

Fishes from the Arroyo Urugua-í (upper Paraná basin, Misiones, Argentina) before impoundment of the dam.

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Abstract

The ichthyofauna of the Arroyo Urugua-í, one of the most important tributaries of the Paraná River in Misiones (Argentina), is analyzed. The aim of this study is to provide information about the species occurring before the construction of the Urugua-í reservoir. A number of reported species are new references for the surveyed area, and the species *Apareiodon piracicabae* is reported for the first time for Argentina.

Introduction

Among changes in nature related to anthropogenic action, those that stand out are the ones associated with the construction of dams and other hydraulic structures. Ecological and economic disturbances in the dynamics of the affected area are common results, which include modifications to the landscape and the function of the involved ecosystems. Reservoirs are usually constructed to furnish hydroelectric power, ensure water supply for irrigation and industry, maintain water levels in navigable channels, favour tourism, as well as to raise local living standards by improving labour offer (López 1992).

Numerous reservoirs were built throughout the Argentine territory, while others are still projects in progress. In the northeastern region, in the provinces of Misiones and Corrientes in particular, the projects of Garaví, Corpus and Yacretá can be mentioned, as well as Urugua-í. This reservoir has been built in Misiones by damming the Arroyo Urugua-í (25°52'30" S and 54°33'30" W), which is, together with the Iguazú river, the most important tributary of the Paraná river in the territory of Misiones. The Urugua-í's course begins at around 700 m above sea level, nearby the locality of Bernardo de Yrigoyen. It runs westward through Misiones and a few kilometers away from the mouth there's a waterfall 28 m high, the so-called Salto del Urugua-í (Fig. 1). The construction of the reservoir was initiated in 1985 at the area of the Salto, with the main purpose of supplying electric power to the region; the completion of the dam will be in the late '90s.

First data on the ichthyofauna of the Arroyo Urugua-í was provided by Ringuélet *et al.* (1967), who reported *Astyanax lineatus* and *Tetragonopterus argenteus* from the lower section of the stream. The species *Glanidium riberoi*, *Hypostomus derbyi* and *H. myersi*, and *Ancistrus piriformis* were later recorded by Gómez y Somay (1985), Gómez *et al.* (1990) and Miquelarena *et al.* (1994), respectively.

The objective of this paper is to provide a list of fish species occurring in the Arroyo Urugua-í before the impounding of the stream, which since has been irrevocably modified by becoming a flooded landscape.

Area of study

From the phytogeographical viewpoint, the area of study is situated in the Paranensean province of the large Amazonian dominion (Cabrera 1976). That province comprises the territories of Misiones and northeastern Corrientes, and extends eastwards throughout eastern Paraguay and southern Brazil. The climate is warm and humid with rainfall year

round; for instance, the annual precipitation at the locality of Bernardo de Yrigoyen is around 1912 mm. The region presents a mountainous terrain with low elevations gradually increasing from Posadas (130 m a.s.l.) up to Bernardo de Yrigoyen and San Antonio (>800 m a.s.l.). Rain forest and savannas are the predominant vegetation, while soils are lateritic, reddish and acid (Figs 8, 10).

According to the ichthyogeographical scheme of Ringuélet (1975), the study area belongs to the Paranoplatensean province (within the Paranensean dominion of the Brazilian subregion). The province largely overlaps with the zoogeographical territory termed as Guiana-Brasilian subregion and Andean dominion.

The following five sampling stations were selected:

- 1- Arroyo Urugua-í at Isla Palacios (Fig. 11).
- 2- Arroyo Urugua-í and Ruta provincial 19, Parque Provincial Islas Malvinas (PPIM).
- 3- Arroyo Uruzú (tributary of the Arroyo Urugua-í) and Ruta provincial 19.
- 4- Arroyo Urugua-í in lands of the "Alto Paraná" Co.
- 5- Arroyo Urugua-í in lands of the "Intercontinental" Co., around 8 km to the North of Ruta provincial 18, near a place known as Paraje Dos Hermanas (Fig. 12).

Material and methods

Fishes were collected during a series of samplings undertaken within the framework of the research programme "Plan de Relevamiento Florístico y Faunístico de la cuenca del Arroyo Urugua-í" (conducted by personnel from the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Ministerio de Ecología y Recursos Naturales de la provincia de Misiones and Electricidad de Misiones). Additional material was examined from the following ichthyological collections: Instituto de Limnología "Dr. Raúl A. Ringuélet" (ILPLA); Museo de La Plata (MLP); Museum of Zoology, University of Michigan, Ann Arbor, Michigan (UMMZ); National Museum of Natural History, Smithsonian Institution (USNM) and Museu de Zoologia da Universidade de São Paulo (MZSP).

Classification follows Nelson (1994). In the synonymy for each species, reference to the original description followed by the corrected name, if it differs, are provided. Measurements were done to the nearest 0.1 mm with a Mitutoyo caliper, and counts using a stereoscopic microscope.

