

A review of the South American cichlid genus *Cichla*, with descriptions of nine new species (Teleostei: Cichlidae)

Sven O. Kullander* and Efrem J. G. Ferreira**

Cichla, with the junior synonym *Acharnes*, is widely distributed in the Amazon, Tocantins, and Orinoco river basins, and in the smaller rivers draining the Guianas to the Atlantic Ocean. Within South America transplantations are recorded from the Paraná and Paraguay river drainages in Paraguay and Brazil, and the Paraíba do Sul and Paraguaçu rivers in Brazil. The genus comprises 15 species recognized by external characters of which colour pattern and meristics are most significant.

In six species juveniles possess three dark blotches on the side and a dark band connecting the posterior blotch to the dark blotch at the caudal-fin base: *Cichla ocellaris* is known from the Guianas, including the Marowijne, Suriname, Corantijn, Demerara, and Essequibo river drainages, and also the upper Rio Branco in Brazil. *Cichla orinocensis* is known from the Negro and Orinoco river drainages in Brazil, Colombia, and Venezuela. *Cichla monoculus* is widespread in the floodplains of the Amazon basin, in Colombia, Peru, and Brazil, and also collected from rivers of Amapá in Brazil, and the lower Oyapock River on the border between Brazil and French Guiana. *Cichla nigromaculata* is known from the upper Rio Orinoco in Venezuela and, tentatively, the middle Rio Negro in Brazil. *Cichla kelberi*, new species, is restricted to the Tocantins river basin, but also found transplanted in the Paraná and Paraíba do Sul river drainages and reported from the Nordeste region of Brazil. *Cichla pleiozona*, new species, occurs in the Madre de Dios, Beni, and Guaporé river drainages in Bolivia and Brazil, and in the Rio Jamari in Brazil. A lectotype is fixed for *Cichla toucoumarai* which is a synonym of *Cichla monoculus*.

Juveniles and young of the remaining nine species, in addition to the three midlateral blotches, possess a dark horizontal band extending from the head to the dark blotch at the caudal-fin base: *Cichla mirianae*, new species, is restricted to the upper Tapajós river drainage, in the Juruena and Teles Pires rivers, and the upper Xingu river drainage in Brazil. *Cichla melaniae*, new species, is restricted to the lower Xingu river drainage in Brazil. *Cichla piquiti*, new species, is restricted to the Tocantins river basin, but transplanted in the Paraná river basin in Brazil and Paraguay. *Cichla thyrorus*, new species, occurs in the Rio Trombetas in Brazil, upstream from the Cachoeira Porteira. *Cichla jariina*, new species, occurs in the Rio Jari in Brazil, where it is so far recorded only from the region of the Santo Antonio rapids. *Cichla pinima*, new species, occurs in the lower parts of southern tributaries of the Rio Amazonas in Brazil (Tapajós, Curuá-Una, Xingu), and the lower Tocantins and Capim rivers. Tentatively identified specimens are recorded from the Amapá, Araguari, and Canumã rivers in Brazil. *Cichla pinima* occurs translocated in the Rio Paraguaçu in southeastern Brazil, and is reported as translocated from the northeast of Brazil. *Cichla vazzoleri*, new species, occurs in the Uatumã and lower Trombetas rivers in Brazil. *Cichla temensis* is known from the Negro and Orinoco river drainages in Brazil, Colombia, and Venezuela. It is also recorded from blackwater rivers along the Rio Solimões-Amazonas in Brazil (Tefé, Rio Puraquequara, Rio Uatumã, and Silves). *Cichla intermedia* is restricted to the Casiquiare and Orinoco river drainages in Venezuela.

* Department of Vertebrate Zoology, Swedish Museum of Natural History, POB 50007, SE-104 05 Stockholm, Sweden. E-mail: sven.kullander@nrm.se

** Centro de Pesquisas de Biologia Acuática, INPA, CP 478, 69083-000 Manaus, AM, Brazil.
E-mail: efrem@inpa.gov.br

A phylogenetic analysis suggests that *C. intermedia*, *C. piquiti*, and *C. melaniae* are successive basal species, whereas an unresolved group composed of *C. jariina*, *C. pinima*, *C. temensis*, *C. thyrorus*, and *C. vazzoleri* is the sister group of (*C. mirianae*,(*C. orinocensis*,(*C. ocellaris*, *C. nigromaculata*),(*C. monoculus*, *C. kelberi*, *C. pleiozona*))).

Introduction

Species of the genus *Cichla* are among the major food and game fishes in South America. They are known locally by the collective names tucunaré in most of the Amazon region, pavón in Venezuela, toekoenali in Suriname, and lukanani in Guyana (Kullander, 2003).

