

ICHTHYOFAUNA IN THE MIDDLE BASIN OF THE RIVER ANCHICAYÁ AND THE IDENTIFICATION OF PROMISSORY NATIVE FISH FOR AQUACULTURE

JORGE AUGUSTO ANGULO*

RESUMEN

Se presentan los resultados obtenidos en tres faenas de pesca realizadas en diferentes estaciones distribuidas a lo largo de la cuenca media del río Anchicayá, entre los meses de marzo y abril del año 2009. El estudio hace parte de la segunda fase de muestreos por medio de los cuales se busca actualizar la información de las especies de peces que habitan la cuenca del río, para efectuar una selección de peces nativos que puedan ser considerados en cultivos con fines alimenticios u ornamentales. La investigación fue dirigida por el autor, quien orientó al grupo de estudiantes¹ que forman parte de un semillero de la Universidad del Pacífico, del programa de Tecnología en Acuicultura, dedicado a las diferentes actividades ejecutadas en el transcurso de los muestreos. En total se realizaron 10 arrastres de pesca entre las comunidades de Guaimía y Sabaletas, que duraron una hora, en promedio, utilizando chinchorro y toldillo. En total se capturaron 381 especímenes, distribuidos en 20 especies, 10 familias y 9 órdenes. Según criterios señalados, un 40% de las especies fueron preseleccionadas para ser cultivadas como peces de consumo y un 30% como ornamentales, el resto no tendría interés comercial, pero sí un importante valor ecológico.

Palabras clave: ictiofauna, peces nativos, río Anchicayá y piscicultura.

ABSTRACT

The document presents the results obtained in three fishing operations, carried out in different stations distributed along the mid basin of the river Anchicayá, between the months of March and April 2009. The study is part of the second phase of samples by means of which it seeks to update the information of the species of fish that inhabit the basin of the river, to perform a selection of native fish that can be considered in crops for food or ornamental purposes. The research was directed by the author, who orientated a group of students² who are part of a research group of "la Universidad del Pacífico" of the Technology in Aquiculture program, dedicated to the different activities executed during the course of the samplings. In total 10 fishing tows were made between the communities of Guaimía and Sabaletas, which lasted on average one hour; using chinchorro (fishing net approx. 200-300m) and mosquito nets. In total 381 specimens were caught, distributed in 20 species, 10 families and 9 orders.

* Lecturer fo the program of Technology in Aquaculture of la Universidad del Pacífico. E-mail: joraugus@yahoo.com

1. Yeison Reina, Juan Carlos Erazo, Brayan Homes, Armando Vidal, Diesent López, Niler Eliana Santiesteban, Weisner Bazán, Marcos Riascos y Jaime Iván Caicedo

2. Yeison Reina, Juan Carlos Erazo, Brayan Homes, Armando Vidal, Diesent López, Niler Eliana Santiesteban, Weisner Bazán, Marcos Riascos y Jaime Iván Caicedo

According to the shown criteria, 40% of the species were preselected to be cultivated for consumption and 30% as ornamental fish, the rest will not have any commercial interest but a very important ecological value.

Key Words: ictiofauna, native fish, Anchicayá river, fish farming.

INTRODUCTION

The real breakthrough in fish-farming in Colombia occurred in 1980, when the first experimental cultivations were started with "cachama blanca" *Piaractus brachypomus* and the "cachama negra" *Colossoma macropomum*, native species from the rivers of the Amazonia and Orinoquia whose extraordinary potential represents, for the country, a true nutritional alternative and profitable to overcome the actual supply of protein of animal origin and the deficient economic income. The levels of yield of the "cachamas" are approximately 10.000 Kg/ha/year, while other species, under equal conditions of cultivation, are below 5000 kg/ha/year (Stevez, 2002).

This has motivated the promotion of fish-farming with a basis on native species in the whole country, developing crops of species such as "bocachico" *Prochilodus magdalenae*, "la dorada" *Brycon moorei sinuensis*, "el yamú" *Brycon siebenthalae*, "el bagre blanco" *Sorubim cuspicaudus*, "el bagre rayado" *Pseudoplatystoma fasciatum*. Cultivating native species reduces the impact on the surroundings because they are organisms that have co-evolved in the same environment, and it has advantages such as being better adapted to the climate and quality of the water of the region, in addition to forming part of the consumption habit of the population. (Atencio, 2001).

