among Anostomidae in the region, the terminal mouth, the characteristically vertical dark blotches along the flanks of the body, and the lower scale count (fewer than 43 scales) than the most similar species in the region, *Schizodon platae* (Garman, 1890), and the presence of four transverse scales above and below scales of the lateral line (Almirón et al. 2015).

Brycon hilarii **(Valenciennes, 1850)**

Figures 1C, 4

New records. URUGUAY — Río Negro • mouth of Río Negro River into Uruguay River; –33.4330, –58.4232; Comité Científico CARU leg.; 20.III.2024; 1 spec. juvenile, 160.3 mm SL, ZVC-P 16082 — Paysandú • Paysandú, Mouth of Queguay River on Uruguay River; –32.0851,–58.0278; Wiston Albieni, Joaquín Pais, Anna Feris and Iván González–Bergonzoni leg.; 24.II.2024; 1 spec. juvenile, 168.5 mm SL, ZVC-P 15916

ARGENTINA — Entre Ríos • Salto Grande Dam, Río Uruguay; –31.3088, –57.9733, Comité Científico CARU leg.; 20.III.2024; 1spec. juvenile, 210 mm SL, ZVC-P 16090.

This species has a disjunct distribution in the basins of the upper Amazon, upper Paraná, and Paraguay rivers (Frederico 2023). The new data include the first records from the Uruguay river basin. This species is classified as Least Concern by the IUCN (Frederico 2023).

Identification. We distinguished *B. hilarii* from the co-occurring *B. orbignyanus* Valenciennes, 1850 in the field by its notably smaller, more numerous scales and its yellowish ventral coloration. Our identification was confirmed using the taxonomic key by Ota et al. (2018), which distinguishes *B. hilarii* in having 65–82 lateral line scales vs. 52–63 in *B. orbignyanus*.

Hoplerythrinus unitaeniatus **(Spix & Agassiz, 1829)**

Figures 1D, 5

New records. URUGUAY — Artigas • floodplain lake in "Rincón de Franquía"; –30.2284, –57.6162; 22.X.2024; Winston Albieni leg.; 1 spec., 170 mm SL, ZVC-P 16087.

This species is widely distributed in tropical and subtropical South America (ICMBio 2022b; Fricke et al. 2025). Bertaco et al. (2016) included it in their list of freshwater fishes of Rio Grande do Sul, both in the Uru-

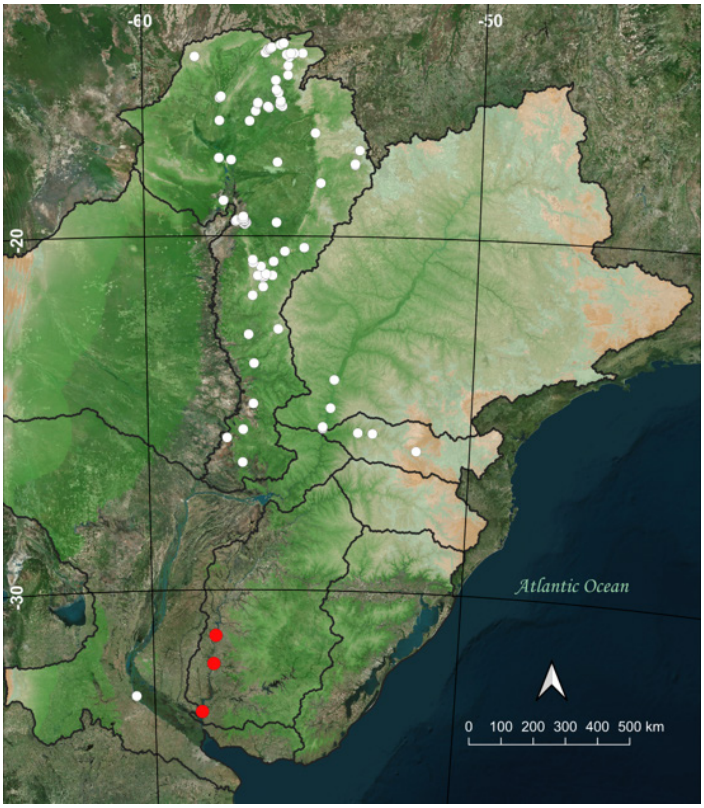

Figure 4. Distribution range for *Brycon hilarii*. Previous records in white and records reported here in red.