The "Material Examined" section for each species is arranged in the following sequence: number of specimens; sex (F or M) when it could be determined; standard length (SL) in mm, indicating the range and the mean standard length in parentheses if more than one specimen were measured; locality data; collector and date.

Specimens marked with an asterisk (*) show unavailability of material.

Instituto de Limnología "Dr. Raúl A. Ringuélet"* y Departamento Científico Zoología Vertebrados, Museo de La Plata, Argentina**.

* Casilla de Correo 712, 1900 La Plata, Argentina.

** Paseo del Bosque s/n, 1900 La Plata, Argentina.

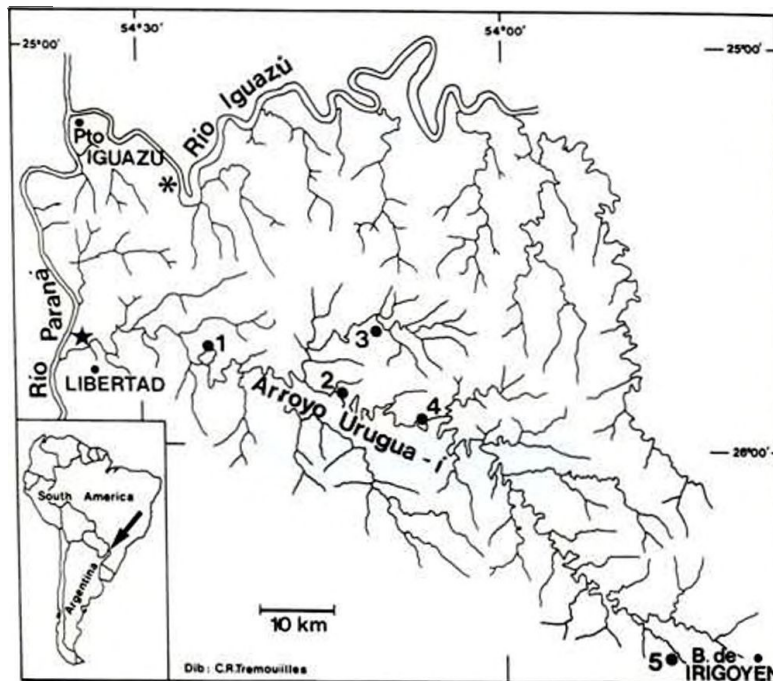


Fig. 1. - In the basin area, the following locations were taken into account: 1- Arroyo Urugua-í at Isla Palacios; 2- Arroyo Urugua-í and Ruta provincial 19, Parque Provincial Islas Malvinas (PPIM); 3- Arroyo Urugua-í (tributary of the Arroyo Urugua-í) and Ruta provincial 19; 4- Arroyo Urugua-í in lands of the "Alto Paraná" Co.; 5- Arroyo Urugua-í in lands of the "Intercontinental" Co., around 8 km to the North of Ruta provincial 18, near a place known as Paraje Dos Hermanas. Asterisk, Cataratas del Iguazú; star, Salto del Urugua-í.
 Dans les limites du bassin, nous avons pris en compte les localisations suivantes : 1 - L'Arroyo Urugua-í à L'île Palacios ; 2 - L'Arroyo Urugua-í et la Route provinciale 19, Parc Provincial des Iles Maldivinas (PPIM) ; 3 - L'Arroyo Urugua-í (affluent de l'Arroyo Urugua-í) et la Route Provinciale 19 ; 4 - L'Arroyo Urugua-í dans les terres de l'"Alto Parana" Co. ; 5 - L'Arroyo Urugua-í dans les terres de l'"Intercontinental" Co., à quelque 8 km vers le Nord de la Route provinciale 18, près du lieu dit Paraje Dos Hermanas. Astérisque : Cataractes de l'Iguazú ; étoile : Saut de l'Urugua-í.

Table 1

Fish fauna from Arroyo Urugua-í. A. From this study, B. Iguazú river, C. Paraná river, D. Uruguay river.

	A	B	C	D
Characidae				
<i>Astyanax abramis</i>	x		x	x
<i>A. b. asuncionensis</i>	x		x	x
<i>A. lineatus</i>	x	x	x	
<i>A. scabripinnis</i>	x		x	
<i>Bryconamericus</i> sp. A	x			
<i>Bryconamericus</i> sp. B	x			
<i>Moenkhausia intermedia</i>	x		x	
<i>Tetragonopterus argenteus</i>	x		x	
<i>Oligosarcus jenynsii</i>	x		x	
<i>O. menezesi</i>	x			
<i>O. paranensis</i>	x		x	
<i>Salminus maxillosus</i>	x		x	x
Anostomidae				
<i>Leporinus friderici</i>	x	x	x	
<i>Schizodon nasutus</i>	x		x	x
Curimatidae				
<i>Prochilodus</i> cf. <i>scrofa</i>	x		x	
Hemiodontidae				
<i>Apareiodon piracicabae</i>	x		x	
Auchenipteridae				
<i>Glanidium riberoi</i>	x	x		
Callichthyidae				
<i>Corydoras carlae</i>	x			
Loricariidae				
<i>Hypostomus derbyi</i>	x	x	x	
<i>H. myersi</i>	x	x	x	
<i>Ancistrus piriformis</i>	x		x	
Cichlidae				
<i>Crenicichla iguassuensis</i>	x			

LIST OF SPECIES

Order Characiformes

Family Characidae

Astyanax abramis (Jenyns, 1842)

Tetragonopterus abramis Jenyns, 1842: 123 (type locality: Paraná river).

