

**Semblanzas Ictiológicas**  
**Pablo Augusto Scarabotti**



**Hugo L. López**  
**y**  
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# **Semblanzas Ictiológicas**

## **Pablo Augusto Scarabotti**



Muestreo con copo de mano  
Lagunas de la Isla Los Sapos, Rio Salado, Santo Tomé, Santa Fe, abril de 2004

**Hugo L. López y Justina Ponte Gómez**

**ProBiota**  
División Zoología Vertebrados  
Museo de La Plata  
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**Febrero, 2014**

Imagen de Tapa

Identificando mojarras en un laboratorio improvisado en la biblioteca del viejo edificio del Instituto Nacional de Limnología, Santo Tomé, Santa Fe, abril de 2007

*El tiempo acaso no exista. Es posible que no pase y sólo pasemos nosotros.*

**Tulio Carella**

*Cinco minutos bastan para soñar toda una vida, así de relativo es el tiempo.*

**Mario Benedetti**

## **Semblanzas Ictiológicas**

A través de esta serie intentaremos conocer diferentes facetas personales de los integrantes de nuestra “comunidad”.

El cuestionario, además de su principal objetivo, con sus respuestas quizás nos ayude a encontrar entre nosotros puntos en común que vayan más allá de nuestros temas de trabajo y sea un aporte a futuros estudios históricos.

Esperamos que esta iniciativa pueda ser otro nexo entre los ictiólogos de la región, ya que consideramos que el resultado general trascendería nuestras fronteras.

***Hugo L. López***

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## Cuestionario

- **Un libro:** *El Nombre de la Rosa* de Umberto Eco
- **Una película:** *Medianoche en París* de Woody Allen
- **Un CD:** *Tríptico 2* de Silvio.
- **Un artista:** Silvio Rodríguez
- **Un deporte:** básquet
- **Un color:** el verde de un bosque
- **Una comida:** canelones con tuco y salsa blanca (en invierno...)
- **Un animal:** perro
- **Una palabra:** esmero
- **Un número:** 2
- **Una imagen:** amanecer en el río Paraná con la bruma sobre el agua
- **Un lugar:** mi pueblo
- **Una estación del año:** verano
- **Un nombre:** los de mis hijos
- **Un hombre:** mi padre
- **Una mujer:** Silvana, mi esposa
- **Un personaje de ficción:** Inodoro Pereyra
- **Un superhéroe:** ninguno, sólo los de verdad



De vacaciones en las sierras de Mina Clavero, Córdoba, enero de 2013  
De izquierda a derecha: Pablo Scarabotti, su esposa Silvana y sus hijos María Paula, Lucas y Juliana



Donde todo empezó

Certámen Nacional de la Olimpiada Argentina de Biología, Río Cuarto, Córdoba, septiembre de 1997

Esudiantes de 4º año del Colegio Mariano Moreno, San Genaro, Santa Fe

De izquierda a derecha: Pablo Scarabotti, Natalia Pedraza (actual Médica), Emiliano Salvucci (actual Microbiólogo investigador del CONICET) e integrantes del equipo de San Jorge, Santa Fe

## Dermal lip protuberances associated with aquatic surface respiration in juveniles of the piscivorous characid *Salminus brasiliensis* (Actinopterygii: Characidae)

Pablo A. Scarabotti<sup>1,2</sup>, M. Julieta Parma<sup>1,3</sup>, Javier A. López<sup>1,2</sup> and Romina Ghirardi<sup>1,4</sup>

Some South American freshwater fishes can improve their capability of aquatic surface respiration (ASR) by developing dermal lip protuberances in the lower jaw. This adaptation was thought to be limited to omnivorous or herbivorous fishes. The present work provides the first evidence that juveniles of a piscivorous characid, *Salminus brasiliensis*, develop dermal lip protuberances during periods of hypoxia in floodplain ponds of the Salado River, in Argentina. The protuberance of *S. brasiliensis* involves dermal portions of both jaws exhibiting lateral lobes on the sides of the mouth arranged in the vertical plane. Water dissolved oxygen concentrations less than or equal to 1.05 mg l<sup>-1</sup> were associated with a remarkable increase in lip protuberance. The lateral lobes of the protuberance in this species may limit the access of water to the anterior portion of the mouth which is positioned nearer to the oxygenated surface water during ASR. Finally, ASR, complemented with the development of dermal lip protuberances, can be considered a valuable strategy to survive in hypoxic environments, even for carnivorous fishes with elevated oxygen requirements.