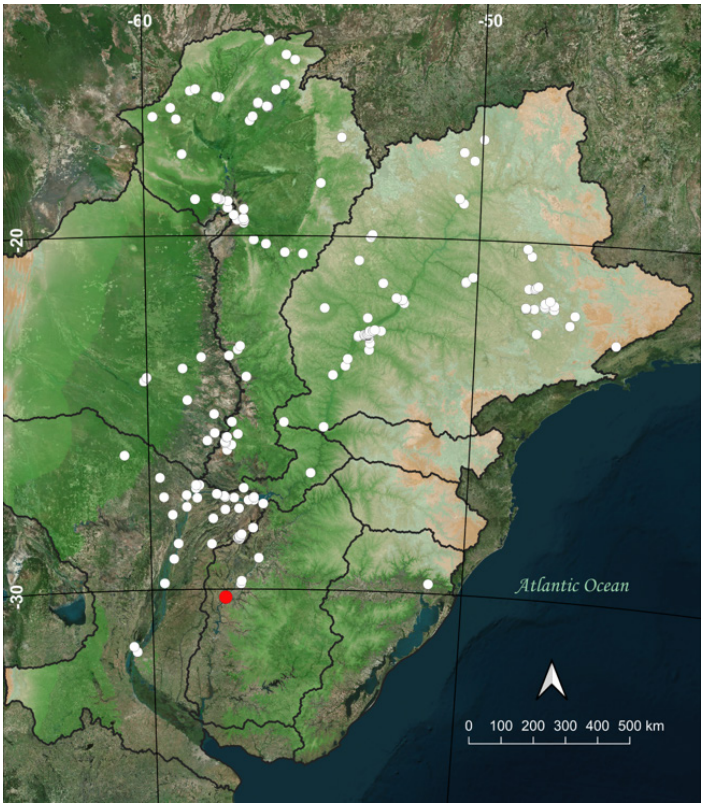

Figure 5. Distribution range for *Hoplerythrinus unitaeniatus*. Previous records in white and records reported here in red.

guay river basin and in the Patos–Merín system. Nión et al. (2002) mentioned it from Uruguay. However, that publication did not cite reference material in collections. In any case, ICMBio (2022b) places it north of the confluence of the Cuareim River with the Uruguay River, which is near where the new record was collected. This species is listed as Least Concern by the IUCN (ICMBio 2022b).

Identification. The specimen was identified by its hypognatha jaw clearly differentiating it from the other Erythrinidae in the region such as *Hoplias* species; it can be further distinguished from *Erythrinus erythrinus* (Bloch & Schneider, 1801), which is present in the lower Paraná River, by the presence of a dark blotch on the operculum and a wide band extending along the flank (Almirón et al. 2015).

***Tetragonopterus argenteus* Cuvier, 1816**
Figures 1E, 6

New records. URUGUAY — Río Negro • mouth of Río Negro River into Uruguay River; –33.4330, –58.4232; Comité Científico CARU; 20.III.2024; 1 spec., 53.5 mm SL, ZVC-P 16083.

This species is widely distributed in South America (Fricke et al. 2025). In La Plata basin it is distributed in the basins of the Paraguay and lower Paraná rivers (Lima 2023a). Nión et al. (2002) listed it from Uruguay but did not cite records in collections. The species has not previously been collected in none of the seasonal fish monitoring programs in the lower Uruguay River since 2005; for this reason, its report from Uruguay by Nión et al. (2002) was considered highly uncertain. This species is classified as Least Concern by the IUCN (Lima 2023a).

Identification. We immediately recognized the collected specimen by its deep, compressed body shape, its two vertical humeral dark bands, and noteworthy dark blotch on the caudal peduncle covering all the base of the caudal fin (Almirón et al. 2015).

***Cynopotamus kincaidi* (Schultz, 1950)**
Figures 1F, 7

New records. URUGUAY — Río Negro • mouth of Río Negro River on Uruguay River; –33.4330, –58.4232; Comité Científico CARU leg.; 20.III.2024; 1 spec., SL not recorded, ZVC-P 15906.

This species is distributed in the basins of the Paraguay and lower Paraná rivers (Fricke et al. 2025; Lima 2023b). The new record represents the first from the Uruguay river basin. This species is classified as Least Concern by the IUCN (Lima 2023b).