Nevertheless, native fish must comply with certain conditions to be considered suitable as fish to be cultivated: reproduction in conditions

of confinement, resistance to high densities, hardness or resistance to manipulation, form, coloration and rapid growth, among others. Considering these criteria, the program of Technology in Aquaculture of "la Universidad del Pacífico" aims to determine the ichthyological potential that it has in the basin of the rivers of the Pacific coast. Studies should be initiated from wildlife survey and ecological and biological assessments of native species.

In framework of this program, in 2009, Angulo & Garcia, published their fish inventory work of the middle basin Anchicayá, conducted between August 2006 and February 2008, following 15 visits to the Anchicayá middle basin. In total they identified nine orders, in 16 families and 29 species of fish. The five most abundant were, "la carduma" *Atherinella serrivomer*. (26,3%), "la sabaleta" *Brycon henni* (23,5%), "la aguja" *Strongylura fluviatilis* 11,46%, "el arrayán" *Hemieleotris latifasciata* (7,4%) and "la chuchulapa" *Rineloricaria jubata* (6,8%).

This work presents results corresponding to the second phase of fishing activities done by the research group "Tropical Aquacultures", with student youth of the research group "Native Hydro-biological Resources" of the program Technology in Aquaculture of "la Universidad del Pacífico", with the purpose of updating the information of the ictiofauna of middle and lower basin of the Anchicayá river, and investigate the native species with potential for aquaculture.

METHODOLOGY

The area of study corresponds to the range of the Anchicayá river, between the villages of "Guaimía" and "Sabaletas", and includes the river "Sabaletas" before its outlet, and the creek "Las Vacas" (Figure 1), corresponding to the middle basin of the river, according to the geomorphological zoning done by Barbosa, 1998 (en Tovar 2004).

The hydrographic basin of the river Anchicayá is located on the Pacific slope of the Western Cordillera. The source of the river is in the "Parque Nacional Natural Farallones de Cali" and flows into the bay of Buenaventura, it has a surface area of 130.568 hectares, distributed in the municipalities of Buenaventura and Dagua (Quiroga-Zea et al, 1998). The river is dammed by two reservoirs, named lower and upper Anchicayá, between kilometer 80 and 90 of the road Simón Bolívar, on the old Buenaventura - Cali road.

The zone presents a constant rainfall (precipitations of up to 183 mm in 24 hours, in greater proportions at night), rainfall and an ambient temperature of 26°C, and relative humidity of 86%. The river passes almost entirely through a mountainous zone, covered by extensive tropical humid forest area (Bmh-T), numerous creeks and streams provide great volume of water to its flow (Tovar, 2004).

The area constitutes a strategic site for the projection and development of aquaculture, planned by "la Universidad del Pacífico", in the Colombian Pacific region.

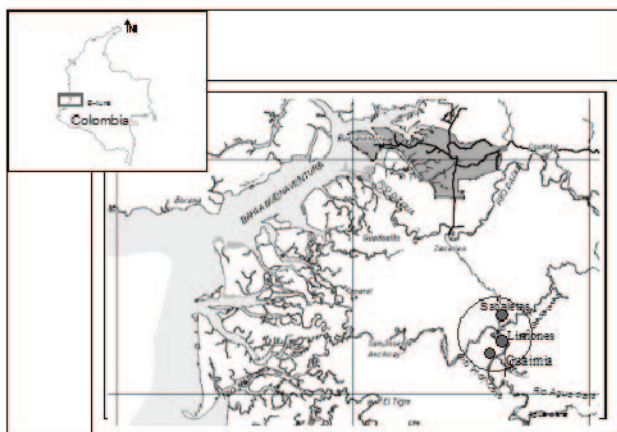
METHOD

Como primera parte del estudio se realizó la recopilación de los antecedentes existentes que permitieran conocer la ictiofauna del río Anchicayá y establecer una lista total de las especies de peces. Entre los documentos revisados se incluyen los realizados por Ospina y Restrepo (1989), el Plan Integral de Ordenamiento y Manejo Sostenible con Participación Comunitaria (Ramos & Ríos, 1998), los estudios de BIOMA, INCOL, Tovar (2004) y Tovar & Acevedo (2007) y el realizado por Angulo & García (2011) que enlista los resultados de la primera fase de esta investigación.

