Arquivos de Zoologia

ARQ. ZOOL. S. PAULO, VOL. 18 (1-2): 1-150 30.IX.1969

SYSTEMATICS AND EVOLUTION OF THE TRIBE ACESTRORHYNCHINI (PISCES, CHARACIDAE)

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INTRODUCTION

The fishes of the genus *Acestrorhynchus* and its close relatives have never been studied properly. It is my intention in this study to revise the tribe Acestrorhynchini, to which they belong, to discuss its evolution and radiation in the South American continent, its taxonomic rank in the subfamily Characinae and its history with respect to South American hydrology.

The first member of the Acestrorhynchini, *Salmo falcatus*, was described by Bloch (1794:120) who considered it to belong to Linnaeus' large genus *Salmo*.

Cuvier (1817:167) in his Règne Animal included Bloch's species in the genus *Hydrocynus* together with *Salmo odoe, Hydrocynus scomberoides, H. lucius, Salmo dentex* and his new species *H. brasiliensis*. These different species were placed in five different subdivisions, one of them formed by Bloch's *Salmo falcatus* and *Salmo odoe*. Cuvier characterized this subdivision as follows: "Les uns ont encore une rangée serrée de petites dents aux maxillaires et aux palatins; leur première dorsal répond à l'intervalle des ventrales et de l'anale." In 1819, without explanation, he changed *Hydrocynus* to *Hydrocyon* and redefined the five subdivisions. Although still considering only one genus, he suggested that the fourth subdivision, formed by *Salmo falcatus, Salmo odoe* and his new species *H. falcirostris* could constitute a separate genus. Referring to these species he states (p. 360): "Elles ont 1.º des fortes dents coniques mêlées de dents plus petites aux intermaxillaires et à la machoîre inférieure; 2.º de petites dents pointues aux maxillaires se continuant avec la rangée intermaxillaire; 3.º une longue rangée de très petites dents à chaque palatin; 4.º la première dorsale répondant à l'intervalle d'entre les ventrales et l'anale."

Quoy & Gaimard (1824:221) recognized a specimen caught during the "Voyage de l'Uranie" in Rio de Janeiro to be identical with Bloch's *Salmo falcatus*, added new characteristics to Bloch's description, and redescribed *Hydrocyon falcatus*. Cuvier (1829:312), however, considered this species different from *Salmo falcatus* and named it *Hydrocyon hepsetus*.

The first modifications in the genus *Hydrocyon* were introduced by Agassiz (1829:76) who erected a new genus, *Xiphorhynchus*, to receive

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the species of Cuvier's fourth subdivision, and shifted *Hydrocyon lucius* and *H. brevidens* respectively to his new genera *Xiphostoma* and *Salminus.*

The first species of our Acestrorhynchini thus first became separated from the genus *Hydrocyon.* Agassiz, however, did not define *Xiphorhynchus* and this name was shown to be invalid by Müller & Troschel (1844:92; 1845:17) because *Xiphorhynchus* was preoccupied in ornithology. They substituted *Xiphorhamphus* for it and included within it *X. falcatus, X. odoe, X. falcirostris, X. hepsetus, X. argenteus, X. humeralis, X. pericoptes* (a new species from Brazil) and *X. microlepis,* which had already been described by Schomburgk (*in* Jardine, 1841:247) from the Branco, Negro, and Essequibo. *Xiphorhamphus* was well characterized by Müller and Troschel.

Valenciennes (*in* Cuvier & Valenciennes, 1849:308) resurrected *Xiphorhynchus* stating that Müller (*in* Müller & Troschel, 1844:92; 1845:17) "... paraît avoir changé très inutilement le nom Xiphorhynchus d'Agassiz en celui de Xiphorhamphe, attendu que le premier de ces deux noms est employé en ornithologie. Il vaudrait mieux sans aucune doute, que ce double emploi n'existât pas, mais le néologisme me paraît avoir plus d'inconvénients." He recognized all the species of Müller and Troschel but correctly synomymized *X. pericoptes* with Cuvier's *Hydrocyon hepsetus* and shifted *X. humeralis* and *X. argenteus* to his new genus *Cynopotamus,* which was mainly characterized by the absence of teeth on the palatines. The name *Xiphorhynchus,* however, was never accepted. It was used once more by Castelnau (1855:75) and then completely replaced by *Xiphorhamphus.*

Before 1864 the species now included in *Acestrorhynchus* and *Oligosarcus* (=*Acestrorhamphus*) were considered to be congeneric. Günther (1864) was the first author to demonstrate the existence of two different groups in *Xiphorhamphus.* In his large characid group Hydrocionina he included *Xiphorhamphus* and his new monotypic genus *Oligosarcus.* According to him, both possessed a series of conical teeth on each palatine bone and a long anal fin but no special higher category was created for these two genera. He recognized two different groups in *Xiphorhamphus*: group 1, characterized by canine teeth on the maxillary; and group 2, without canine teeth on the maxillary. In group I he included *X. falcirostris, X. falcatus, X. microlepis,* and a new species, *X. ferox* (Günther, 1863:443) and in group 2, *X. pericoptes, X. hepsetus,* and *X. jenynsii. X. pericoptes* and *X. hepsetus* had already been recognized by previous authors. *X. jenynsii* was created by Günther as a substitute name for *Hydrocyon hepsetus,* which was erroneously considered by Jenyns (1842:128) to be identical with the species of Cuvier. For the first time Bloch's *Salmo Odoe* is excluded from *Xiphorhamphus* and placed in the African genus *Sarcodaces* which is completely unrelated to the Characinae.

From the 1860's to the end of the nineteenth century there were no major revisions. Only new species were added to *Xiphorhamphus*: *X. oligolepis* Steindachner, 1867, *X. macrolepis* Steindachner, 1876, *X.*

anomalus Steindachner, 1886, *X. lacustris* Reinhardt, 1874, *X. abbreviatus* Cope, 1878, *X. heterolepis* Cope, 1878, and *X. brachycephalus* Cope, 1894. Eigenmann & Eigenmann (1891: 58) included *Xiphorhamphus* together with other characid genera in the subfamily Hydrocyoninae.

The names *Acestrorhynchus* and *Acestrorhamphus* were first introduced by Eigenmann (*in* Eigenmann & Kennedy, 1903:527). The former was created as a substitute for Agassiz's *Xiphorhynchus,* which according to Eigenmann was preoccupied, and the latter for *Hydrocyon hepsetus.* Eigenmann (1903:146) referred again to *Acestrorhynchus* as a new name for *Xiphorhynchus* of Agassiz and to *Xiphorhamphus* of Müller & Troschel, both according to him being proccupied in Aves. He created and defined *Acestrorhamphus* as a new genus, but did not define *Acestrorhynchus* or list the species to be included in these genera. *Acestrorhynchus* was first defined later in Eigenmann's work on the fishes of [British] Guyana (1912b:406-7).

Boulenger (1904:575) considered *Acestrorhynchus, Acestrorhamphus* and *Oligosarcus* to belong in the subfamily Hydrocioninae, in which he also included some other characid genera, but Eigenmann (1910:447) placed those three genera plus *Acestrocephalus* in a separate subfamily Acestrorhamphinae. *Acestrocephalus* was later considered by Géry & Vu-Tân-Tûe (1963a; 1963b) as a subgenus of *Cynopotamus.* In *Acestrorhynchus* Eigenmann put the species of Günther's group 1, plus *X. abbreviattus, X. lacustris* and *X. heterolepis,* described after Günther's work and in *Acestrorhamphus* the species of Günther's group 2 plus *X. oligolepis* and *X. brachycephalus.* Eigenmann's subfamily was never properly defined and subsequent authors used indifferently either Acestrorhamphinae or Acestrorhynchinae or, more rarely, Oligosarcinae.

Gregory & Conrad (1938:321-324) defined the subfamily Sarcodacinae in which they included Regan's Acestrorhamphinae (1911:16). Included were *Sarcodaces, Luciocharax* and *Acestrorhynchus. Acestrorhynchus* is unrelated to the other two genera, which are now placed in families unrelated to the Characidae.

Campos (1945a:431-483) described *Oligosarcus pintoi* and later, (1945b:467-481) revised the subfamily Acestrorhynchinae. Her work, however, is a literature compilation of limited usefulness. Campos & Trewawas (1949:157-160) compared *O. pintoi* with Günther's *O. argenteus* and erected a new subgenus, *Paroligosarcus,* to receive the former.

Fowler (1950:321-327) introduced some modifications in the limits of the subfamily Acestrorhynchinae. He recognized all three genera previously included in the subfamily but placed *Acestrorhamphus oligolepis, A. brachycephalus, A. pericoptes* and *Acestrorhynchus lacustris* in *Sphyraenocharax* Fowler (1906:400). He considered *X. abbreviatus* of Cope to be the type-species of *Sphyraenocharax* but at the same time also placed this type-species in *Acestrorhynchus.* He also included *falcatus* in *Acestrorhamphus* without any reasonable explanation.

Fernandez-Yepez (1955) raised the group to family but did not properly define it. His work is mostly speculative and largely based on data taken from the literature. He accepted Fowler's *Sphyraenocharax* and included *Charaxodon* (Fernandez-Yepez, 1947) in the family.

This genus was considered by Böhlke (1958:70) to be synonym of *Moralesia* which is not related to the Acestrorhynchini.

The first author to consider the group as a tribe was Géry (*in* Hoedeman 1956:16). He included Acestrorhynchidi and Cynodontidi in the subfamily Hepsetinae. Cynodontidae and Hepsetidae have been recently considered by Greenwood, Rosen, Weitzman & Myers (1966: 395) as true families different from the family Characidae, of which our Acestrorhynchini are a part.

Acestrorhynchidi was briefly mentioned by Géry & Vu-Tân-Tuê (1963a; 1963b) and included by Géry (1964:30-31) without definition in the subfamily Characinae.

Paroligosarcus (=*Oligosarcus* in part), *Oligosarcus* (=*Acestrorhamphus*) and *Acestrorhynchus* are related to other genera of the subfamily Characinae but, as will be shown, they constitute a fairly well-defined and homogeneous group and are here united into the tribe Acestrorhynchini.

ACKNOWLEDGEMENTS

This work was presented as a thesis in March 1968 to the Department of Biology (Pisces) of Harvard University in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

My stay at Harvard would not have been possible without the cooperation of the Government of the State of São Paulo, Brasil. I gratefully acknowledge the financial support received from the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) and from the Coordenação do Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Rio de Janeiro, during my first year at Harvard and I owe a special debt to the members of the Committee on Evolutionary Biology who provided the necessary funds for two field trips to Brazil in the summers of 1965 and 1966 and for two trips within the United States for the study of specimens and types. During my last year at Harvard I received financial support from the Organization of American States (OAS). I am sincerely grateful for this help.