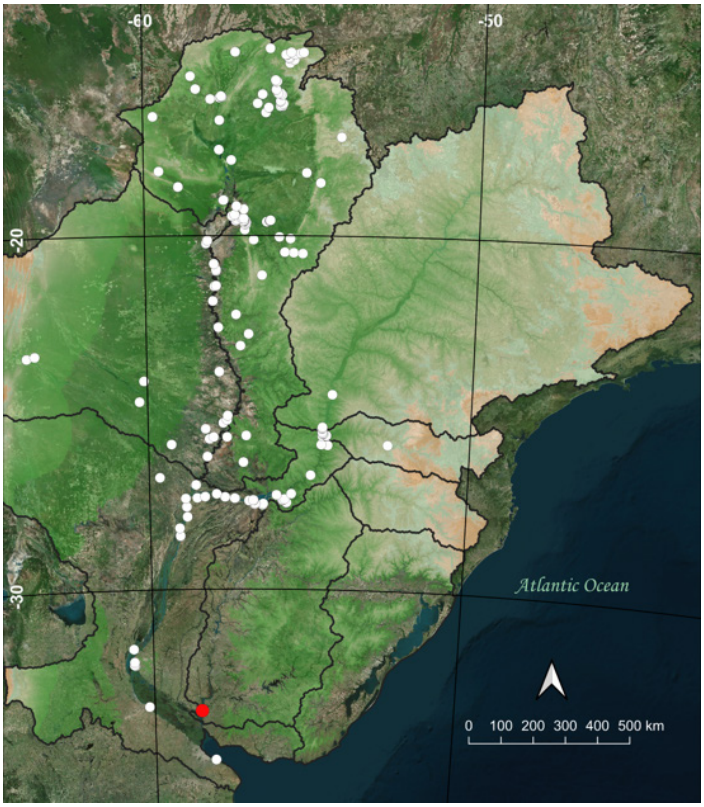

Figure 6. Distribution range for *Tetragonopterus argenteus*. Previous records in white and records reported here in red.

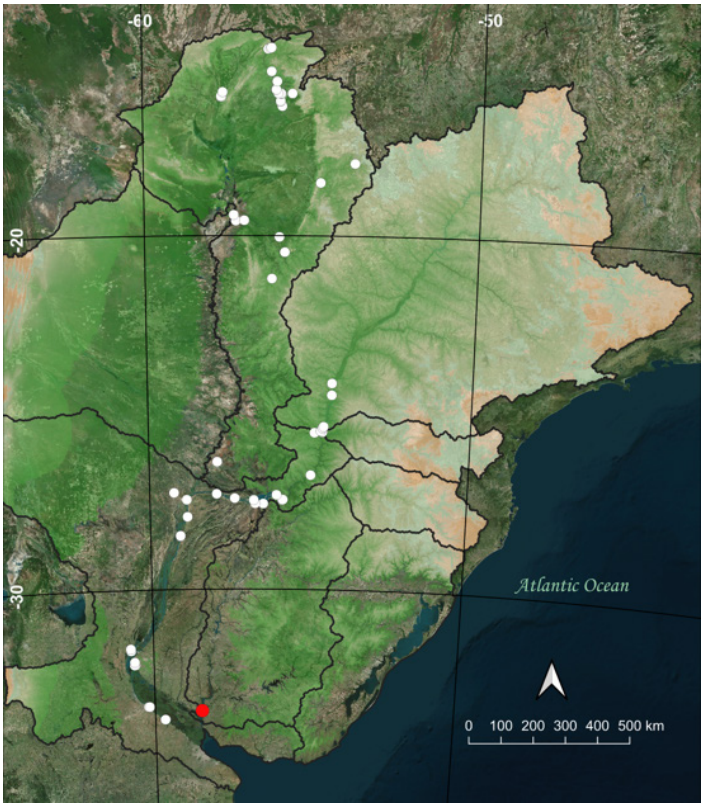

Figure 7. Distribution range for *Cynopotamus kincaidi*. Previous records in white and records reported here in red.

Identification. The only specimen collected was found in the sampling gillnet lacking a great portion of its body; it had been predated. Despite this, the unique combination of the presence of strong canine teeth, a deep body shape, and a prominent black humeral spot allowed us to identify the species. *Cynopotamus kincaidi* differs from the more common *C. argenteus* (Valenciennes 1836) by the presence of the humeral