Catching of fish

Three fishing sessions were done in various stations throughout the middle basin of the river, establishing showcase stations at the following points: San Marcos river; Anchicayá river, in the community of Guaimía; Sabaletas river, close to the outlet of the Anchicayá river; the "Yesqueros" and "Las Vacas" creeks, neighboring the Center of Aquaculture Research of la Universidad del Pacífico and a natural pond locally known as "el Pondón".

Figure 1. Area of study. The circle shows the middle basin of the Anchicayá River, the red points show the communities close to fishing stations in the samplings.



The fishing arts used were "chinchorro and toldillo". Technically the "chinchorro" is the most significant art of fishing due to its effectiveness and possibility of catching species found in the total column of water, including those of benthonic habits (Tovar & Acevedo, 2007 and Angulo & García, 2010). The net used has a length of 20m and a height of 2m that can be extended to 3m due to the elasticity of the material (polyethylene), with a pore diameter of ½ inch. Its use is linked to the conditions of the current and depth, usually used in sweeps over an area of approximately 50m (Tovar, 2004). But in the streams, the use of mosquito nets is the best choice; they are made of tulle fabric with a mesh eye of 0.5 to

1 mm, which allows the capture of small fish in ponds and streams.

Inventories of the species

The individuals captured were measured and weighed "in situ", taking the Total Length (TL) and Standard Length (SL) with a measuring board, afterwards they were released back into the river alive. The information was compiled on predesigned formats. The taxonomic identification was performed using specialized codes and references from Eigenann (1912 y 1922), Dahl (1971), Miles (1947), Castillo and Rubio (1987), Rubio (1988), Ospina and Restrepo (1989), Galvis et al (1997), Robertson and Allen (2002) and Reis (2003). Some species of which there were doubts in the identification were preserved in formol at 10%, for subsequent identification in the laboratory.

In all cases the information from fish capture was tabulated according to common name, scientific name, taxonomic group (order and family), abundance, location and distribution of the monitored species.

Criteria for the selection of species

Considering characteristics of species, a selection of their use as fish suitable for aquaculture was performed, taking into account criteria such as abundance and frequency of catch, size, shape and color.

RESULTS AND DISCUSSION

Bibliographic revision

In the bibliographic revision it was found that for the Anchicayá river basin there is a register of 81 species, 31 of which are of marine origin that trace back to determined stretches of the river.

Abundance and frequency of capture

In total 381 specimens were captured. The most abundant species were in order: "la carduma" *Atherinella serrivomer*, followed by "el guacuco" *Chaetostoma sp.* and sardine *Bryconamericus spp.* Considering groupings by family, those presenting the largest numbers of individuals were: *Atherinidae* 180, *Loricariidae* 95 and *Characidae* 68. The individuals captured were distributed taxonomically in 20 species of fish, 10 families and 9 orders. The family with the largest number of species was *Characidae* with six, followed by *Loricariidae* with four (figure 2, 3 y 4). No new species were found, that is, all the species collected were referenced in lists of earlier works.

Activities on the main river channel of the Anchicayá River were scarce due to sudden rising of river levels, which is produced by the permanent rain in the area or by the increase in power generation in the reservoir. This caused a scarcity or absence in the capture of species such as "el sábalo", "mojarras", the river "nayo" and "barbudos".

Figure 2. Distribution of numeric abundance of the total of captured fish. Middle basin Anchicayá river.

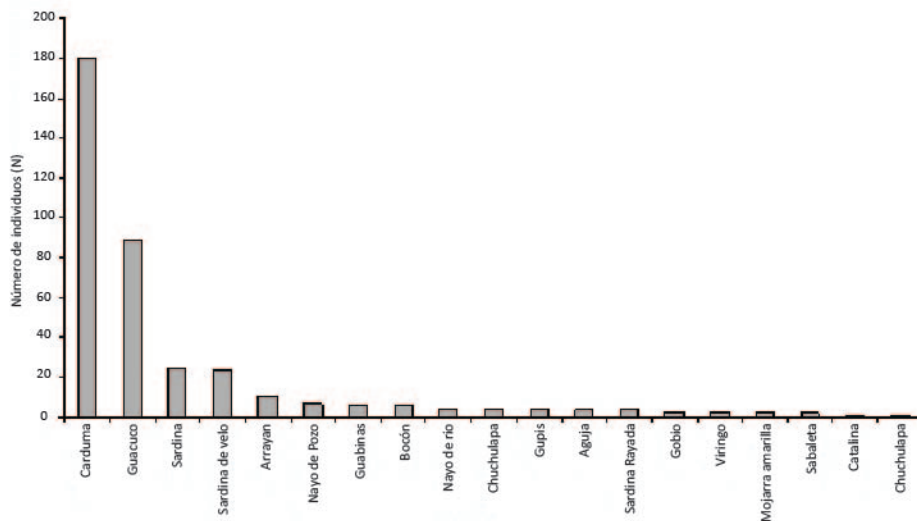


Figure 3. Distribution percentage of abundance of the orders of fish captured. Middle basin Anchicayá river.