Dr. Giles W. Mead, my adviser, read the manuscript and contributed decisively in many other ways for the accomplishment of this work. For his advice, encouragement, patience and tolerance I am sincerely grateful.

I am deeply indebted to Dr. Paulo E. Vanzolini of the Departamento de Zoologia, Secretaria da Agricultura, São Paulo, who was always available for discussions, suggestions and comments throughout the development of this study. His experience on studies of geographic differentiation in South America was of great help.

Dr. Ernest E. Williams dedicated much of his time to discussions on evolutionary aspects of this work and on other topics. It is a great pleasure to acknowledge my indebtedness for his advices and suggestions.

I extend sincere thanks to Dr. Aziz Nacif Ab'Sáber for his help on problems of South American geomorphology and my thanks also go to

Dr. Ernst Mayr, Dr. James E. Böhlke, and Dr. Stanley H. Weitzman for useful general comments.

I am obliged to Dr. Jacques Géry who made some suggestions through correspondence and made two of his unpublished manuscripts on characid fishes available to me.

Special thanks are extented to my colleague and friend Heraldo A. Britski of the Departmento de Zoologia, São Paulo, who collected and sent many specimens to me and helped in many other ways.

For the loan or gift of specimens I am grateful to Dr. James E. Böhlke of the Academy of Natural Sciences of Philadelphia, Mr. W.I. Follett of the California Academy of Sciences, Dr. P.H. Greenwood of the British Museum (Natural History), Mr. Loren P. Woods of the Chicago Natural History Museum, and to Mr. Francisco Mago Leccia and Mr. José A. Luengo of the Instituto de Zoologia Tropical, Caracas.

METHODS AND MATERIALS

The specimens used in this study are from the institutions listed below.

ANSP	Academy of Natural Sciences of Philadelphia.
BM(NH)	British Museum (Natural History), London.
CAS	California Academy of Sciences.
CAS(IUM)	Specimens belonging to the California Academy of Sciences but formerly deposited at the Indiana Museum.
DZSP	Departamento de Zoologia, Secretaria da Agricultura, São Paulo, Brasil.
FMNH	Field Museum of Natural History, Chicago.
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.
USNM	United States National Museum, Washington, D.C.

This work is based on the examination of 791 specimens from the localities presented in figures 1, 2 and 3 and in the appendix. The localities involved were located through the Map of Hispanic America published by the American Geographical Society, but other sources were also consulted.

MEASUREMENTS

All measurements and counts were made on the left side of the specimens. The measurements were taken with a ruler and a point to point caliper and were recorded to the nearest millimiter.

Standard length - from the tip of the snout to base of caudal fin.

Body depth - taken at the origin of dorsal fin, where the body has its greatest vertical dimension.

Trunk length - the standard length minus head length.

Head length - measured from tip of snout to the posteriormost tip of opercle, including its membranous edge.

Snout length - mesured from fleshy tip of premaxillary to posterior margin of antorbital bone.

Orbital diameter - measured from posterior border of antorbital bone to the anterior border of fifth infraorbital bone.

Interorbital distance - is the least distance between the borders of the frontal bones.

Caudal peduncle depth - is the least depth, measured vertically.

Pectoral fin length - measured from base of uppermost ray to the posteriormost tip of first rays.

Ventral fin length - measured from the base of the fin (outer point) to the posteriormost tip of first rays.

Predorsal distance - from tip of snout to anterior base of first dorsal fin ray.

Preventral distance - from tip of snout (upper jaw) to anterior base of first ventral fin ray.

Preanal distance - from tip of snout (upper jaw) to anterior base of first anal fin ray.

Postorbital distance - measured from the anterior border of fifth infraorbital bone to the posteriormost tip of opercle, including its membranous edge.

Counts

All counts were made with a thin needle under the stereomicroscope.

Dorsal fin - the last two close-set dorsal fin rays were counted as one.

Anal fin - the last two close-set rays were counted as one.

Caudal fin - only the principal caudal rays (the branched rays plus one unbranched ray on each side) were counted.

Pectoral fin - the first thin outer ray was not included in the counts.

Lateral line scales - scales counts in the lateral line refer to the series of perforated scales along the body, extending to the base of the caudal fin. When scales were lost the pockets were counted.

Scales above lateral line — this count refers to a vertical row of scales from the origin of dorsal fin to the lateral line. The scale belonging to the lateral line itself was not included.

Scales below lateral line - this count refers to a vertical row of scales from lateral line to origin of anal fin. The lateral line scale is not included.

Gill rakers - the gill rakers were counted on the lower part of the first gill arch only; the gill raker in the angle formed by the superior and inferior gill arches was included, as were all rudiments. Gill rakers in *Acestrorhynchus* are flat spiny bony plates and all, including rudiments, were counted. The lower part of the first gill arch was always detached and observed under the stereomicroscope.

Posterior dentary tooth row - this count refers to a row of small close-set teeth which immediately follows the spaced anterior teeth on the dentary.

Ectopterygoid tooth row - this count refers to a row of small teeth on the ectopterygoid bones.

Maxillary tooth row - this count includes all maxillary teeth on the free edge of the maxillary bone in *Oligosarcus* and only conical teeth which follow the large maxillary canines in *Acestrorhynchus*.

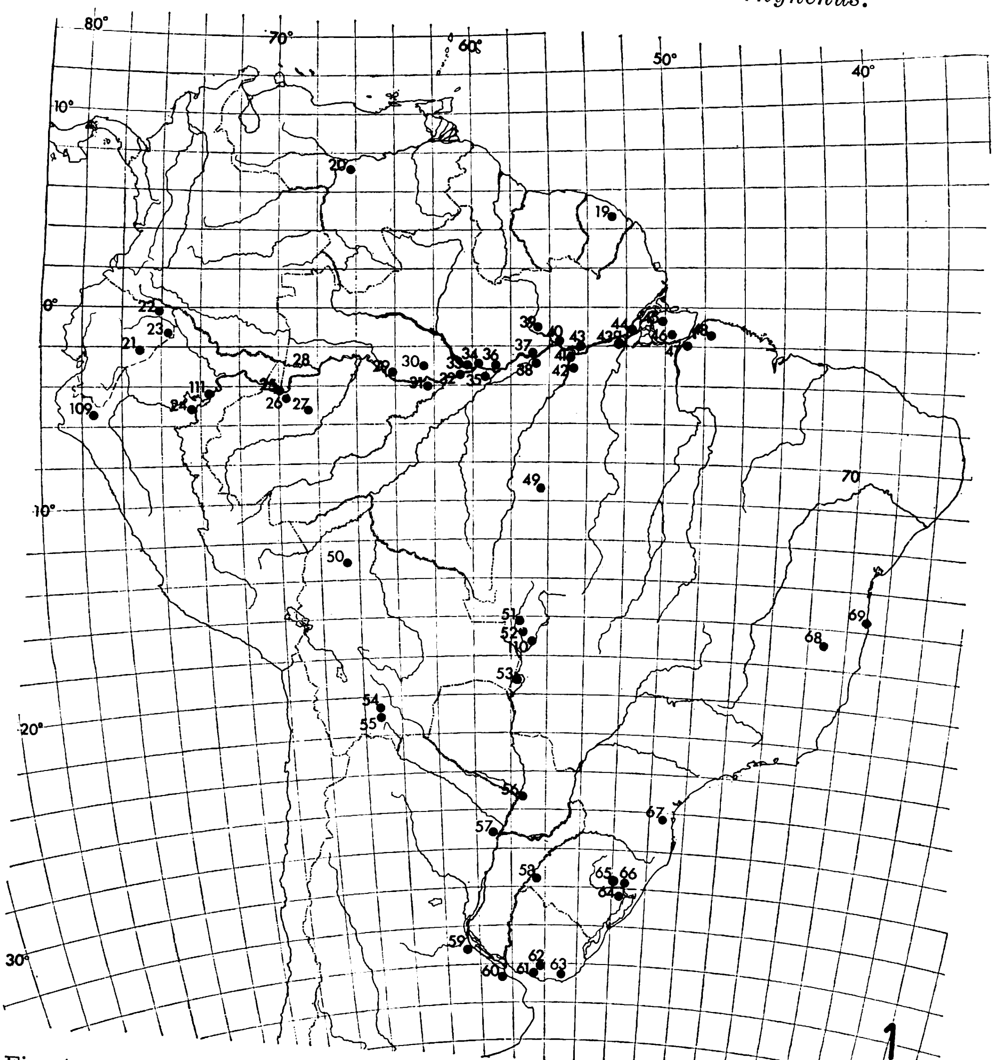


Fig. 1: localities from which material has been available for this study. Details are presented in the appendix.

Specimens for osteological studies were cleared and stained according to the method developed by Taylor (1967). All drawings were made from direct observation of specimens submerged in glycerine under the stereomicroscope. Figures 5A, 6A, 23A, 36A, 38A, 42A, 43A, 50A, 54A, 57A, 59A, 60A, are to a certain extent diagrammatic but the characters involved are accurate. The names of bones used in this work are those of Weitzman (1962).

Sexes were easily determined in those species of *Oligosarcus* and *Paroligosarcus* that exhibit sexual dimorphism. Sex in *Acestrorhynchus* was determined by examining sections of oviducts and spermaducts under high magnification.

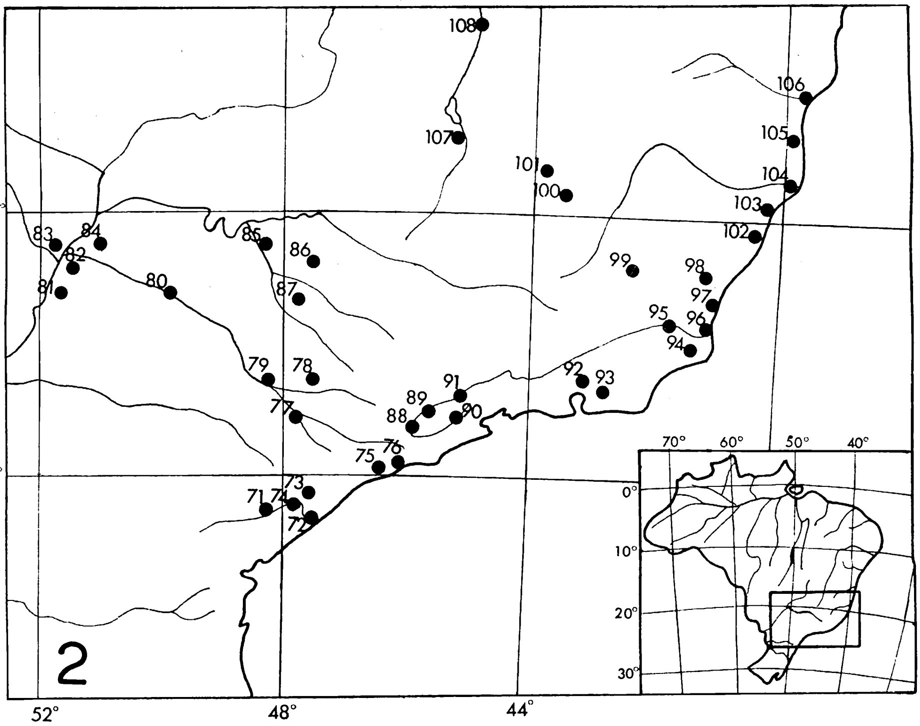


Fig. 2: localities (continued) from which material has been available for this study. Details are presented in the appendix.