Astyanax abramis Fowler, 1906: 439 (new combination).

Material examined: ILPLA 382, 1, 69.4 mm LS, Arroyo Urugua-í, Departamento Iguazú, Misiones, col.: C.R. Guillén, Apr. 1977.

Additional material: *A. abramis* USNM 303130, Mar de Dios, Perú, col.: Ortega *et al.*

Distribution: Ringuélet *et al.* (1967) mentioned this species for the Paraná river, middle Uruguay river and Río de la Plata. López *et al.* (1984) and Butí y Miquelarena (1995) reported it from Salta and the Salí river (Departamento Trancas), Tucumán, respectively.

Remarks: no further locality data are available about the precise stream section where this species was caught.

Astyanax bimaculatus asuncionensis Géry, 1972

A. b. asuncionensis Géry, 1972: 3 (proposed this new combination).

Material examined: ILPLA 383, 2, 44.4-64.8 mm SL (54.6), Arroyo Urugua-í, Departamento Iguazú, Misiones, col.: C.R. Guillén, Apr. 1977.

Distribution: Ringuélet *et al.* (1967) mentioned this species for the Pilcomayo basin in Formosa, Bermejo basin in Salta, Salí basin in Tucumán, Dulce river in Santiago del Estero, Laguna del Iberá in Corrientes, and Paraná basin, southwards up to the Delta zone.

Remarks: no further locality data are available about the precise stream section where this species was caught.

**Astyanax lineatus* (Perugia, 1891)

Tetragonopterus lineatus Perugia, 1891: 644 (type locality: Villa María (Matto Grosso, Brazil); Paraguay river).

A. lineatus Fowler, 1906: 348 (new combination).

Distribution: middle and upper Paraná river; Paraguay river and Bermejo river basins. It was mentioned for the lower Arroyo Urugua-í by **Ringuélet et al.** (1967).

Astyanax scabripinnis (Jenyns, 1842) (Fig. 2)

Tetragonopterus scabripinnis Jenyns, 1842: 125 (type locality: Rio de Janeiro).

A. scabripinnis Eigenmann, 1910: 433 (new combination)

Material examined: ILPLA 377, 12, (6F-6M), 35.2-81.3 mm SL (65.7), Arroyo Urugua-í and Ruta provincial 19 (PPIM), Misiones, col.: **Toresani et al.**, Feb. 1986; ILPLA 378, 1, (1F), 65 mm SL, Arroyo Uruzú and Ruta provincial 19 (PPIM), Misiones, col.: **Toresani et al.** Sep. 1986, ILPLA 379, 2, (1F-1M), 70.8-75.2 mm SL (73), Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **Toresani et al.**, Feb. 1986; ILPLA 380, 3, (3F), 94.7-99.4 mm SL (97.6), Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **Toresani et al.**, Ago. 1986; ILPLA 381, 10, (4F-6M), 50.2-89.0 mm SL (71.3), Arroyo Urugua-í in lands of the "Intercontinental" Co., Misiones, col.: **Toresani et al.**, Nov. 1986.

Additional material: *A. scabripinnis* USNM 229945, Paraguay, col.: **Naylor et al.**; USNM 088310, Argentina, col.: **Hanson**; USNM 313190, Brazil, col.: **Ferraris**; USNM 229946, Paraguay, col.: **Naylor et al.**

Distribution: East and southeastern Brazil and Argentina. **García** (1992) reported this species from Misiones and northeastern Corrientes province.

Remarks: though the specimens we have examined are congruent with the "scabripinnis group" characteristics, they differ from *A. s. paranae*, which was reported by **Eigenmann** (1927) from the Iguazú river drainage in some meristic and morphometric characters. **Agostinho et al.** (1995) reported this species for high-gradient tributaries and creeks of the Alto Paraná.



Fig. 2. - *Astyanax scabripinnis*, ILPLA 381, female, 76 mm SL, Arroyo Urugua-í in lands of the "Intercontinental" Co., around 8 km to the North of Ruta provincial 18, near a place known as Paraje Dos Hermanas.

Astyanax scabripinnis, ILPLA 381, femelle, 76 mm LS, Arroyo Urugua-í dans les terres de l' "Intercontinental" Co., à quelque 8 km vers le Nord de la Route provinciale 18, près du lieu dit Paraje Dos Hermanas.