Cichla has been the subject of several recent reviews dealing with phylogenetic position (Stiassny, 1982, 1987; Kullander, 1986, 1998), life history (Zaret, 1980), and particular species (Machado, 1971, 1973; Kullander, 1986; Kullander & Nijsen, 1989). There are surprisingly few studies on the ecology and behaviour of *Cichla*. Lowe-McConnell (1969) reported on field observations of *C. ocellaris* in Guyana, and Winemiller (2001) summarised ecological studies on Venezuelan species, which are probably representative for the genus.

Fifteen nominal species are referable to *Cichla* (Table 1). The majority were described in the period 1821-1855 and frequently based on field observations and drawings. Revisions by Günther (1862), Pellegrin (1904), and Regan (1906) distinguished principally only the two species *C. temensis* and *C. ocellaris* with varying synonym lists. Günther (1862) also listed *C. conibos* and *C. multifasciata*, and Regan recognized *C. multifasciata* based on the drawings and sketchy information from Castelnau (1855). Castelnau's names, however, more likely refer to unrecognizable species of *Crenicichla* (Kullander, 1986). Most literature before Machado's (1971) revision mentioned only two species, viz. *C. temensis* and *C. ocellaris*.

Ringuelet et al. (1967: 507) reported *C. chacoensis* (Holmberg, 1891) from Argentina. Holmberg (1891) described the species in the genus *Acharnes*, a synonym of *Cichla*. His description, as well as

Table 1. Nominal species of *Cichla* in chronological order of description.

| original combination | author, year | type locality (river basin) | current name |
|------------------------------|-------------------------|-------------------------------|-----------------------------|
| <i>Cichla ocellaris</i> | Schneider, 1801 | East India, erroneous | <i>Cichla ocellaris</i> |
| <i>Cichla temensis</i> | Humboldt, 1821 | Rio Negro | <i>Cichla temensis</i> |
| <i>Cichla atabapensis</i> | Humboldt, 1821 | Rio Orinoco | <i>Cichla temensis</i> |
| <i>Cichla argus</i> | Valenciennes, 1821 | Unknown | <i>Cichla orinocensis</i> |
| <i>Cichla orinocensis</i> | Humboldt, 1821 | Rio Orinoco, Rio Negro | <i>Cichla orinocensis</i> |
| <i>Cichla monoculus</i> | Agassiz, 1831 | Brazilian sea [Amazon basin] | <i>Cichla monoculus</i> |
| <i>Cichla Tucunare</i> | Heckel, 1840 | Rio Branco | <i>Cichla temensis</i> |
| <i>Cichla flavo-maculata</i> | Jardine, 1843 | Rio Negro | <i>Cichla temensis</i> |
| <i>Cichla nigro-maculata</i> | Jardine, 1843 | Rio Negro | <i>Cichla nigromaculata</i> |
| <i>Cichla trifasciata</i> | Jardine, 1843 | Rio Negro | <i>Cichla temensis</i> |
| <i>Acharnes speciosus</i> | Müller & Troschel, 1849 | Guyana coast, Essequibo River | <i>Cichla ocellaris</i> |
| <i>Cycla toucoumarai</i> | Castelnau, 1855 | Amazon basin | <i>Cichla monoculus</i> |
| <i>Cichla unitaeniatus</i> | Magalhães, 1931 | Rio Negro, Rio Purús | <i>Cichla temensis</i> |
| <i>Cichla bilineatus</i> | Nakashima, 1941 | Rio Amazonas, Peru | <i>Cichla monoculus</i> |
| <i>Cichla intermedia</i> | Machado-Allison, 1971 | Rio Casiquiare | <i>Cichla intermedia</i> |
| <i>Cichla kelberi</i> | new species, this paper | Rio Tocantins | <i>Cichla kelberi</i> |
| <i>Cichla pleiozona</i> | new species, this paper | Rio Guaporé | <i>Cichla pleiozona</i> |
| <i>Cichla mirianae</i> | new species, this paper | Rio Tapajós | <i>Cichla mirianae</i> |
| <i>Cichla melaniae</i> | new species, this paper | Rio Xingu | <i>Cichla melaniae</i> |
| <i>Cichla piquiti</i> | new species, this paper | Rio Tocantins | <i>Cichla piquiti</i> |
| <i>Cichla thyrorus</i> | new species, this paper | Rio Trombetas | <i>Cichla thyrorus</i> |
| <i>Cichla jariina</i> | new species, this paper | Rio Jari | <i>Cichla jariina</i> |
| <i>Cichla pinima</i> | new species, this paper | Rio Curuá-Una | <i>Cichla pinima</i> |
| <i>Cichla vazzoleri</i> | new species, this paper | Rio Trombetas | <i>Cichla vazzoleri</i> |

The whole contribution can be purchased as a PDF file.