The study of geographic variation was accomplished through the analysis of individual variation in single characters (Vanzolini, 1951; Vanzolini & Williams, 1962). The study of body proportions was based on routine regression analysis. The following regressions were analysed in all species: body depth on standard length, head length on trunk length, snout length on head length, orbital diameter on head length, interorbital distance on head length, interorbital distance on orbital diameter, caudal peduncle depth on body depth, pectoral fin length on standard length, ventral fin length on standard length, and pectoral fin length on ventral fin length. All regressions proved to be linear.

Because so many samples from any one locality contained very few specimens most of the analysis of meristic variation are based on tendencies rather than on absolute differences between samples. The following meristic characters were studied: number of branched anal fin rays, number of gill rakers, number of scales in the lateral line, number of scales above the lateral line, number of scales below the lateral line, and number of teeth on the posterior row on the dentary. The number of dorsal fin rays, ventral fin rays and caudal fin rays proved to be constant within the tribe and the number of pectoral fin rays and gill rakers showed intraspecific variation in just one case (Figs. 27 and 30).

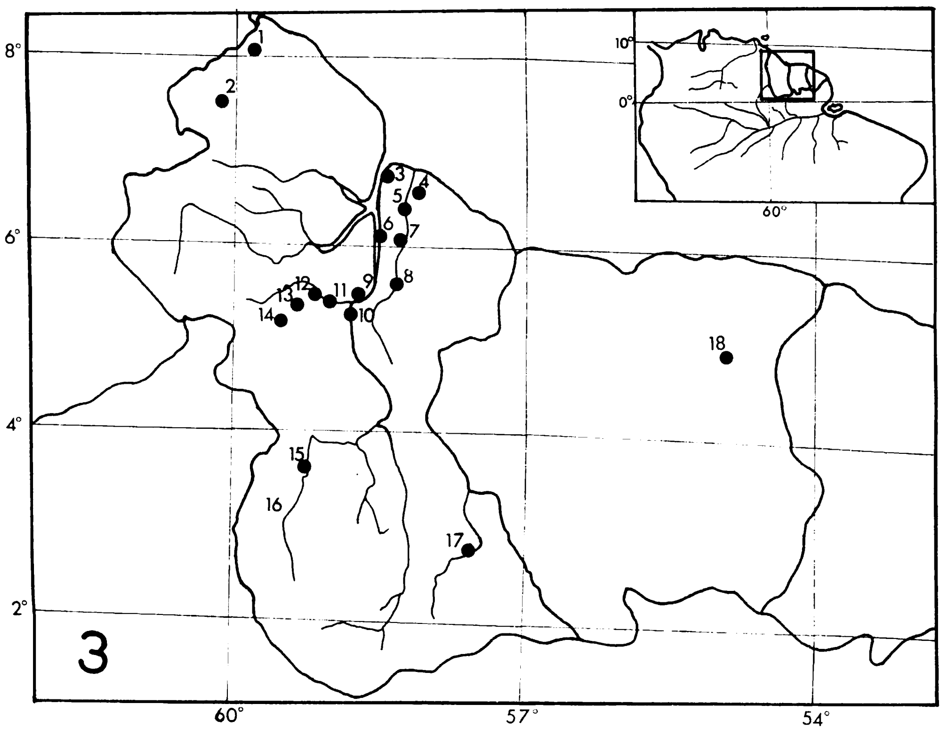


Fig. 3: localities (continued) from which material has been available for this study. Details are presented in the appendix.

The number of teeth on the ectopterygoid was used for the species of the genus *Oligosarcus* only, where they can be easily counted. In the species of the genus *Acestrorhynchus* these teeth are small and so close-set that it is hard to make an accurate count even under high magnification. The number of maxillary teeth was found to vary ontogenetically (see below) and therefore could be studied through regression analysis.

Data from males, females and juveniles were considered separately but with exception of the increase in the number of maxillary teeth with increasing standard length (see for instance fig. 104), no change in meristic values associated with growth was found.

TRIBE ACESTRORHYNCHINI GÉRY, 1956

Body elongate, compressed; circumorbital series complete with 8 bones; third infraorbital not covering cheek completely; premaxillary divided posteriorly into two arms, with one tooth row; branch of the laterosensory canal present or not on premaxillary; maxillary long, strongly toothed, the number of teeth varying with age; dentary with one or two rows of teeth; teeth well developed in both jaws, conical, slightly tricuspid or multicuspid; nostrils close together, much nearer to eye than to tip of snout; gape long, reaching and surpassing anterior border of orbit; gill membranes separate and free from the isthmus; laterosensory canal present on circumorbital series, nasals, frontals, parietals, extrascapulars, posttemporals, supracleithra, cleithra, preopercles, dentaries and maxillaries.

Scales cycloid, small to large; lateral line complete, curved anteriorly, the canal on each scale oblique either upward or downward; adipose dorsal fin present, situated over the end of anal fin base; anal fin base moderately long, fin with v, 21-32 rays; males with hooks on anal fin or not; dorsal fin with ii, 9 rays, situated between pelvics and anal fins, its origin always nearer to caudal base than tip of snout; caudal fin forked, lobes equal or lower lobe longer in some species; number of principal caudal rays 10/9; row of close-set teeth always present in the ectopterygoid bones.

The name Acestrorhynchidi, used for first time by Géry (*in* Hoedeman 1956:16), is here changed to Acestrorhynchini in conformity with recommendation 29A of the International Code of Zoological Nomenclature (1964:11). The name Acestrorhynchini is based on the genus *Acestrorhynchus*. The name based on the oldest genus (*Oligosarcus*) has not been adopted by usage and the oldest name, Acestrorhamphinae, is based ond a name which is but a synonym of *Oligosarcus*.

The tribe Acestrorhynchini is restricted to the South American continent east of the Andes.

KEY TO GENERA OF THE TRIBE ACESTRORHYNCHINI

1. First infraorbital bone small, in contact with or slightly covering a small part of the upper edge of the maxillary; maxillary without canines; teeth pentacuspid, tricuspid and slightly tricuspid; gill rakers long, slender, not spiny 2

   First infraorbital bone long, covering almost completely the maxillary when mouth is closed; maxillary with strong, sharp canines; all teeth conical; gill rakers short and broad, with well-developed spines on their surface .... *Acestrorhynchus*

2. Teeth conical and partially tricuspid; first infraorbital covering a small part of the upper edge of the maxillary; lower jaw equal to or slightly shorter than upper jaw when mouth is closed .... *Oligosarcus*

Teeth tricuspid and pentacuspid; first infraorbital in contact with maxilary; lower jaw longer than upper jaw when mouth is closed .... *Paroligosarcus*

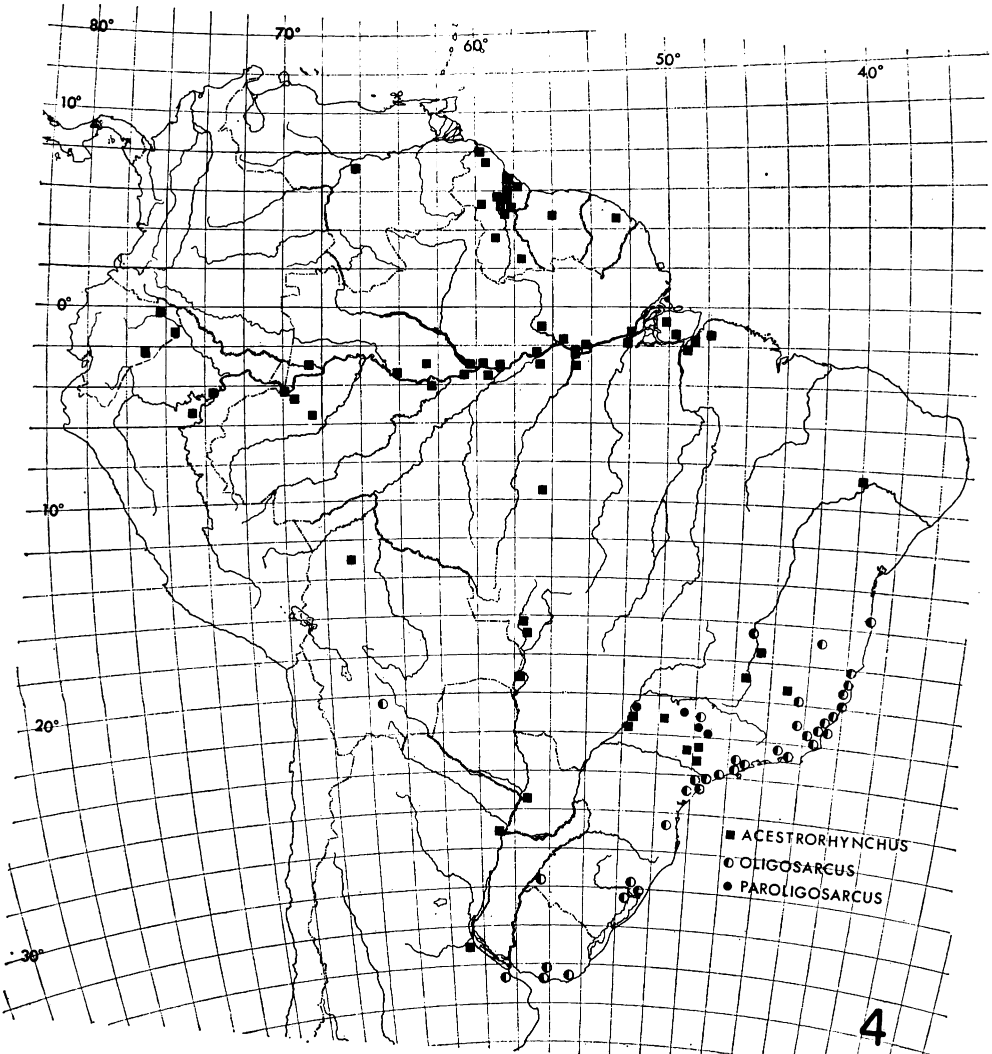


Fig. 4: geographic distribution of *Acestrorhynchus*, *Oligosarcus* and *Paroligosarcus*.