Alguns peixes de água doce da América do Sul podem melhorar o desempenho da respiração aquática superficial (RAS) desenvolvendo protuberâncias dérmicas labiais na mandíbula. Considerava-se que essa adaptação era limitada aos peixes onívoros ou herbívoros. Este trabalho apresenta os primeiros indícios de que juvenis de um caracídeo piscívoro, *Salminus brasiliensis*, desenvolvem protuberâncias dérmicas labiais durante períodos de hipoxia em lagoas de várzea do rio Salado, Argentina. As protuberâncias de *S. brasiliensis* envolvem porções dérmicas das duas mandíbulas e exibem lóbulos laterais ao lado da boca dispostas no plano vertical. Concentrações de oxigênio dissolvido na água, inferiores ou iguais a 1,05 mg l<sup>-1</sup>, foram associadas a um aumento notável no desenvolvimento das protuberâncias labiais. Nesta espécie os lóbulos laterais da protuberância podem limitar o acesso de água à porção anterior da boca, que está posicionada mais perto da superfície da água oxigenada durante a RAS. Finalmente, a RAS, complementada com o desenvolvimento de protuberâncias dérmicas labiais, pode ser considerada uma valiosa estratégia para a sobrevivência em ambientes hipóxicos, mesmo para peixes carnívoros com elevada demanda de oxigênio.

**Key words:** Hypoxia, Morphological adaptation, Lip extension, Floodplain pond, Argentina.

### Introduction

Aquatic surface respiration (ASR) is a widespread behavioral mechanism in freshwater fishes that allows the utilization of the relatively oxygen-rich surface water in contact with the atmosphere during environmental hypoxia (Kramer & Mehegan, 1981; Kramer & McClure, 1982; Soares *et al.*, 2006). Some South American freshwater fishes improve

ASR performance by developing a swelling in the lower lip (Braun & Junk, 1982; Saint-Paul & Soares, 1988; Winemiller, 1989; Val & Almeida-Val, 1995). The lip swelling does not have a gas exchange function, but it has been hypothesized that it prevents the mixture of the surface water with the hypoxic water just beneath (Val *et al.*, 1998) and by changing the mouth opening to a more up-turned position, a better design to perform ASR (see Lewis, 1970).

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# Flood pulse and the dynamics of fish assemblage structure from neotropical floodplain lakes

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**Abstract** – The dynamics of fish assemblages from seven floodplain lakes of Salado River (Argentina) was monthly analysed during two contrasting hydrological seasons. Partial canonical correspondence analysis indicated that assemblage structure was predictably linked to environmental characteristics that varied along temporal and spatial scales. Species distributed differentially along an environmental gradient of temperature, hydrometric level, conductivity, macrophyte cover and transparency in relation to their sensory capabilities (following piscivory-transparency-morphometry model) and life history strategies. During high water season, assemblages were associated with temperature and hydrometric level, factors which varied mainly across temporal scales and exhibit a regional range of action. During low waters, assemblage structure correlated with macrophyte cover and transparency, factors that varied fundamentally on spatial scales and have local impact. These results indicate that the determinism of fish assemblages does not vary substantially between hydrometric periods, although the environmental variables affecting fish assemblages and their scale of action are clearly different.