Bryconamericus sp. A. (Fig. 3)

Material Examined: ILPLA 385, 5, (3F-2M), 40.1-58.2 mm SL (48.9), Arroyo Urugua-í at Isla Palacios, Misiones, col.: **Somay, D.**, Dic. 1983; ILPLA 386, 4, (2F-2M), 35.0-56.9 mm SL (50.1), Arroyo Urugua-í at Isla Palacios, Misiones,

col.: **Toresani et al.**, Feb. 1986; ILPLA 387, 1, (1F), 33.9 mm SL, Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **Toresani et al.**, Feb. 1986; ILPLA 388, 10, (8F-2M), 39.6-62.5 mm SL (51.4), Arroyo Urugua-í in lands of the "Intercontinental" Co., Misiones, col.: **Toresani et al.**, Nov. 1986.

Additional material: *B. iheringi* MZSP 18994, 17, Rio Caí, cercas de 5 1/2 Km, de Sao Sebastiao do Caí, RS, col.: Exp. MZUSP-USNM, 8/12/1979; MZSP 19055, 22, Amoió Chasqueiro, rodavia Pelotas Jaquarao, RS, col.: Exp. MZUSP-USNM, 14/12/1979; MLP 21-II-90-1, 2, (1F-1M), arroyo La Ramadita, camino a Tafi del Valle, Tucumán, col.: **López et al.**, Mar. 1983; ILPLA 294, 4, (2F-2M), Laguna de Lobos, Buenos Aires, col.: **Miquelarena et al.**, Mar. 1986.

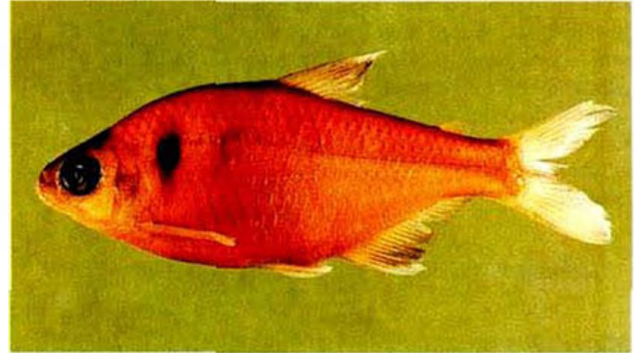


Fig. 3. - *Bryconamericus* sp. A, ILPLA 388, female, 57.7 mm SL, Arroyo Urugua-í in lands of the "Intercontinental" Co., around 8 km to the North of Ruta provincial 18, near a place known as Paraje Dos Hermanas.

Bryconamericus sp. A, ILPLA 388, femelle, 57.7 mm LS, Arroyo Urugua-í dans les terres de l' "Intercontinental" Co., à quelque 8 km vers le Nord de la Route provinciale 18, près du lieu dit Paraje Dos Hermanas.

Remarks: **Eigenmann** (1927) reported *B. iheringi* from the Iguazú river basin. Our specimens differ from that species, among other characters, in having a larger eye diameter.

Bryconamericus sp. B.

Material Examined: ILPLA 389, 7, 32.3-40.9 mm LS (36.7), Arroyo Urugua-í at Isla Palacios, Misiones, col.: **Toresani et al.**, Feb. 1986.

Remarks: it differs from *Bryconamericus* sp. A, among other characters, in having a different pigmentation pattern, which comprises a well defined deep silver lateral band, ending over the middle rays of the caudal fin.

Moenkhausia intermedia Eigenmann, 1908

M. intermedia Eigenmann, 1908: 103 (type locality: Tabatinga, Brazil).

Material Examined: ILPLA 384, 5, 24.6-31.2 mm SL (27.8), Arroyo Urugua-í, Departamento Iguazú, col.: **C.R. Guillén**, Apr. 1977.

Distribution: Amazonia; northwestern and northeastern Argentina; upper and middle Paraná river (see **Menni et al.** 1992).

Remarks: **Agostinho et al.** (1995) reported this species from different types of environment of the Alto Paraná basin.

**Tetragonopterus argenteus* Cuvier, 1817

T. argenteus Cuvier, 1817: 166 (type locality: South America).

Distribution: middle and upper Paraná; Río de la Plata, Pilcomayo and Paraguay basins. It was reported from lower Arroyo Urugua-í by **Ringuélet et al.** (1967).

Oligosarcus jenynsii (Günther, 1864)

Xiphorhamphus jenynsii Günther, 1864: 356 (type locality: lake in Maldonado).

O. jenynsii Menezes, 1969: 16-26 (new combination)

Material examined: ILPLA 395, 2, (2M), 164.2-178.5 mm SL (171.3), Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **Toresani et al.**, Aug. 1986; ILPLA 396, 1, (1F), 184.6 mm SL, Arroyo Urugua-í in lands of the "Intercontinental" Co., Misiones, Nov. 1986, col.: **Toresani et al.**

Distribution: **Ringuet et al.** (1967) mentioned this species for the drainage basins of Taff river in Tucumán, Bermejo river in Salta, Paraná river, Uruguay river, Tercero river in Córdoba, Salado river and lentic water bodies in Buenos Aires also including the Río de la Plata system. **Miquelarena y Menni** (1992) reported it from the endorheic system of the Panaholma-Mina Clavero river in western Córdoba, and **Miquelarena and López** (1995) for the system of Lagunas Encadenadas West in Buenos Aires province.