Genus **Paroligosarcus** Campos & Trewawas, 1949

(Figs. 61A, 62-64, 71)

Paroligosarcus Campos & Trewawas, 1949:157. Type-species *Oligosarcus pintoi* Campos, 1945.

NOMENCLATURAL NOTE

Campos (1945a:456) described *Oligosarcus pintoi* as belonging to the genus *Oligosarcus* Günther. Later on she and Trewawas (1949) erected a new subgenus, *Paroligosarcus* to receive the peculiar *Oligosarcus pintoi*. Fowler (1950:326) and Fernandes-Yepez (1955:7) ignored Campos & Trewawas paper and included this species under *Oligosarcus*.

DESCRIPTION

Body small (S. L. 34-88 mm), moderately deep; snout short, shorter than orbital diameter; premaxillary without foramina to receive the anterior mandibular teeth; ethmoid, prevomer, antorbital, infraorbital, mesopterygoid and nasal short; first infraorbital bone reduced, anteriorly in contact with the upper edge of the maxillary; rhinosphenoid small, in close contact with lateral ethmoid anteriorly, attached to orbitosphenoid by ligament only but not in contact with parasphenoid even in adult specimens; branch of the laterosensory canal absent from premaxillary; nasal bone tubular; anterior part of maxillary without canines; lower jaw with one tooth row; teeth tricuspid on premaxillary and maxillary, tricuspid to pentacuspid on the dentary; ectopterygoid tooth row short, with relatively large multicuspid teeth; lower jaw longer than upper jaw when mouth is closed; gill rakers long, not spiny (Fig. 5A); upper edge of opercle without notch: supraopercle a very distinct bone, not fused with subopercle; supraoccipital long, posteriorly pointed; scales large, 36-40 in the lateral line; anal fin slightly emarginate, situated a little nearer to caudal base than tip of snout, its anterior rays (Fig. 5B) with hooks in males.

DISTRIBUTION

The monotypic genus *Paroligosarcus* is restricted to small streams of the upper Paraná basin (Fig. 4).

Paroligosarcus pintoi (Campos, 1945)

(Figs. 5, 61A, 62-64, 71)

Oligosarcus pintoi Campos, 1945a:456 (type-locality: Rio Mogi-Guaçu; types in DZSP examined); 1945b:480; Fowler, 1950:326 (synomymy); Fernandez-Yepez, 1955:6 (diagnosis, distribution); Gomes & Monteiro, 1955:82-154.

Paroligosarcus pintoi; Menezes, 1969:218, 220.

Specimens studied (32) : DZSP — Usina do Limoeiro, Rio Pardo, São Paulo (9) ; Lagoa São Vicente, Pirassununga, São Paulo (2) ; Córrego do Pernilongo, Pereira Barreto, São Paulo (8) ; Rio Mogi-Guaçu, Pirassununga, São Paulo (13).

DIAGNOSIS

D. ii, 9; A. v, 25-28; P. 13-15; V. 8; 36-40 perforated scales in the lateral line; 7-9 scales from lateral line to origin of dorsal fin, 6-8 from lateral line to origin of anal; 13-15 gill rakers on the lower part of the first gill arch.

DESCRIPTION

Body small (S.L. 40-83 mm). Dorsal and ventral outlines of the body similarly curved, dorsal curvature from origin of dorsal to tip of snout interrupted at the occipital region by a slight depression. Snout conical, always shorter than orbital diameter at all ages. Mouth terminal; lower jaw projecting slightly when mouth is closed. Maxillary curved, narrow, bearing teeth most of which are tricuspid. Premaxillary with a large tricuspid tooth in front, followed by a row of 3 to 4 tricuspid teeth; a large tricuspid tooth similar to the first and 1 to 2 tricuspid teeth similar to the anterior ones follow this row. An inner

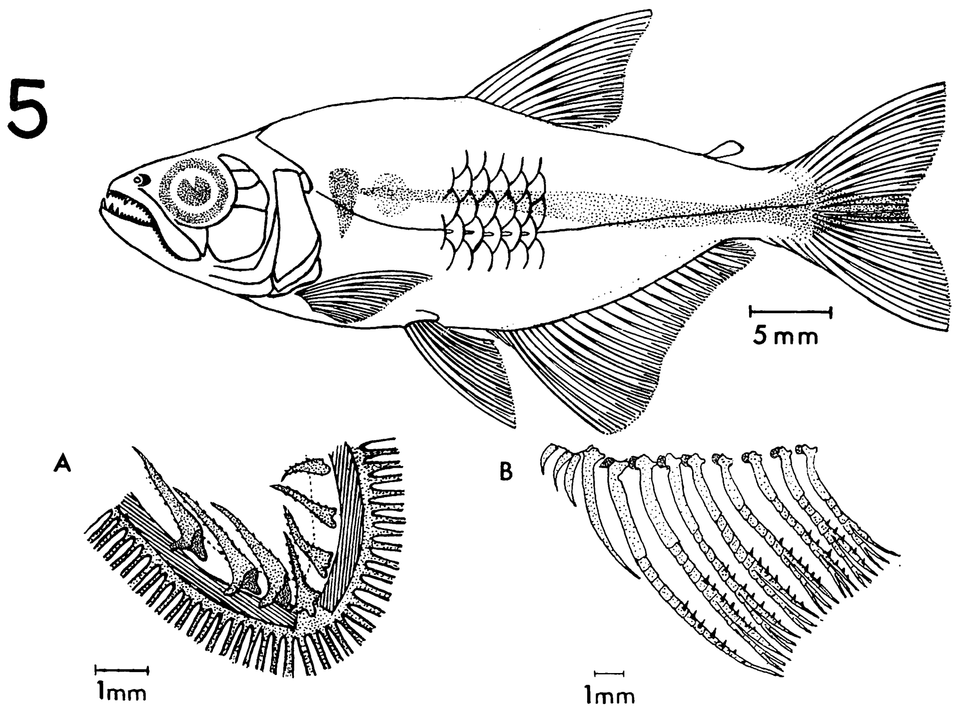


Fig. 5: *Paroligosarcus pintoi* (Campos), male, 54 mm S.L., DZSP 4656; A, gill rakers on first gill arch; B, anterior anal fin rays.

tricuspid tooth seems to be the representative of an inner row, there are 4 large tricuspid to pentacuspid teeth on the dentary, followed by a row of small tricuspid teeth variable in number (10-18). Number of multicuspid ectopterygoid teeth highly variable (5-14). 13-15 gill rakers on the lower part of the first gill arch.

Scales large on sides of the body, small above and below, lateral line curved anteriorly, with 36-40 scales; 7-9 scales from lateral line to origin of dorsal fin, 6-8 from lateral line to origin of anal. 1-2 rows of scales along the anal fin base. Ventral axillary scale very small, about one eighth as long as ventral fin.

Anal fin slightly lobed anteriorly, its origin under the base of dorsal fin. Number of anal fin rays v, 25-28. Ventral fins inserted between pectorals and dorsal origin, reaching anal fin. Pectorals long, always surpassing origin of ventrals.

Color in alcohol, dark brown above and somewhat lighter below; cheek, postorbital region and opercles, punctate with black pigment; a dark vertical humeral blotch followed by a light area; an axial dark stripe from about origin of dorsal fin to caudal base, where it becomes enlarged and forms a caudal blotch which continues through median caudal rays; all fins pale.

The measurements of the specimens are shown in appendix table 18; the regression data in figures 74-83 and appendix table 1.

Distribution

That of the genus (Figs. 4 and 7).

Geographic variation

The samples from the different localities in the upper Paraná basin proved to be quite homogeneous with regard to both meristic characters and body proportions.

Genus **Oligosarcus** Günther, 1864

(Figs. 65-67, 72)

Oligosarcus Günther, 1864:353. Type-species *Oligosarcus argenteus* Günther, 1864, by monotypy.

Oligosargus Eigenmann, 1910:447; 1917:33 (*Lapsus calami*)

Acestrorhamphus Eigenmann & Kennedy, Sept. 1903:527. Type-species *Hydrocyon hepsetus* Cuvier, by monotypy. (Eigenmann, Dec. 1903: 146. Types-species *Hydrocyon hepsetus* Cuvier, by original designation).

Description

Body small to moderately large (S.L. 53-235 mm), snout moderate, equal to or slightly longer than orbital diameter; premaxillary with one foramen to receive the first large mandibular tooth; ethmoid, prevomer, antorbital, infraorbital, mesopterygoid, and nasal moderate; first infraorbital short, slightly covering a small part of the upper edge of the maxillary; rhinosphenoid moderate, in close contact with lateral ethmoid anteriorly, attached to orbitosphenoid by ligament only, but not in contact with parasphenoid; branch of the laterosensory canal absent from premaxillary; nasal bone tubular; anterior part of maxillary without canines; lower jaw with but one tooth row; teeth conical on premaxillary, slightly tricuspid on maxillary, conical in the anterior part on the dentary, and slighthy tricuspid in the posterior row on the dentary; ectoptorygoid tooth row short, with slightly tricuspid teeth; lower jaw equal to or slightly shorter than upper jaw when mouth is closed; gill rakers slender, long, not spiny (Fig. 6A); opercle without notch in its upper edge; supraopercle not fused to subopercle; scales moderate, 43-83 in the lateral line; anal fin emarginate with v, 20-31 rays, its anterior part (Fig. 6B) with hooks in males, origin of dorsal fin situated a little nearer to caudal base than tip of snout.

DISTRIBUTION (fig. 4)

The species of *Oligosarcus* are mostly distributed among the rivers which drain the narrow coastal strip of Eastern Brazil and the rivers of Eastern Uruguay. Some specimens of *O. hepsetus* (Cuvier) have been recorded from the Rio Uruguay and the Lower Paraná and a few specimens from the Rio Paraguay. One specimen of *O. jenynsii* (Günther) has been recorded from the Rio São Francisco. *O. meadi*, sp. n., was found in a small stream in the Rio das Velhas basin and *O. bolivianus* (Fowler) in a small stream (Rio Lipeo) tributary of the Rio Camblaya in Bolivia.