**Key words:** Paraná River Basin; determinism; Argentina; hydrological connectivity; lowland rivers

## Introduction

Current approaches in community ecology aim to explain the patterns of distribution and abundance of species, linking processes that occur at different spatio-temporal scales (Ricklefs & Schluter 1993; Leibold et al. 2004). Proposed models differ in the relative importance conferred to site characteristics, species interactions and stochastic phenomena in the determination of the structure of local assemblages. Neutral perspectives argue that assemblage composition is largely sustained by stochastic processes (Bell 2000; Hubbell 2001) whereas niche theories (Tilman 1982; Chase & Leibold 2003) assume that local abiotic environmental characteristic and species interactions strongly determine the species composition. In large floodplain rivers, the adjustment of communities to each kind of model can vary with seasonal water-

level fluctuation (Winemiller 1996; Arrington et al. 2005; Arrington & Winemiller 2006). The high interconnection among habitats during high water season offers an opportunity to random reshuffling of fish and may promote stochastic processes on community structure and composition. As water level diminishes during dry season, floodplain lakes and channels become isolated and fish densities increases. Strong biotic interactions such as competition and predation (Bonetto et al. 1969; Zaret & Rand 1971; Rodríguez & Lewis 1994) and physiologic stress (Winemiller et al. 2000) can shape fish assemblages on deterministic trajectories depending on the geomorphic characteristics of the habitats (Lewis et al. 2000). Although generally accepted, the hypothesis that stochastic and deterministic processes vary seasonally in floodplain lakes has seldom been evaluated (Arrington & Winemiller 2006).

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# Morphological plasticity associated with environmental hypoxia in characiform fishes from neotropical floodplain lakes

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**Abstract** The ability to develop reversible dermal extensions on the lower jaw in some South American characiform fishes has been proposed as a way to optimize the performance of aquatic surface respiration (ASR) during hypoxic conditions. These structures are formed by edema of the hypodermal tissues and can develop in a large proportion of individuals inhabiting a lake within a few hours following daily changes in dissolved oxygen. Our study report the development of dermal lip protuberances in eleven species of characiform fishes associated with periods of strong environmental hypoxia in floodplain lakes of Salado River, Argentina. Protuberances occurred in different basic forms in fishes with divergent head morphology (genera *Astyanax*, *Ctenobrycon*, *Aphyocharax*, *Brycon*, *Mylossoma*, *Tri-*

*portheus*, *Oligosarcus* and *Acestrorhynchus*). The discovery of dermal projections on the anterior border of maxillary bone extends the known range of structures affected by lip protuberances. Dermal structures began to develop simultaneously in both jaws below dissolved oxygen (DO) concentrations of 1.20–1.75 mg l<sup>-1</sup> and rose in a steep manner as oxygen level decreased. The degree of morphological plasticity differed among traits and species. The shape of response of morphology to DO was similar to that previously reported on ASR, providing additional evidence about the functional link between these traits. Our results suggests that dermal lip protuberances are widely spread among characiform fishes, affecting several mouth structures. The different types of protuberances would make up for the limitations imposed by body size and mouth shape and position on the performance of ASR in fishes with divergent morphology.

**Keywords** Aquatic surface respiration · Dissolved oxygen · Dermal lip protuberances · Paraná River Basin

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## Introduction

Floodplain lakes of large tropical and subtropical rivers experience wide environmental fluctuations driven by the recurrent seasonal increase in water level, known as flood pulse (Junk et al. 1989; Junk 1997; Welcomme 2001). In these environments, dissolved oxygen (DO) shows strong spatial and temporal variation, from supersaturation to complete



De campaña con la Dirección de Pesca en la laguna La Cierva, Cayastá, santa Fe, abril de 2007  
De izquierda a derecha: Pablo Scarabotti, Alicia Trógolo y Gustavo Picotti



A cerrar el cerco volante  
Muestreo con red de arrastre sobre un arroyo del Paraná, noviembre de 2013  
Pablo Scarabotti con la red y Marcelo Piacenza, técnico del INALI, en el bote

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*(Programa para el estudio y uso sustentable de la biota austral)*

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