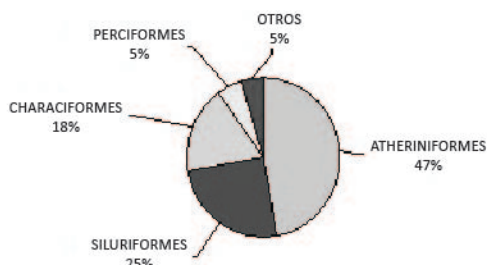
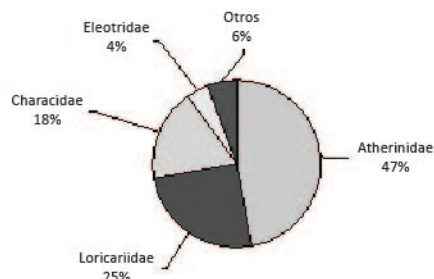


Figure 4. Distribution percentage of abundance of the families of fish captured.



The most abundant species was the "carduma" *A. serrivomer*, present in five of the six sampling stations (83%). This high frequency is due to its presence both in rivers and creeks, from rapid to moderate current zones. They are followed by "la aguja" *Strongylura fluviatilis* (67%) only in places of transparent waters and fast currents; and "el arrayán" *Hemieleotris latifasciata*, that inhabits clear or transparent, but moderate currents. Its distribution is restricted to pods and streams that flow in main rivers. Among the species with scarce

numbers are "los Viringos" of which 3 examples were captured in small cavities in the brook of "Las Vacas".

The majority of species captured use the pools in their larval and juvenile stages, but move into the main flow after reaching a size sufficient to withstand the temperature and current (Tovar & Acevedo, 2007).

Selection of species for cultivation

40% of the species were preselected to be cultivated for consumption and 30% as ornamental fish, the rest do not have commercial interest.

Figure 5.
Selection of native fish suitable for aquaculture

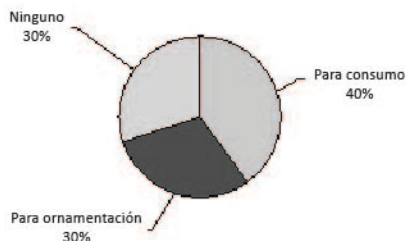


Figure 5

The number of individuals caught per trawl is low, which is normal for the zone according to the referenced works. However, the number of species is relatively high in relation to the previous works.

Fish selected for consumption

River "Lisa or Nayo" *Agonostomus monticola*. Is a fish of good size and very popular in the area to be used as food. It has a dark dorsal and inhabits whitewater. It was found in Sabaletas and San Marcos with sizes of 27 cm and more. It belongs to the group of "Lisas".

Yellow Mojarra *Petenia krausii*. Is characterized by possessing yellowish colouring alternated with dark brown; it has a black dot in the upper posterior region of the caudal peduncle. The specimens captured measured just 13 cm (juveniles) but literature reports assure that they may reach 30 cm TL (Ortega-Lara et al., 2002). It reaches its first length of maturity at 18 cm standard length and 100 gr. (Infante & La Bar, 1977).

There are studies about its feasibility to be considered for its cultivation. It feeds on fish and benthic invertebrates like most cichlids; it is a very territorial species inhabiting the pools of rivers. During the fishing activities it was only caught in "el Pondón". In addition to the Anchicayá River, it is also reported in the Atrato, San Juan, Cauca and Magdalena; likewise in Venezuela in the Lake of Maracaibo and Orinoco River.

"Cuchillo o Viringo" *Sternopygus sequilabiatus*. It is a flat fish, laterally compressed, which has a characteristic shape of knife, with an anal fin that spans the width of the fish; which, moreover, lacks a dorsal fin. It has carnivorous and nocturnal habits which makes it difficult to observe during the day. The specimens were captured in the creek hollows of "Las Vacas", with sizes of between 6 and 7 cm. Literature reports sizes that can be more than 80 cm.