Oligosarcus menezesi Miquelarena et Protogino, 1996

(Fig. 4)

Material examined: ILPLA 306, 4 (3F-1M), 70.1-83.0 mm SL (76.9), Arroyo Urugua-í at Isla Palacios, col.: **D. Somay**, Dec. 1983; ILPLA 305, 4 (4F), 36.5-101.5 mm SL (62.9), Arroyo Urugua-í and Ruta provincial 19, PPIM, Misiones, col.: **N. Toresani et al.**, Feb. 1986; ILPLA 304, 1 (1F), 138.8 mm SL, Arroyo Urugua-í and Ruta provincial 19, PPIM, Misiones, col.: **N. Toresani et al.**, Sep. 1986; ILPLA 303, 6, (2F-4M), 49.4-125.8 mm SL (105.9), Arroyo Uruzú and Ruta provincial 19, Misiones, col.: **N. Toresani et al.**, Sep. 1986; ILPLA 299, 1 (1F), 88 mm SL, Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **N. Toresani et al.**, Feb. 1986; ILPLA 302, 2, (2F), 58.5-86.0 mm SL (72.2), Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **N. Toresani et al.**, Feb. 1986; ILPLA 301, 2 (1F-1M), 122.1-126.3 mm SL (124.2), Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **N. Toresani et al.**, Ago. 1986; ILPLA 300, 2 (2F), 112.3-126.3 mm SL (119.3), Arroyo Urugua-í in lands of the "Intercontinental" Co., Misiones, col.: **N. Toresani et al.**, Nov. 1986; MZSP 48001, 2 (2F), 94.5-100 mm SL (97.2), Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **N. Toresani et al.**, Aug. 1986; MZSP 48000, 3 (3F), 115.6-131.9 mm SL (124.8), Arroyo Urugua-í in lands of the "Intercontinental" Co., Misiones, col.: **N. Toresani et al.**, Nov. 1986; MZSP 48002, 3 (1F-2M), 115.8-122.2 mm SL (119.9), Arroyo Uruzú and Ruta provincial 19, Misiones, col.: **N. Toresani et al.**, Sep. 1986.



Fig. 4. - *Oligosarcus menezesi*, ILPLA 299, holotype female, 88 mm SL, Arroyo Urugua-í in lands of the "Alto Paraná" Co. *Oligosarcus menezesi*, ILPLA 299, holotype femelle, 88 mm LS, Arroyo Urugua-í dans les terres de l' "Alto Paraná" Co.

Distribution: upper Arroyo Urugua-í basin, Departamento Iguazú in province of Misiones.

Remarks: this new species, is distinguished from all other species of the genus *Oligosarcus* by the combination of characters: lateral line with 40 to 48 pored scales, and ectopterygoid bone with a series of 4 to 10 teeth (see **Miquelarena y Protogino** 1996).

Oligosarcus paranensis Menezes et Géry, 1983

O. paranensis Menezes et Géry, 1983: 572 (type locality: Salesópolis reservoir, Estado de São Paulo, Brazil).

Material examined: ILPLA 390, 1 (1F), 183.8 mm SL, Arroyo Urugua-í and Ruta provincial 19 (PPIM), Misiones, col.: **Toresani et al.**, Feb. 1986; ILPLA 391, 3 (2F-1M), 141.6-209.1 mm SL (178.1), Arroyo Uruzú and Ruta provincial 19 (PPIM), Misiones, col.: **Toresani et al.**, Sep. 1986; ILPLA 392, 1 (1M), 155.4 mm SL, Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **Toresani et al.**, Feb. 1986; ILPLA 393, 4 (2F-2M), 140.8-191.5 mm SL (172.9), Arroyo Urugua-í in lands of the "Alto Paraná" Co., Misiones, col.: **Toresani et al.**, Aug. 1986; ILPLA 394, 3 (2F-1M), 178.2-238.8 mm SL (200.5), Arroyo Urugua-í in lands of the "Intercontinental" Co., Misiones, col.: **Toresani et al.**, Nov. 1986.

Additional material: *O. paranensis* USNM 228081, Arroio Iguacu, State of Paraná, Brazil; *O. longirostris* USNM 228080 Porto Lupion, Rio Iguacu, State of Paraná, Brazil.

Distribution: Alto Paraná basin, in rivers of Brazil and Paraguay upstream from Siete Quedas (**Menezes** 1987).

Remarks: **Azpelicueta et al.** (1985) reported *O. paranensis* from Misiones, Argentina. Later, **Braga** (1994) takes no account of *O. paranensis* among the species of the genus she reviews, and states that the material examined by **Azpelicueta et al.** (op. cit.) corresponds to *O. brevioris*. **Agostinho et al.** (1995) reported *O. paranensis* from the Alto Paraná basin, indicating that it inhabits high-gradient tributaries, streams and reservoirs.

**Salminus maxillosus* Valenciennes, 1840

S. maxillosus Valenciennes in Cuvier et Valenciennes, 1840: 62 (type locality: Amazonia).

Distribution: it is a widespread species distributed throughout the large rivers of the Plata basin.