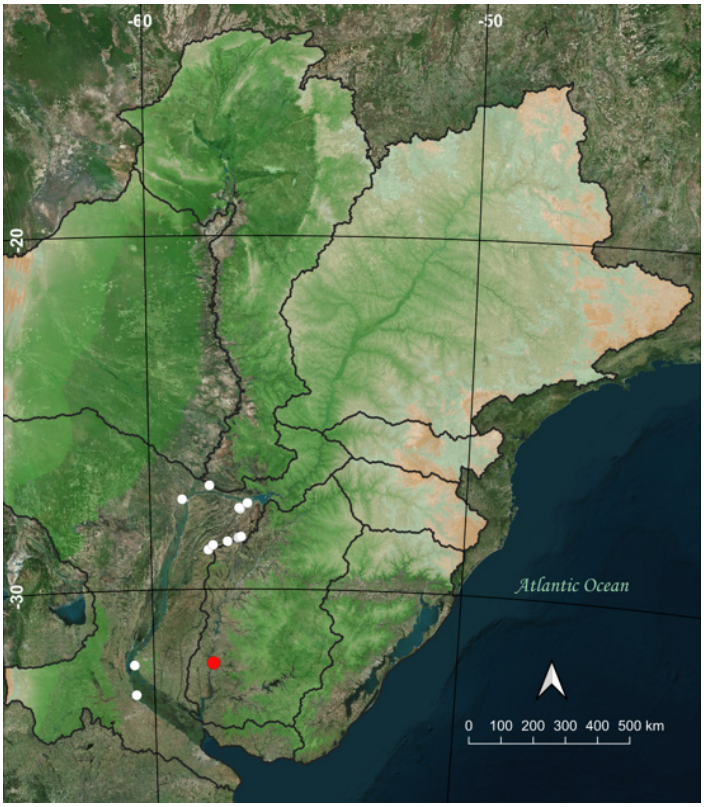

Figure 8. Distribution range for *Cnesterodon raddai*. Previous records in white and records reported here in red

round spot and deep body (Almirón et al. 2015). Furthermore, *C. kincaidi* is clearly distinguished from *Roeboides microlepis* (Reinhardt, 1851), which similar in shape and also has a dark humeral blotch, by its canine teeth; *R. microlepis* presents small teeth in the outer margin of mouth.

***Cnesterodon raddai* Meyer & Etzel, 2001**
Figures 1G, 8

New records. URUGUAY — Paysandú • Paysandú, mouth of Queguay River on Uruguay River; –32.0851, –58.0276; Laboratorio Ecología Fluvial; 20.X.2023; 1 female 17.7 mm SL, 3 males 11.3–19.1 mm SL, ZVC-P 15899 • Paysandú, mouth of Queguay River on Uruguay River; –32.0851, –58.0276; Laboratorio Ecología Fluvial; 27.XI.2023; 1 male, 11 mm SL, ZVC-P 16091; preserved in ethanol 95%.

According to Fricke et al. (2025) this species occurs in the basins of the Paraguay and the lower Paraná rivers. Vera-Alcaraz and Fernando (2023) believed it to be very restricted within these basins. *Cnesterodon raddai* is classified as Least Concern by the IUCN (Vera-Alcaraz and Fernando 2023).

Identification. *Cnesterodon raddai* is characterized among species of *Cnesterodon* Garman, 1895 by: the reduced number of spots (one to four) with dark pigmentation along the flanks; the small adult size (14.6–17.0 mm in males and 17.2–23.2 mm in females); absence of the predorsal line; and three rays on the pelvic fins in males (Lucinda 2005). We identified this species using taxonomic key by Lucinda (2005).

DISCUSSION

Our study adds or confirms the presence of seven species in Uruguay and in the Uruguay river basin. All the records are associated with an extraordinary period of flood pulse which occurred between October of 2023 and January of 2024 following an El Niño climatic event in the region. The Uruguay River lacks a markedly seasonal river discharge, unlike most subtropical rivers, and in the Uruguay River, large flood pulses occur at frequency of 4–6 years (Krepper et al. 2003) during El Niño Southern Oscillation events. This implies that the dispersal of many species from upstream reaches and larger connected systems (such as the Paraná River), as well as the reproduction of those species highly associated to flood pulses, is strongly enhanced during these infrequent events, potentially increasing temporarily, the local biodiversity. Alternatively, some fish species might occur in the river after large floods as a consequence of aquaculture escapes (e.g. Casemiro et al. 2018), but we disregard this because none of the species that we report here are farmed in the region.

It remains to be established if these species have the capacity to form viable populations in the region after flood pulses. If not forming viable populations, these species can only be considered visitors under extreme hydrological events. The establishment of viable populations of these or other newly arrived species in the Uruguay Basin has importance in light of climate change and the expected effects in biotic assemblages when warmer temperature and more frequent and intense flood pulses as predicted.

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ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

No ethical statement is reported.

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Author contributions

Conceptualization: IGB, ML. Data curation: IGB, ML. Formal analysis: IGB, IS, JP, AF, FC, EB, LU, ML. Funding acquisition: EB, FC, AF, WA, LU, IGB, IS. Resources: IGB, ML. Supervision: IG, ML. Writing – original draft: IGB, ML. Writing – review and editing: all authors.

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Data availability

All data that support the findings of this study are available in the main text.

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