"Nayo de Pozo" *Seudocurimata lineopunctata*. A few juveniles of this promising species of which there has been an attempt to cultivation at the aquaculture station of "la Universidad del Pacífico". Trials of crops of this variety have been conducted, with good behavior in captivity, but with some drawbacks in reproduction (Lamouroux & Gross, 2008).

"La carduma" *Atherinella serrivomer*. It was the most abundant species in the river, despite its small size; it meets certain criteria for cultivation as a fish for consumption. However, the community primarily uses it as bait to catch larger fish. The largest specimens captured registered lengths of 14 cm. Relevant literature indicates the maximum size of 17 cm. Specimens live in large groups, but they are very susceptible to manipulation and, apparently, require high levels of oxygen.

Ornamental fish

The Guacuco *Chaetostoma* sp. Fish of this genus have head with soft rounded snout, no roughness, eyes on the dorsal region, the body color is highly variable, with individuals being gray, brown, dark brown and with numerous light spots (Maldonado et al., 2005).

The color pattern of this species allows you to blend into the background. It inhabits areas of the river where there are fast currents. It was fished in great abundance in the river Sabaletas. The average catch size was 12 cm.

The "Chuchulapa" *Sturisoma panamenses*. This species is distinguished from others of the genus by not having the extremely long caudal fin filaments (Ejemplo: *S. festivum*). Its color is dark brown on the dorsal side and light brown on the lower body. It is common in the main streams, and could be cultivated as ornamental fish.

"Arrayán" *Hemieleotris latifasciatus*. The body of this little fish has a black band from the end of the caudal peduncle, to the beginning

of the mouth; the sides are yellowish and the belly is white with a green iridescent stripe. These fish were found in the pools of streams that drain into Sabaletas and San Marcos. Because of its bright color, it can be exploited as an ornamental fish; their sizes were between 5 and 7 cm.

"Sardina de velo" *Astyanax* sp. There is little information about this species of sardine caught in calm waters, its shape and reddish colour of its fins places it as an attractive species to be selected as an ornamental fish. Its maximum size when caught was 7 cm.

There exist many other species to be considered in the field of aquaculture of native species of the Anchicayá basin, of which are expected to obtain representative catches in future fishing operations carried out in the basin. Among these are highlighted "el sábalo" *Brycon meeki*, "el morado" *Arius* sp, "las mojaras" *Cichlassoma* spp, "el Jojorro" *Pomadasys bayanus*, among others. It is important to consider that its abundance in the river is maybe one of the main factors to start aquaculture projects with this species.

Selection of species of fish with a potential for consumption or ornamentation.

Especies	Common N	Selected for
<i>Strongylura fluviatilis</i>	Aguja	consumo
<i>Gobiomorus</i> sp	Bocón	consumo
<i>Cichlassoma ornatum</i>	Mojarra	consumo
<i>Petenia kraussii</i>	Mojarra amarilla	consumo
<i>Seudocurimata Lineopunctata</i>	Nayo de pozo	consumo
<i>Agonostomus monticula</i>	Nayo de río	consumo
<i>Brycon henni</i>	Sabaleta	consumo
<i>Sternopygus</i> sp	Viringo	consumo
<i>Atherinella serrivomer</i>	Carduma	ninguno
<i>Loricaria</i> sp.	Chuchulapa	ornamental
<i>Rineloricaria jubata</i>	Chuchulapa	ornamental
<i>Gobiosoma</i> sp	Gobio	ninguno
<i>Characidium fasciatus</i>	Guabinas	ninguno
<i>Poecilia caucana</i>	Gupis	ninguno
<i>Bryconamericus</i> sp	Sardina	ninguno
<i>Bryconamericus</i> sp2	Sardina rayada	ninguno
<i>Hemieleotris latifasciata</i>	Arrayán	ornamental
<i>Bunocephalus colombianus</i>	Catalina	ornamental
<i>Chaetostoma</i> sp.	Guacuco	ornamental
<i>Astyanax</i> sp	Sardina de velo	ornamental

CONCLUSIONS

20 Species of fish were observed distributed in 10 families and 9 orders. The family with the most number of species was *Characidae* with 6, followed by *Loricaridae* with four. *Characidae* was constituted in the dominant family in terms of the number of species that form part of it and the number of individuals captured.