KEY TO THE SPECIES OF *OLIGOSARCUS*

1. First premaxilary canine tooth included in the mandible when mouth is closed; dorsal outline from tip of snout to occipital region convex 2

   First premaxillary canine not included, free or resting in a small furrow on the anteriormost part of the mandible; dorsal outline from tip of snout to occipital region nearly straight 4

2. 10-11 scales from lateral line to origin of dorsal fin, 9-10 from lateral line to origin of anal .... *O. bolivianus*

   9 scales from lateral line to origin of dorsal fin, 7-8 from lateral line to origin of anal 3

3. 43 scales in the lateral line; 7 scales from lateral line to origin of anal .... *O. argenteus*

   46-49 scales in the lateral line; 7-8 scales from lateral line to origin of anal .... *O. meadi*, sp.n.

4. Body small (S.L. 53-77 mm); scales large, 46-52 scales in the lateral line; 8 scales from lateral line to origin of dorsal fin, 7 from lateral line to origin of anal .... *O. macrolepis*

Scales moderately large; 10-19 scales from lateral line to origin of dorsal fin 5

5. 75-83 scales in the lateral line; 17-19 scales from lateral line to origin of dorsal fin, 12-15 from lateral line to origin of anal .. .. *O. robustus*, sp.n.

10-15 scales from lateral line to origin of dorsal fin 6

6. 51-71 scales in the lateral line; 10-13 scales from lateral line to origin of dorsal fin, 8-10 from lateral line to origin of anal ... . *O. jenynsii*

68-82 scales in the lateral line; 14-15 scales from lateral line to origin of dorsal fin, 10-13 from lateral line to origin of anal .... *O. hepsetus*

Oligosarcus jenynsii (Günther, 1864)

(Figs. 6, 61C, 65-67, 72)

Hydrocyon hepsetus (not of Cuvier, 1829:312) Jenyns, 1842:129 (specimen collected by Darwin from the lake at Maldonado, Uruguay).

Xiphorhamphus jenynsii Günther, 1864:356 (based on Jenyns, 1842; type-locality: Lake at Maldonado; type in BM(NH), not seen; topotypes examined); Steindachner, 1869:299 (Montevideo); 1876:53 (part: Rio Paraíba; Rio Piabanha in Teresópolis; Rio Doce; São Mateus; Itabapoana); 1891:371 (Arroyo Miguelete; Rio Paraíba; description); Hensel, 1870:89 (Rio Guaíba in Pôrto Alegre; descripton); Eigenmann, 1894:635 (Rio Grande do Sul, Brazil; listed); 1910:447 (listed); Evermann & Kendall, 1907:84 (Argentina).

Acestrorhamphus jenynsii; Eigenmann & Ogle, 1907:35 (La Paz; Montevideo, Uruguay); Eigenmann, 1910:447 (listed); MacDonagh, 1930:231-233 (Laguna Cochicó, Argentina); 1931:255-289 (listed); 1934:49 (listed); 1934a:183-197 (Laguna Alsina, Argentina); Pozzi, 1945:257 (listed); Fowler, 1950:325-326 (synonymy); Aramburu, 1953:308 (description); Fernandez-Yepez, 1955:5 (diagnosis); Menezes, 1969:218, 221.

Acestrorhynchus jenynsii; Devincenzi, 1924:178 (Arroyo Miguelete, Uruguay).

Acestrorhamphus hepsetus (not of Cuvier 1829:312) Campos, 1945:481 (part; Rio Juquiá; Rio São Francisco; specimens examined).

Xiphorhamphus brachycephalus Cope, 1894:84 (type-locality: Rio Grande do Sul, Brazil; types and syntypes in ANSP, examined); Ihering, 1897:21 (diagnosis).

Sphyraenocharax brachycephalus; Fowler, 1906:84 (syntypes of Cope); 1950:326 (Rio Grande do Sul; synonymy).

Acestrorhamphus brachycephalus; Eigenmann, 1907:452 (La Plata; diagnosis); 1910:447 (listed); Campos, 1945b:482 (Rio Paraíba; specimen examined); Fernandez-Yepez, 1955:5 (diagnosis).

Acestrorhamphus purpureus Messner, 1962:1-5 (type-locality: Rio Olimar, Montevideo; type in MNHN, not seen).

Specimens studied (130) : ANSP — Rio Grande do Sul (2) ; MCZ — Maldonado (11), Mendes, Rio de Janeiro (1), Teresópolis, Rio de Janeiro (5), Rio Paraíba (16), Santa Clara, Rio Mucuri (1), Rio Doce, Espírito Santo (8), São Mateus, Rio São Mateus (1) ; Itabapoana, Rio Itabapoana (1) ; DZSP — Montenegro, Rio Grande do Sul (2), Pôrto Alegre, Rio Grande do Sul (1), Santa Adela, Uruguay (3). Iporanga, São Paulo (3), Registro, São Paulo (1), Cubatão, São Paulo (4), Piassaguera, São Paulo (2), São Luís do Paraitinga, São Paulo (2), São Fidélis, Rio de Janeiro (9), São João da Barra, Rio de Janeiro (5), Atafona, Rio de Janeiro (2), Cachoeiro do Itapemirim, Espírito Santo (1), Rio Doce, Minas Gerais (1), Rio Doce, Espírito Santo (12), Rio Santa Maria, Espírito Santo (3) Rio São José, Espírito Santo (3), Belmonte, Bahia (6), Rio São Francisco (1).

DIAGNOSIS

D. ii, 9; A. v, 23-31; P. 13-16; V. 8; 51-71 perforated scales in the lateral line; 10-13 scales from the lateral line to the origin of dorsal fin, 8-10 from lateral line to origin of anal; 12-16 gill rakers on the lower part of the first gill arch. This species is most closely related to *Oligosarcus hepsetus* (Cuvier, 1829:312) from which it differs by having a fewer number of scales in, above and below the lateral line. The predorsal outline (from tip of snout to origin of dorsal fin) is evenly curved in *O. jenynsii* whereas in *O. hepsetus* there is a pronounced depression at the occipital region. The species are sympatric and occur together in most of the rivers in the total range of *O. jenynsii.*

6

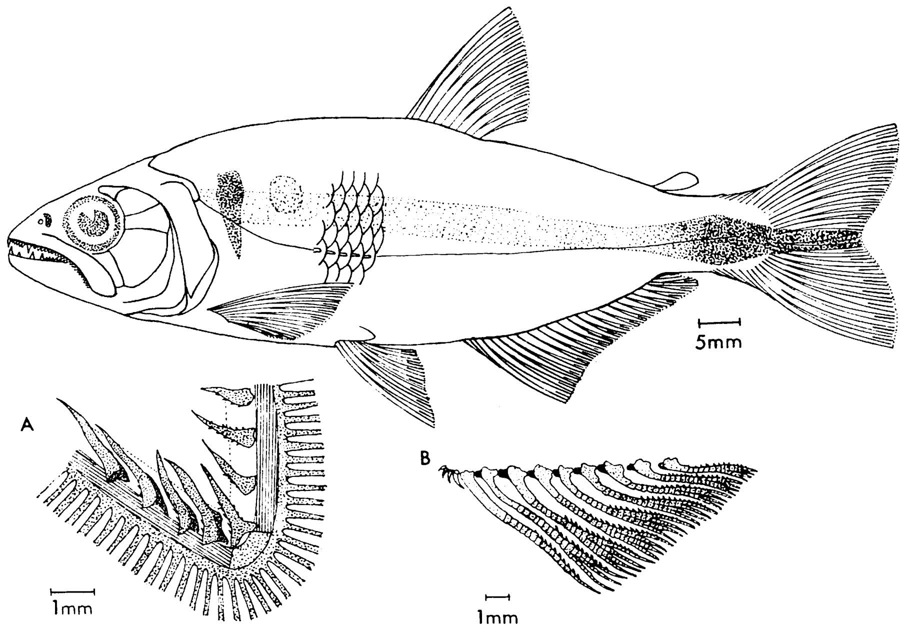


Fig. 6: *Oligosarcus jenynsii* (Günther), male, 115 mm S.L., MCZ 20613a; A, gill rakers on first gill arch; B, anterior anal fin rays.

DESCRIPTION

Body moderate (S.L. 46-222 mm). Dorsal and ventral outlines of the body similarly curved, dorsal outline from origin of dorsal fin to tip of snout almost evenly curved.

Snout pointed, shorter than orbital diameter in young, equal to or slightly longer than orbital diameter in adults. Mouth terminal; jaws equal when closed or lower jaw projecting slightly when opened. Maxillary curved, bearing teeth that are slightly tricuspid. Premaxillary with a large canine in front, followed by a row of five nearly conical teeth of which the middle one is the largest; a large canine similar to the anterior one follows this row. The large anterior premaxillary canine rests in a small furrow on the anterior part of the mandible when mouth is closed. Dentary with a large canine in front, followed