Remarks: specimens of *S. maxillosus* were observed jumping over the Salto del Urugua-í when moving upstream (**O. García**, pers. com.).

Family Anostomidae

Leporinus friderici (Bloch, 1794)

Salmo friderici Bloch, 1794: 94, t. 378 (type locality: Suriname).

L. friderici Müller et Troschel, 1844: 87 (new combination).

Material Examined: ILPLA 399, 1, 83 mm SL, Arroyo Urugua-í, Departamento Iguazú, Misiones, col.: **C.R. Guillén**, Apr. 1977.

Distribution: Paraná river, Paraguay river, Río de la Plata, and Iguazú river. Amazonia, Guiana and Perú.

Remarks: most authors place *L. acutidens* as a junior synonym of *L. friderici*. However, **Braga** (1993) points out that *L. acutidens* should be considered as a valid species until more comparative data on both nominal species is available. **Agostinho et al.** (1995) indicate that *L. friderici* is a widespread species inhabiting different types of environments of the Alto Paraná basin.

Schizodon nasutus Kner, 1859 (Fig. 5)

S. nasutus Kner, 1859: 164 (type locality: Brazil, Irissanga)

Material Examined: ILPLA 404, 1, 226.6 mm SL, Arroyo Urugua-f at Isla Palacios, col.: **Toresani et al.**, Feb. 1986; ILPLA 403, 7, 24.2-205 mm SL (57.7), Arroyo Urugua-f and Ruta provincial 19, PPIM, col.: **Toresani et al.**, Feb. 1986; ILPLA 405, 1, 238.5 mm SL, Arroyo Uruzú and Ruta provincial 19, col.: **Toresani et al.**, Sep. 1986; ILPLA 397, 1, 178.5 mm SL, Arroyo Urugua-f in lands of the "Alto Paraná" Co., col.: **Toresani et al.**, Feb. 1986.

Additional Material: *Laemolyta taeniata*, UMMZ 204218, 29, 47-104 mm SL, Rio Itenez opposite Costa Marques, Brazil; Madeira drainage, col.: **R. Bailey and R. Ramos**, 30-08-64; UMMZ 204335, 1, 112 mm SL, Mamore-Madeira Rio Itenez opp. Costa Marques, Brazil, col.: **R. Bailey and R. Ramos**, 01-09-64; UMMZ 204499, 4, 71-80 mm SL, Pond in arroyo below lower campo of Pampa de Meio, ca 12 Km SE Costa Marques, Brazil, col.: **R. Bailey and R. Ramos**, 21-09-64.



Fig. 5. - *Schizodon nasutus*, ILPLA 403, 31.2 mm SL, Arroyo Urugua-f and Ruta provincial 19, PPIM.
Schizodon nasutus, ILPLA 403, 31, 2 mm LS, Arroyo Urugua-f et Route provinciale 19, PPIM.

Distribution: **Pozzi** (1945) mentioned this species for the Pilcomayo, Paraná and Uruguay rivers.

Remarks: further information about this species is provided by **Miquelarena y Menni** (1983). **Agostinho et al.** (1995) reported it in tributaries and streams of the Alto Paraná basin.

Family Curimatidae

**Prochilodus cf. scrofa* Steindachner, 1882

P. scrofa Steindachner, 1882: 129 (type locality: Rio de Janeiro, probably Paranahyba river).

Distribution: large rivers of the Paraná-Plata basin (see **López et al.** 1993).

Remarks: specimens of *P. cf. scrofa* were observed jumping over the Salto del Urugua-f when moving upstream (**O. García**, pers. com.).

Family Hemiodontidae

Apareiodon piracicabae (Eigenmann, 1907)
(Fig. 6, 7 a y b)

Parodon piracicabae Eigenmann, in **Eigenmann and Ogle** 1907: 6 (type locality: Piracicaba).

A. piracicabae Eigenmann, 1916: 71-72 (review).

Material Examined: ILPLA 400, 3, 28.5-57.0 mm SL (39.6), Arroyo Urugua-f at Isla Palacios, Misiones, col.: **Toresani et al.**, Feb. 1986; ILPLA 398 ,2, 25.5-29.3 mm SL (27.4), Arroyo Urugua-f and Ruta provincial 19, PPIM, col.: **Toresani et al.**, Feb. 1986; ILPLA 401, 2, 94.5-108.0 mm SL (103.0), Arroyo Urugua-f in lands of the "Alto Paraná" Co., Misiones, col.: **Toresani et al.**, Feb. 1986; ILPLA 402, 2, 85.7-109.0 mm SL (98.3), Arroyo Urugua-f in lands of the "Intercontinental" Co., Misiones, col.: **Toresani et al.**, Nov. 1986.