Judging by the captures, it is considered that the basin has a low number in their abundance of fish. The most abundant species was "la carduma" *A. serrivomer*, which turns it into a variety of high ecological value for the zone under study. Undertake crop species is complicated because it is highly susceptible to manipulation, in difference to the guacucos *Chaetostoma sp*, which continued in abundance, that resist manipulation and can be considered as ornamental .

The fishing activities on the river Achicayá were scarce due to the constant rising of the river caused by the permanent rains. This caused species such as "las mojarras", the river "nayo" and barbudos to be scarce or absent during the captures.

Although the capture of individuals per species was very low, 40% of captured varieties have relevance for human consumption. Some of them were "la aguja" *S. fluviatilis*, "el nayo de pozo" *S. lineopunctata*, "la mojarra" *Petenia krausii* and "el nayo de río" *A. monticula*. This percentage is considered high as well as for the species that can be considered for ornamentation. (30%).

In the later stages of the project, some of the selected species will be subject to other selection criteria related, directly, with its cultivation in captivity.

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ANEXO 1

Table 1. List of identified fish of the basin of the river Anchicayá according to bibliographic registers. (Modification of Tovar & Acevedo, 2007 and Angulo & García 2010).

SPECIES	COMMON NAME	FRESH WATER	ESTUARY
<i>Achirus klusingeri</i> (<i>A. mazatlanus</i>)	Lenguado		X
<i>Agonostomus monticola</i> (<i>Chaenomugil proboscideus</i>)	Nayo	X	
<i>Anchoa spinifer</i>	Anchoveta		X
<i>Apteronotus rostratus</i>	Viringo	X	
<i>Arius</i> sp	Morado		X
<i>Astrolepus latidens</i>	Babosa	X	
<i>Astrolepus trifasciatus</i>	Babosa	X	
<i>Astyanax ruberimus</i>	Sardina	X	
<i>Atherinella serrivomer</i> (<i>Melaniris pachylepis</i>)	Carduma		X
<i>Awous transandeanus</i>	Lambearena	X	
<i>B. transmontanus</i> (<i>Cephalosilurus zungaro</i>)	Capitán	X	
<i>Bodianus diplotaenia</i>	Vieja		X
<i>Brotula</i> sp	Merluza		X
<i>Brycon argenteus</i>	Sabaleta	X	
<i>Brycon henni</i>	Sabaleta	X	
<i>Brycon meeki</i>	Sábalo	X	
<i>Brycon oligolepis</i>	Sabaleta	X	
<i>Brycon scopiferus</i>	Sabaleta	X	
<i>Bryconamericus</i> sp	Sardina	X	
<i>Bryconamericus emperador</i> (<i>B. scopiferus</i>)	Sardina	X	
<i>Bunocephalus colombianus</i> (<i>Dupouyichthys</i> sp)	Catalina	X	
<i>Caquetaia kraussii</i> (<i>Petenia kraussi</i>)	Mojarra amarilla	X	
<i>Centropomus robalito</i>	Gualajo		X
<i>Cetopsis amphiloza</i> (<i>Pseudocetopsis othonops</i>)	Doncella - Jabón	X	
<i>Chaetostoma marginatum</i>	Guacuco	X	
<i>Characidium caucanum</i>	Guavina	X	
<i>Characidium fasciatus</i>	Guavina	X	
<i>Cichlassoma atromaculatum</i>	Mojarra paridera	X	
<i>Cichlassoma ornatum</i> (<i>Petenia ornatum gephyrum</i>)	Mojarra - Macho	X	
<i>Cichlassoma</i> sp	Mojarra	X	
<i>Ciprynus carpio</i> vr <i>specularis</i>	Carpa común	X	
<i>Ctenogobius sagitula</i>	Góbido	X	
<i>Cyclopsetta</i> sp.	Lenguado		X
<i>Daector dowi</i>	Pejesapo		X
<i>Diapterus peruvianus</i>	Palometa		X
<i>Dolychancistrus daguae</i>	Guacuco	X	
<i>Eleotris picta</i>	Bobo		X
<i>Eugerres periche</i>	Palometa		X
<i>Galeichthys dasycephalus</i>	Bagre		X
<i>Galeichthys peruvianus</i>	Bagre		X
<i>Gobiesox juradoensis</i>	Góbido	X	
<i>Gobiesox</i> sp	Góbido	X	
<i>Gobiomorus maculatus</i> (<i>Gobiomorus</i> sp)	Bocón		X
<i>Gobiosoma</i> sp	Góbido	X	