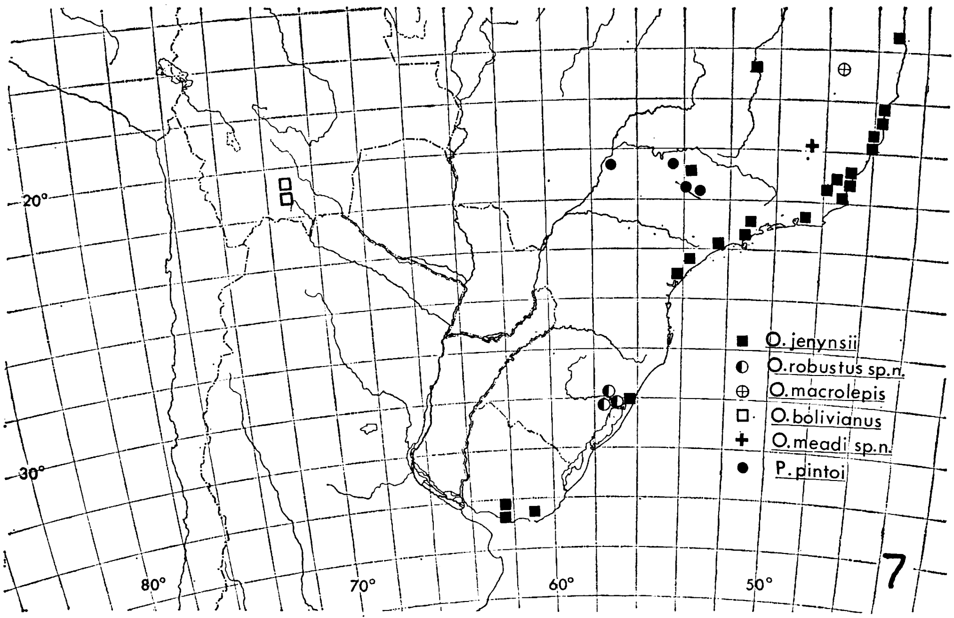
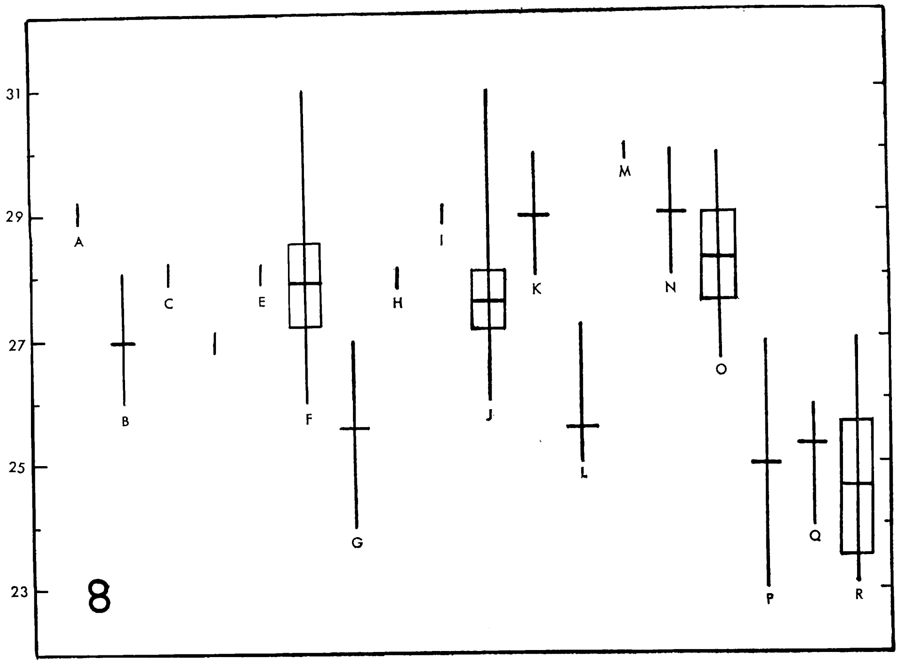


Fig. 7: geographic distribution of *Oligosarcus jenynsii* (Günther), *robustus*, sp. n., *macrolepis* (Steindachner), *bolivianus* (Fowler), *meadi*, sp. n. and *Paroligosarcus pintoi* (Campos).

by three conical teeth, the size of which increases gradually from the first to the third, the last being almost a canine and then a row of slightly tricuspid teeth variable in number (10-23). Number of ectopterygoid teeth highly variable (9-22). 12-16 gill rakers on the lower part of the first gill arch.

Lateral line with a slight curvature in front, with 53-71 scales; 10-13 scales from lateral line to origin of dorsal fin, 8-10 from lateral line to origin of anal. Single row of scales along the anterior part of



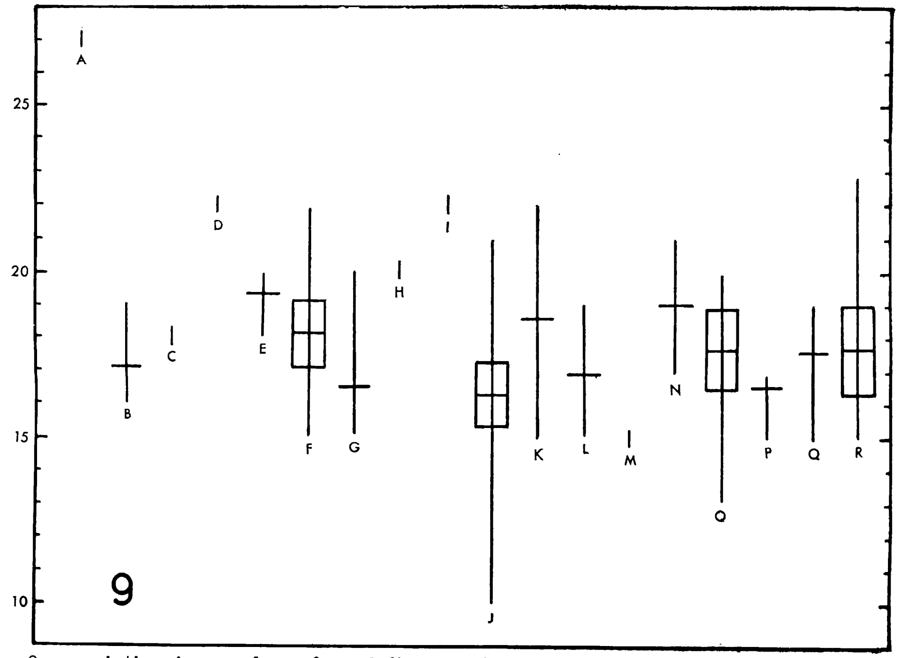
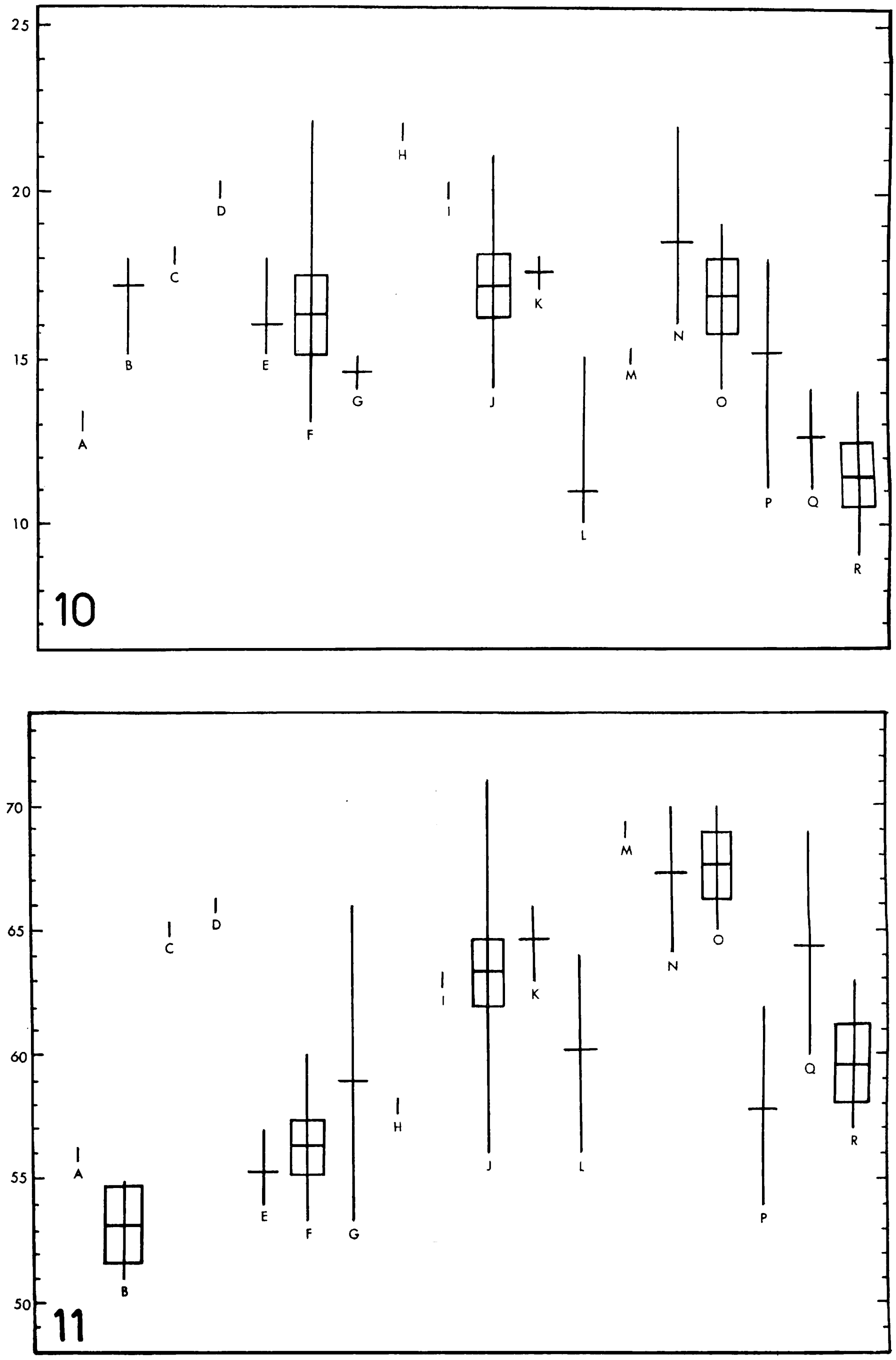


Fig. 8: variation in number of anal fin rays in *Oligosarcus jenynsii* (Günther). The samples are arranged from north (A) to south (R). The crossbar in each sample indicates the mean and the the hollow rectangle *t* standard deviations on either side of the mean. A, Rio São Francisco; B, Rio Jequitinhonha; C, Rio Mucuri; D, Rio São Mateus; E, Rio São José; F, Rio Doce; G, Rio Santa Maria; H. Cachoeiro do Itapemirim; I, Itabapoana; J, Rio Paraíba; K, Lagoa Feia; L, Teresópolis; M, Franca; N, Cubatão; O, Rio Quilombo; P, Rio Guaíba; Q, Chamizo; R, Maldonado.
Fig. 9: variation in number of posterior teeth on the dentary in *Oligosargus jenynsii* (Günther). Localities as in fig. 8.



Oligosarcus jenynsii (Günther). Fig. 10: variation in number of ectopterygoid teeth; fig. 11: variation in number of lateral line scales. Localities as in fig. 8.

anal fin base, continued back to the fifteenth or sixteenth branched ray. Ventral axillary scale about one third as long as ventral fin.