Additional Material: *A. piracicabae* MZSP 43962, 4, Foz do rio Bandeira, rio Piquiri, rio Paraná, municipio de Campina da Lagoa, na divisa de Guaraniacu e Campo Bonito, PR, col.: **Nupelia**, 19-07-88; MZSP 43965, 1, Foz do rio Bandeira, rio Piquiri, rio Paraná, municipio de Campina da Lagoa, na divisa de Guaraniacu e Campo Bonito, PR, col.: **Nupelia**, 10-12-89; MZSP 43963, 2, Foz do rio Bandeira, rio Piquiri, rio Paraná, municipio de Campina da Lagoa, na divisa de Guaraniacu e Campo Bonito, PR, col.: **Nupelia**, 30-10-89; MZSP 43943 Foz do rio Cantu, rio Piquiri, rio Paraná, municipio de Campina da Lagoa, na divisa de Altamira do Parana e Guaraniacu, PR, col.: **Nupelia**, 21-02-88.



Fig. 6. - *Apareiodon piracicabae*, ILPLA 402, 99.3 mm SL.. Arroyo Urugua-f in lands of the "Intercontinental" Co., around 8 km to the North of Ruta provincial 18, near a place known as Paraje Dos Hermanas.

Apareiodon piracicabae, ILPLA 402, 99,3 mm LS, Arroyo Urugua-f dans les terres de l' "Intercontinental" Co., à quelque 8 km vers le Nord de la Route provinciale 18, près du lieu dit Paraje Dos Hermanas.

Distribution: upper Paraná basin in Brazil and Argentina.

Remarks: *A. piracicabae* is hereby reported for the first time from Argentina, being the its type locality Piracicaba, São Paulo, Brazil. According to **Garavello** (1977) this species is closely related with *A. vittatus*. In the specimens examined, though the total number of scales overlaps that of both *A. piracicabae* and *A. vittatus*, and the extent of the pigmented lateral bands varies according to the length of the specimens, other characters such as the number of preanal scales (24-28) and length of the anal-fin first ray (6.8-8.1), are congruent with *A. piracicabae*. Whereas the mandibular length in head ratio (6.1-6.6) is congruent with *A. vittatus*. **Starnes and Schindler** (1993), when considering the species of the genus, comment that *A. vittatus* would probably be a synonym of *A. piracicabae*.



Fig. 7. - *Apareiodon piracicabae*, a) ILPLA 400, 56.3 mm SL; b) ILPLA 400, 35.9 mm SL, Arroyo Urugua-f at Isla Palacios.
Apareiodon piracicabae, a) ILPLA 400, 56,3 mm LS ; b) ILPLA 400, 35,9 mm SL, Arroyo Urugua-f à l' Ile Palacios.

Order Siluriformes

Family Auchenipteridae

**Glanidium ribeiroi* Haseman, 1911

Glanidium ribeiroi Haseman, 1911: 381, fig. 78 (type locality: Porto Uniao da Victoria (Paraná, Brazil).

Distribution: Gómez y Somay (1985) reported this species from several localities of the Iguazú river basin and the Arroyo Urugua-í.

Family Callichthyidae

**Corydoras carlae* Nijssen et Isbrücker, 1983

Corydoras carlae Nijssen et Isbrücker, 1983 (type locality: small stream, tributary of the Iguazú river in the Paraná basin, route 101, between Puerto Iguazú and Bernardo de Irigoyen, 50 km from Puerto Iguazú).

Distribution: it coincides with the type locality mentioned above.

Family Loricariidae

Hypostomus derbyi (Haseman, 1911)

Plecostomus derbyi Haseman, 1911: 384-385 (type locality: Porto União da Victoria, Brazil).

H. derbyi: Isbrücker, 1980: 23 (new combination).

Material Examined: MLP 19-X-87-5, 1, 242.0 mm SL, Arroyo Urugua-í at Isla Palacios, Misiones, col.: S. Gómez et al., Feb. 1986; MLP 19-X-87-8, 2, 187.0-216.0 mm SL (201.5), Arroyo Uruzú and Ruta provincial 19, Misiones, col.: S. Gómez et al., Sep. 1986.

Distribution: upper Iguazú and upper Paraná basins.

Hypostomus myersi (Gosline, 1948)

Plecostomus myersi Gosline, 1948: 116-117 (type locality: Porto União da Victoria, Brazil).

H. myersi Isbrücker, 1980: 28 (new combination).



Fig. 8. - Rain forest.
Forêt hygrophile.

Material Examined: MLP 19-X-87-1, 1, 143.0 mm SL, Arroyo Urugua-í and Ruta provincial 19, Misiones, col.: N. Toresani et al., Feb. 1986; MLP 19-X-87-3, 3, 127.0-182.0 mm SL (153.3), Arroyo Urugua-í and Ruta provincial 19, Misiones, col.: N. Toresani et al., Sep. 1986.

Distribution: upper Iguazú and upper Paraná basins.

Remarks: when considering the relationships between *H. myersi* and *H. derbyi*, Gómez et al. (1990) point out that they share similar habitats and markedly nocturnal habits. Adults usually inhabit deep-water sites (2 to 3 m in depth), with muddy bottom and weak-water flow. Juvenile stages were caught in shallow habitats (20 to 30 cm in depth), with sandy bottom and attached macrophytes (i.e. *Potamogeton* sp.). Agostinho et al. (1995) mention this species for creek and stream of the Alto Paraná basin (5: Fig. 1).