<i>Haemulon scudderi</i>	Curruca		X
<i>Haemulon sexfasciatum</i>	Curruca		X
<i>Hemicarax sp.</i>	Comegargajo		X
<i>Hemieleotris latifasciata (Rivulus sp)</i>	Arrayán		X
<i>Hippoglossina bollmani</i>	Lenguado		X
<i>Hippoglossina tetraphtalmus</i>	Lenguado		X
<i>Hoplias malabaricus</i>	Chícharo	X	
<i>Lasiancistrus sp</i>	Guacuco	X	
<i>Leporinus sp.</i>	Rollizo	X	
<i>Lile stelifera</i>	Plumuda		X
<i>Loricaria filamentosa (L. magdalanae)</i>	Chuchulapa	X	
<i>Oligoplites altus</i>	Rascalalos		X
<i>Oreochromis niloticus</i>	Tilapia Nilótica	X	
<i>Oreochromis spp.</i>	Tilapia Roja	X	
<i>Pimelodella grisea</i>	Micuro	X	
<i>Pimelodella eutaenia</i>	Micuro	X	
<i>Poecilia caucana.</i>	Gupi		X
<i>Pomadasys panamensis (P. bayanus)</i>	Jojoborro		X
<i>Pseudocurimata lineopunctata (C. lineopunctata)</i>	Nayo de Pozo	X	
<i>Pseudopeneus grandisquamis</i>	Chivo		X
<i>Pseudophallus starksi</i>	Culebrilla		X
<i>Pseudopimelodus bufonicus</i>	Capitán	X	
<i>Pseudancistrus daguae</i>	Guacuco	X	
<i>Rhamdia quelen (R. wagneri)</i>	Barbudo	X	
<i>Rineloricaria jubata</i>	Rabijunta	X	
<i>Roeboides occidentalis (R. hildebrandi)</i>	Anchoveta	X	
<i>Sicydium hildebrandi (S. salvini)</i>	Viuda	X	
<i>Spheroides anulatus</i>	Tamborero		X
<i>Sternopygus seguilabiatum - group (S. macrurus)</i>	Viringo	X	
<i>Strongylura scapularis</i>	Aguja		X
<i>Sturisoma panamensis</i>	Chuchulapa	X	
<i>Symbranchius marmoratus (F. Ophichthidae)</i>	Anguilla	X	
<i>Synodus sp1</i>	Pez Huevo		X
<i>Trichomycterus sp, A</i>	Anguñia	X	
<i>Trichomycterus striatum (Pygidium caliense)</i>	Anguñia	X	
<i>Trinectes fluviatilis</i>	Lenguado		X
<i>Trichomycterus taenia</i>	Anguñia	X	
TOTAL	81 SPECIES	50	31

ANEX 2.

Photographs of some species captured in the middle basin of the Anchicayá river.

Agonostomus monticola. Nayo de río



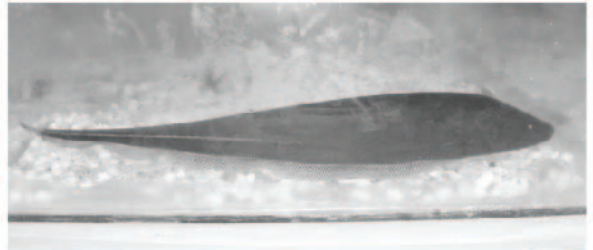
Atherinella serrivomer. Carduma



Cichlassoma ornatum. Mojarra



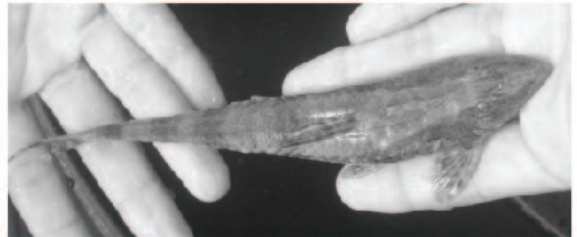
Sternopygus sp. Viringo



Astyanax sp. Sardina de velo



Rineloricaria jubata. Chuchulapa



Seudocurimata lineopunctata. Nayo de pozo



Chaetostoma sp. Guacuco



Hemieleotris latifasciata. Arrayán



Cephalosilurus zungaro. Capitán