To avoid unlicensed distribution of the PDF files we use an encryption method which which attaches the permission to open the PDF files to the customers computer.

The installation of these PDF files does exclusively run on IBM compatibles (**not** Apple Macintosh).

Prices

Articles in journals and single contributions or chapters in books:

10 € basic price (the first 10 pages are included), and

0.50 € page price, beginning with the 11th page.

Orders

Use our order form for PDF files or send your order informal per e-mail (pdf@pfeil-verlag.de). The only accepted payment is by credit card. Using the order form for PDF files, your data will be transmitted by secure link (ssl). You also may send the informations informally by e-mail, fax, phone or mail.

Handling

- After we charged your credit card, you will receive the **PDF file(s)** together with an **installer** ("install.exe") per e-mail. Larger PDF files can be downloaded from our webspace, if necessary, or we send it by mail on CD.
- To open the encrypted PDF files, the plugin "fOpen32.api" must be existing in the "Plug_ins" directory of Acrobat Reader or Acrobat. Running the installer, you will be informed if this plugin is missing.
- Running "install.exe" on your computer, a new directory "PDF-Pfeil" will be created.
- During installation, a "Product ID" [e.g., 1234509876] and an "Input string" [e.g., ABCXYZMNO] are shown.
- Clicking on the "Create E-Mail" button, your e-mail program will open, and both the "Product ID" and the "Input string" will automatically be transferred to a new e-mail.
- Submit this e-mail and stop installation.
- As soon as possible, depending on our business hours, you will receive an e-mail with an "authorization string" [e.g., XOOFQOXSV].
- Run the installer again and transfer this string to the corresponding box. The PDF file can now be opened.

Libraries and standing orders

If you wish to subscribe a PDF version of a journal or you want to order publications for a public library, please contact us per e-mail.

Dieser Beitrag kann als PDF-Datei erworben werden.

Um die unlizenzierte Weitergabe der PDF-Dateien zu verhindern, verwenden wir eine spezielle Verschlüsselungstechnik, die die Berechtigung zum Öffnen der PDF-Dateien an einen Rechner bindet.

Die Installation dieser PDF-Dateien läuft nur auf IBM-kompatiblen Computern (**nicht** Apple Macintosh).

Preise

Zeitschriftenbeiträge und einzelne Kapitel aus Sammelbänden bzw. Büchern:

10 € Grundbetrag (einschließlich der ersten 10 Seiten), und

0,50 € Seitenpreis ab der 11. Seite.

Bestellungen

Bestellungen sind mit dem PDF-Bestellformular oder formlos per E-Mail (pdf@pfeil-verlag.de) an uns zu richten. Die Bezahlung ist ausschließlich per Kreditkarte möglich. Bei Verwendung unseres Bestellformulars werden die Kreditkartendaten über eine gesicherte Verbindung (ssl) übermittelt. Sie können die Daten aber auch formlos per E-Mail, Fax, Post oder telefonisch übermitteln.

Abwicklung

- Nach Abbuchung des Betrages von Ihrer Kreditkarte schicken wir Ihnen die **PDF-Datei(en)** zusammen mit einem **Installer** (»install.exe«) per E-Mail. Größere Dateien bieten wir Ihnen gegebenenfalls zum Download von unserem Webspace an, bzw. schicken sie auf CD per Post.
- Um die verschlüsselten PDF-Dateien öffnen zu können, muss sich das Plugin »fOpen32.api« im »Plug_ins«-Verzeichnis von Acrobat Reader bzw. Acrobat befinden. Bei der Ausführung des Installers werden Sie gegebenenfalls darauf hingewiesen.
- Führen Sie den Installer auf Ihrem Computer aus, so wird ein Verzeichnis »PDF-Pfeil« angelegt.
- Im Verlauf der Installation werden eine »Product ID« [z.B. 1234509876] und ein »Input string« [z.B. ABCXYZMNO] angezeigt.
- Klicken Sie im angezeigten Fenster auf »Create E-Mail«, so öffnet sich Ihr E-Mail-Programm und die »Product ID« und der »Input string« werden automatisch in eine neue E-Mail übertragen.
- Schicken Sie die E-Mail ab und brechen Sie die Installation ab.
- So bald wie möglich, aber abhängig von unseren Bürozeiten, senden wir Ihnen einen »Authorization string« [z.B. XOOFQOXSV] zurück.
- Geben Sie diesen String bei erneuter Installation ein. Anschließend kann die PDF-Datei geöffnet werden.

Bibliotheken und Zeitschriftenabonnements

Wenn Sie die PDF-Version einer Zeitschrift abonnieren oder für eine Bibliothek bestellen wollen, setzen Sie sich bitte per E-Mail mit uns in Verbindung.