Ancistrus piriformis Muller, 1989 (Fig. 9)

A. piriformis Muller, 1989: 885-904 (type locality: rio Acaray, Paraguay).

Material Examined: ILPLA 273, 4, 60.4-92.8 mm SL (78.9), Arroyo Urugua-í, Misiones, col.: O. García, Feb. 1983.

Distribution: Miquelarena et al. (1994) make comments on the species distribution and provide information on meristic data, pigmentation and anatomical features.



Fig. 9. - *Ancistrus piriformis*, ILPLA 273, male, 103.8 mm SL, Arroyo Urugua-í
Ancistrus piriformis, ILPLA 273, male, 103.8 mm LS, Arroyo Urugua-í.



Fig. 10. - Lateritic soils.
Sols latéritiques.



Fig. 11. - Arroyo Urugua-í at Isla Palacios.
L'Arroyo Urugua-í à l'Île Palacios.

Order Perciformes
Family Cichlidae

**Crenicichla iguassuensis* Haseman, 1911

C. iguassuensis Haseman, 1911: 352. pl. 61 (type locality: Porto União da Victoria, Iguazú river).

Remarks: this species has been previously reported with some doubts from the Arroyo Urugua-í by Casciotta (1987).

Discussion

The fish fauna of the Arroyo Urugua-í is composed of 22 Characiformes, Siluriformes and Perciformes species, which belong to 8 families and 15 genera. This composition mirrors a closer ichthyofaunistic relation with the Paraná river than with the Uruguay and Iguazú rivers (Table I). If we consider those groups of common occurrence in the Paraná basin but which we have not been able to find in the Urugua-í, it is worth noting the absence of certain taxa (i.e. Myliobatiformes, Clupeiformes, Pleuronectiformes), as well as the most frequent Characiformes and Siluriformes of Misiones watershed (i.e. species of the genera *Piaractus*, *Brycon*, *Serrasalmus*, *Pseudoplatystoma*, *Paulicea*, and the large Doradidae "armados"). It seems likely that certain features of this stream and the presence of the Salto del Urugua-í have represented a barrier to the upstream movement of those fish species, with the exception of some migratory species of the genera *Salminus* and *Prochilodus*. In this regard, the role that waterfalls play in determining species isolation is commented on by among others, Weber (1985), Menezes (1988), Muller (1989), and Miquelarena y Protogino (1996). Nevertheless, the occurrence of shared species with other zones of the basin, even with non-adjacent zones reflects the current degree of isolation which has historically affected the species of the Arroyo Urugua-í, as indicated by the presence of the other Characiformes and Siluriformes (López y Miquelarena 1991; Miquelarena *et al.* 1994).

Acknowledgments

We are grateful to Sergio Gómez for the donation of specimens and photographs of the environments and to Heraldo Britski (MZSP), William Fink (UMMZ) and Richard Vari (USNM) for assistance and loan of material.



Fig. 12. - Arroyo Urugua-í in lands of the "Intercontinental" Co.
L'Arroyo Urugua-í dans les terres de l' "Intercontinental" Co.

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RÉSUMÉ

Poissons de l'Arroyo Uruguay (Haut Bassin du Parana, Misiones, Argentina) avant la mise en eau du barrage.

Parmi les changements infligés à la nature par l'action de l'Homme, ceux qui émergent sont liés à la construction de barrages et autres structures hydrauliques. Des troubles écologiques et économiques dans la dynamique de la zone affectée en sont les effets ordinaires, comportant des modifications du paysage et du rôle des écosystèmes. Les réservoirs construits d'ordinaire pour fournir l'énergie hydro-électrique, assurer l'approvisionnement en eau pour l'irrigation et l'industrie, maintenir le niveau des voies navigables, favoriser le tourisme et aussi élever le niveau de vie des populations locales en favorisant l'embauche. De nombreux réservoirs ont été construits en Argentine, tandis que d'autres sont encore à l'état de projets. Celui qui nous concerne a été construit dans les Misiones en barrant l'Arroyo Uruguay qui est, avec l'Iguazu, l'affluent le plus important du Parana dans le territoire des Misiones. L'Uruguay prend sa source, vers 700 m d'altitude, près de Bernardo de Yrigoyen. Il coule vers l'Ouest et, à quelques kilomètres de son confluent avec le Parana, il subit une chute de 28 m dite "Saut de l'Uruguay". La construction du réservoir débuta en 1985, dans la zone du Saut pour alimenter la région en électricité et le barrage sera terminé à la fin des années 90.

L'ichtyofaune de l'Arroyo Uruguay est inventoriée, l'objet de cette étude étant de fournir des informations sur les espèces présentes avant la construction du réservoir de l'Uruguay. Un bon nombre des espèces reconnues sont nouvelles pour la zone concernée et l'une d'elles, *Apareiodon pracicabae* est signalée d'Argentine pour la première fois.

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