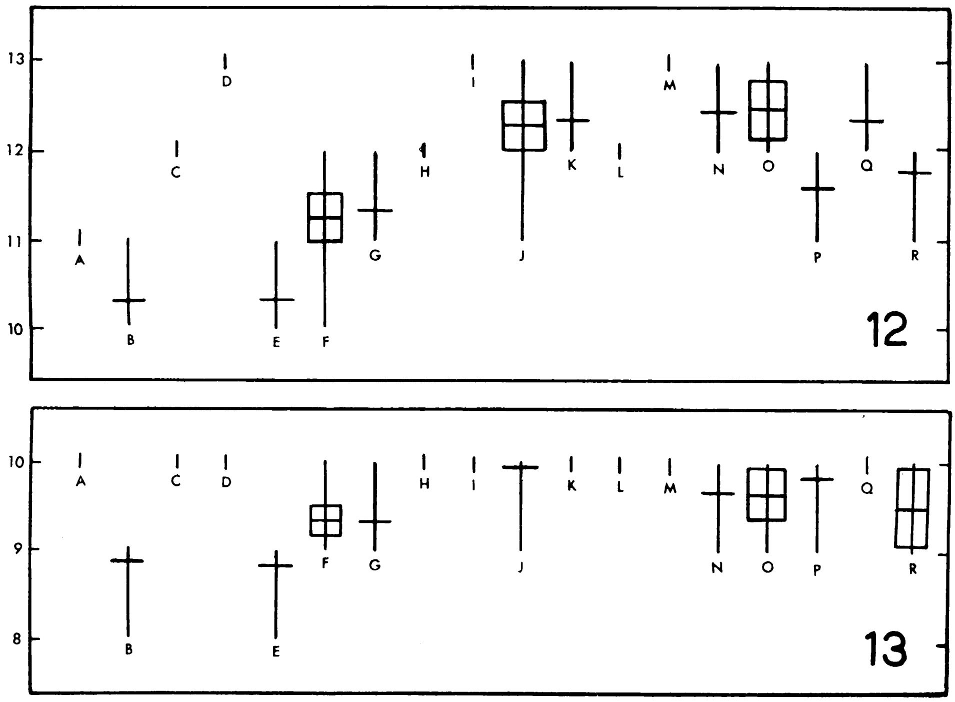
Anal fin with anterior lobe, its insertion under one of the last two or three dorsal fin rays. Number of anal fin rays v, 23-31. Ventral fins not reaching anal fin but reaching and passing a little over the anus. Pectorals moderately long, reaching and sometimes surpassing origin of ventrals. Hooks on anterior rays of anal fin a little recurved.

Color in alcohol, dark brown above, light yellow below; sides and below with silvery white reflections; cheek, postorbital region and opercles with scattered black pigment; a dark vertical blotch in the humeral region gently tapering below, immediately followed by a light area and then by a rather diffuse dark blotch; an axial dark silvery stripe, thin at its beginning, becoming enlarged and blackier posteriorly on sides of the caudal peduncle, extending back finally over median caudal rays; all fins pale; edge of dorsal, anal and caudal fins punctate with black pigment.

The measurements of the specimens are presented in appendix table 19; the regression data in figures 84-93 and apendix table 2.

Distribution (fig. 7)

Rivers of Eastern and Southeast Brazil from Bahia to Rio Grande do Sul; Uruguay and Argentina.



Oligosarcus jenynsii (Günther). Fig. 12: variation in number of scales above the lateral line; fig. 13: variation in number of scales below the lateral line. Localities as in fig. 8.

GEOGRAPHIC VARIATION

1. Meristic characters. Variation in number of anal rays, teeth and scales are shown in figures 8-13. Specimens from Maldonado, Chamizo, Rio Guaíba, Teresópolis and Rio Santa Maria tend to have fewer branched anal rays and specimens from the rios Guaíba, Santa Maria, Doce, São José, Jequitinhonha and São Francisco tend to have fewer scales above lateral line. The number of scales below the lateral line is a character which tends to vary clinally (Fig. 13), although the single specimens from the rios São Mateus, Mucuri and São Francisco tend to distort the general picture. The single specimen from the Rio São Francisco has a significantly larger number of posterior teeth on the dentary. In other respects meristic variation appears to be without geographical significance.

2. Body proportions. The analysis of the several regressions revealed close agreement for all samples.

From the evidences brought forward by the analysis of meristic characters and body proportions we can conclude that there is no variation of taxonomic significance. Most of the characters in the total range of the species do not seem to follow any definite pattern of variation.

Oligosarcus hepsetus (Cuvier, 1829)

(Figs. 14, 61D)

Hydrocyon hepsetus Cuvier, 1829:312 (type locality: Brazil, probably in Rio de Janeiro; type not seen); Valenciennes, 1874:9 (Rio de Janeiro).

Xiphorhamphus hepsetus; Müller & Troschel, 1844:39 (America do Sul); 1845:17; Günther, 1864:356 (Rio de Janeiro; description); Hensel, 1870:88 (Rio Guaíba; description); Steindachner, 1876:593 (part; Rio Paraíba, Rio Piabanha in Teresópolis, Rio Doce, São Mateus, Itabapoana); 1891:371 (Arroyo Miguelete; Rio Paraíba; description); Eigenmann & Eigenmann, 1891:58 (listed); Ihering, 1893:26 (diagnosis); 1897:21 (diagnosis); Boulenger, 1896a:154 (Colônia Alpina, Rio de Janeiro).

Xiphorhynchus hepsetus; Cuvier & Valenciennes, 1849:343 (Rio de Janeiro).

Acestrorhamphus hepsetus;? Eigenmann & Kennedy, 1903a:527 (Asunción, Paraguay); Eigenmann, Mc Atee & Ward, 1907:154 (Paraguay); Eigenmann, 1907:452 (La Plata; listed); MacDonagh, 1940:95 (listed); Devincenzi & Teague, 1942:82 (Rio Uruguay); Pozzi, 1945:257 (listed); Campos, 1945b:481 (part; Rio Juquiá; Rio São Francisco; specimens examined); Gomes, 1947:22 (Lagoa dos Quadros, Rio Grande do Sul); Fowler, 1950:325 (synonymy); Aramburu, 1953:311 (description); Fernandez-Yepez, 1955:5 (diagnosis); Géry, 1960:278 (Rio Humboldt, Santa Catarina; description); Menezes, 1969:218, 221.

Acestrorhynchus hepsetus; Devincenzi, 1924:178 (Arroyo Miquelete, Uruguay).
Xiphorhamphus hepseticus; Castelnau, 1855:75 (Bahia; listed).
Xiphorhamphus jenynsii; Günther, 1880:13 (Rio La Plata; specimens examined).
Xiphorhamphus pericoptes Müller & Troschel, 1844:93 (type-locality: Brazil; type not seen); 1845:18 (description); Eigenmann & Eigenmann, 1891:58 (listed); Günther, 1864:355 (compiled from Müller & Troschel, 1845:18).
Acestrorhamphus pericoptes; Eigenmann, 1910:447 (listed); Campos 1945b:482 (Lagoa Feia, Rio de Janeiro; specimens examined).
Sphyraenocharax pericoptes; Fowler, 1950:327 (synonymy).
Xiphorhamphus oligolepis Steindachner, 1876:339 (type-locality: Rio La Plata; types not seen).
Acestrorhamphus oligolepis; Eigenmann, 1910:447 (listed); Pozzi, 1945: 257 (listed).
Sphyraenocharax oligolepis; Fowler, 1950:327 (synonymy).
Hydrocyon falcatus (not of Bloch, 1794:120) Quoy & Gaimard, 1824: 221 (Rio de Janeiro).

Specimens studied (77): MCZ — Buenos Aires (10), Rio Paraíba, Rio de Janeiro (4); BM(NH) — Rio Novo, Santa Catarina (9); DZSP — Itaqui, Rio Grande do Sul (7), Iguape, São Paulo (4), Registro, São Paulo (2), Iporanga, São Paulo (6), Cachoeira, São Paulo (4), Taubaté, São Paulo (1), São Luís do Paraitinga, São Paulo (3), Santa Branca, São Paulo (4), Magé, Rio de Janeiro (4), Pôrto Cachoeiro, Espírito Santo (7).

DIAGNOSIS

D. ii, 9; A. v, 24-31; P. 13-17; V. 8; 68-82 perforated scales in the lateral line; 14-15 scales from lateral line to origin of dorsal fin, 10-13 from lateral line to origin of anal; 13-17 gill rakers on the lower part

14

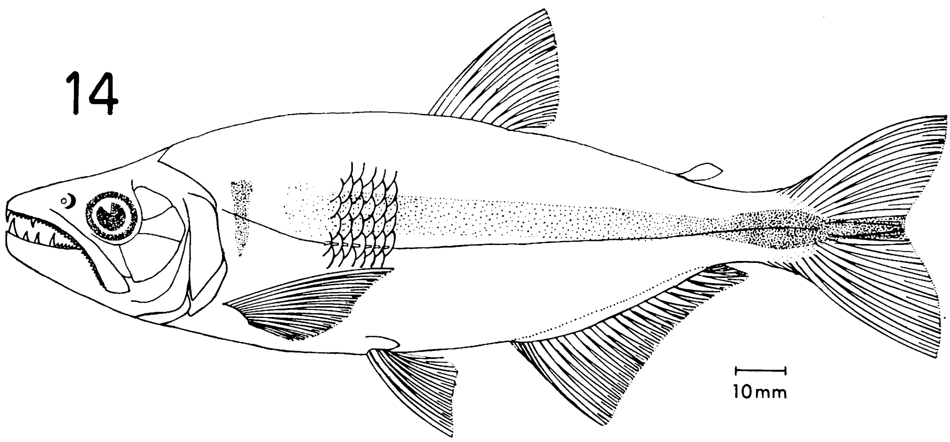


Fig. 14: *Oligosarcus hepsetus* (Cuvier), male, 180 mm S.L., MCZ, 20548b.

of the first gill arch. This species is closely related to *O. jenynsii* (Günther) and the comparisons are given under the latter diagnosis.

DESCRIPTION

Body moderately large (S.L. 43-238 mm). Dorsal and ventral outlines of the body almost evenly curved, dorsal outline from origin of dorsal fin to tip of snout interrupted at occipital region by a depression. Snout pointed, equal to or slightly shorter than orbital diameter in young, much longer in adults. Mouth terminal; lower jaw projecting slightly when mouth is open, or slightly shorter than upper jaw when mouth is firmly closed. Maxillary curved, narrow anteriorly, and widening posteriorly, with slightly tricuspid teeth. Premaxillary with a large canine in front, followed by five nearly conical teeth; a large canine similar to the first and a conical tooth similar to the anterior ones follow these teeth. The large anterior canine, as in *O. jenynsii* (Günther) also rests in a small furrow on the anterior part of the mandible when mouth is closed. The composition, size and shape of the teeth on dentary are identical to those in *O. jenynsii*. The number of posterior small slightly tricuspid teeth on the dentary varies from 12-24 and on the ectopterygoid from 11-23. There are 13-17 gill rakers on the lower part of the first gill arch.

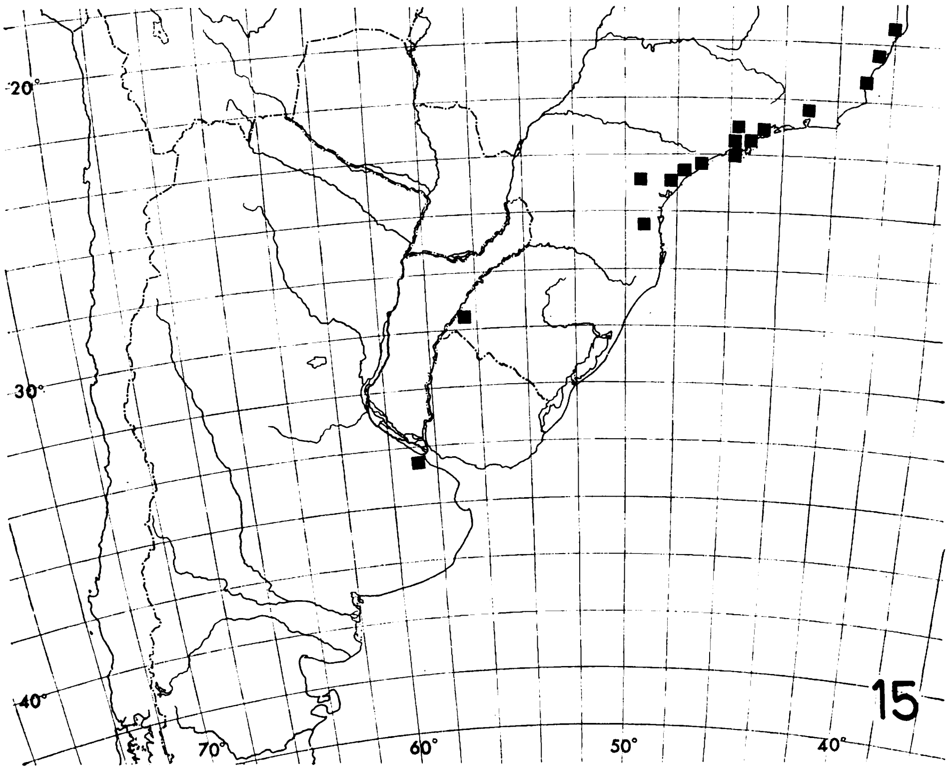
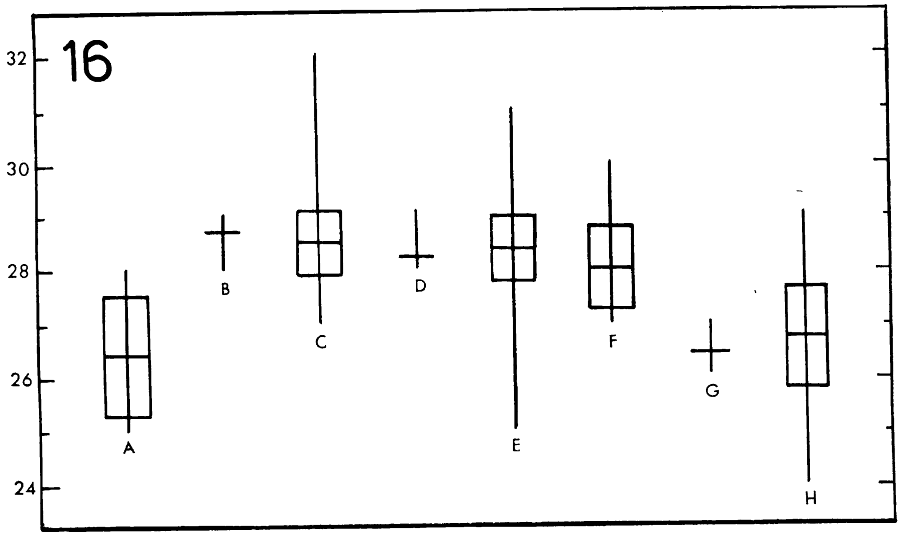
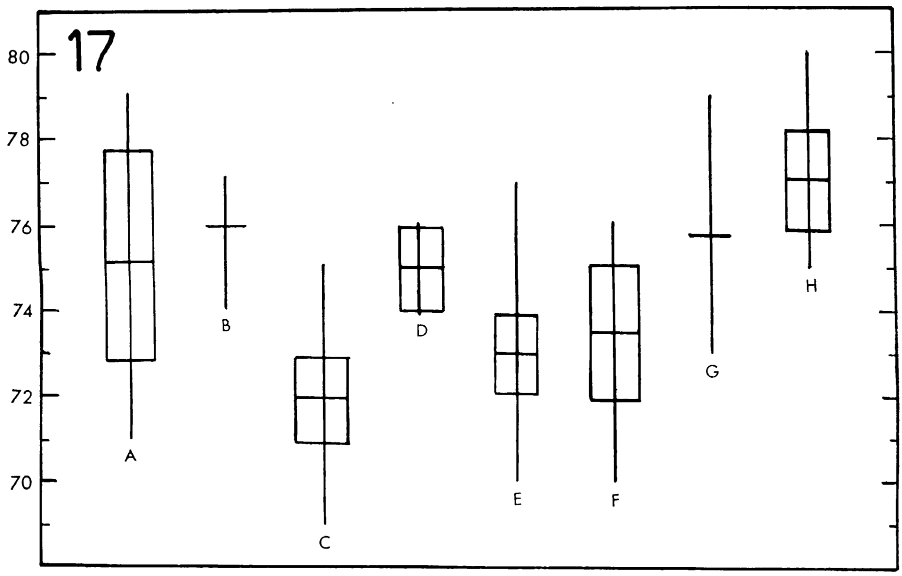


Fig. 15: geographic distribution of *Oligosarcus hepsetus* (Cuvier).





Oligosarcus hepsetus (Cuvier). Fig. 16: variation in number of anal fin rays. The samples are arranged from north (A) to south (H). In each sample the crossbar indicates the mean and the hollow rectangle *t* standard deviations on either side of the mean. A, Rio Santa Maria; B, Magé; C, Rio Paraíba; D, Cubatão; E, Rio Ribeira; F, Santa Catarina; G, Itaqui; H, Buenos Aires. Fig. 17: variation in number of lateral line scales. Localities as in fig. 16.

Lateral line with 68-82 scales: 14-15 scales from lateral line to origin of dorsal fin, 10-13 from lateral line to origin of anal. Single row of scales along the anterior portion of anal fin base continued back to the sixteenth branched ray. Ventral axillary scale about one fourth as long as ventral fin.

Anal fin lobed anteriorly, inserted behind dorsal fin. Number of anal fin rays v, 24-31. Ventral fins not reaching anal but surpassing anus. Pectorals long, surpassing origin of ventrals.

Color in alcohol, identical with that of *O. jenynsii.*

The measurements of the specimens are shown in appendix table 20; the regression data in figures 84-93 and appendix table 3.

DISTRIBUTION (fig. 15)

Rivers of Eastern and Southeast Brasil, from Espírito Santo to Rio Grande do Sul; Uruguay and Paraná river basins including the rios Paraná, Paraguay and Uruguay.

GEOGRAPHIC VARIATION

1. Meristic characters. Specimens from Itaqui, Buenos Aires, Santa Catarina and Rio Santa Maria tend to have fewer branched anal rays (Fig. 16) and the samples from Buenos Aires and Santa Catarina tend to have more scales in the lateral line (Fig. 17). Otherwise there is no significant geographical variation in meristic characters.

2. Body proportions. No differences between the samples were found in the analysis of the several regressions.

The results of the analysis of meristic characters and body proportions indicate that although there are some minor differences (meristic characters), the various samples should be considered as local variations of a widespread species.

Oligosarcus robustus, sp.n.

(Fig. 18)

Xiphorhamphus hepsetus (not of Cuvier 1829:312) Cope, 1894:85 (Rio Grande do Sul; specimens examined).
Acestrorhamphus hepsetus (not of Cuvier 1829:312) Fowler, 1906:460 (Rio Grande do Sul, specimen examined).
Acestrorhamphus sp. A. Menezes, 1969: 219, 221.

Type-locality: Rio Caí in Montenegro, Rio Grande do Sul, Brazil (Guaíba River basin).

Holotype: DZSP 4917, collected by Renato Leal.

Paratypes: ANSP — Rio Grande do Sul (2); MCZ — Rio Grande do Sul (5); DZSP — Montenegro, Rio Grande do Sul (3), São Leopoldo, Rio Grande do Sul (2), Salto Chico, Uruguay (3), Pôrto Alegre, Rio Grande do Sul (6).

DIAGNOSIS

D. ii, 9; A. v, 23-28; P. 14-16; V. 8; 75-85 perforated scales in the lateral line: 17-19 scales from lateral line to origin of dorsal fin, 12-15 from lateral line to origin of anal; 14-17 gill rakers on the lower part of the first gill arch. This species is closely related to *O. hepsetus* (Quoy & Gaimard) from which it differs by having a higher number of scales in, above, and below the lateral line. Both forms occur together in the Uruguay River.

DESCRIPTION

Body large and massive (S.L., 85-215 mm). Dorsal outline more strongly curved than ventral. Head depressed at occipital region, from where the dorsal outline rises abruptly. Snout pointed, equal to orbital diameter in very young specimens, much longer in adults. Mouth terminal; jaws equal when open or upper jaw projecting when closed. Maxillary curved, narrow anteriorly, widening gently posteriorly, larger than in the previous species. Composition, size and shape of teeth on premaxillary and dentary identical with those of *O. hepsetus*. The large anterior canine on the premaxillary is free or touches slightly the anteriormost part of the mandible. The number of posterior small slightly tricuspid teeth on the dentary varies from 14-23 and on the ectopterygoid from 12-21. There are 14-17 gill rakers on the lower part of the first gill arch.

Lateral line with 75-85 scales; 17-19 scales from lateral line to origin of dorsal fin, 12-15 from lateral line to origin of anal. Single row of scales along the anterior portion of anal fin base continued back to about the twentieth branched ray. Ventral axillary scale about one third as long as ventral fin.

Anal fin slightly lobed anteriorly, inserted behind dorsal fin. Number of anal fin rays v, 23-28. Ventral fins extending beyond anus but not to anal fin. Pectorals long, surpassing origin of ventrals.

Color in alcohol identical to that of *O. jenynsii*.

The measurements of the specimens are shown in appendix table 21; the data from regression analysis in figures 84-93, and appendix table 4.

DISTRIBUTION (fig. 7)

Guaíba River basin in Rio Grande do Sul, Brazil and Uruguay River basin in Uruguay.

GEOGRAPHIC VARIATION

The samples from the rios Guaíba and Uruguay proved to be identical in both meristic and morphometric characters.

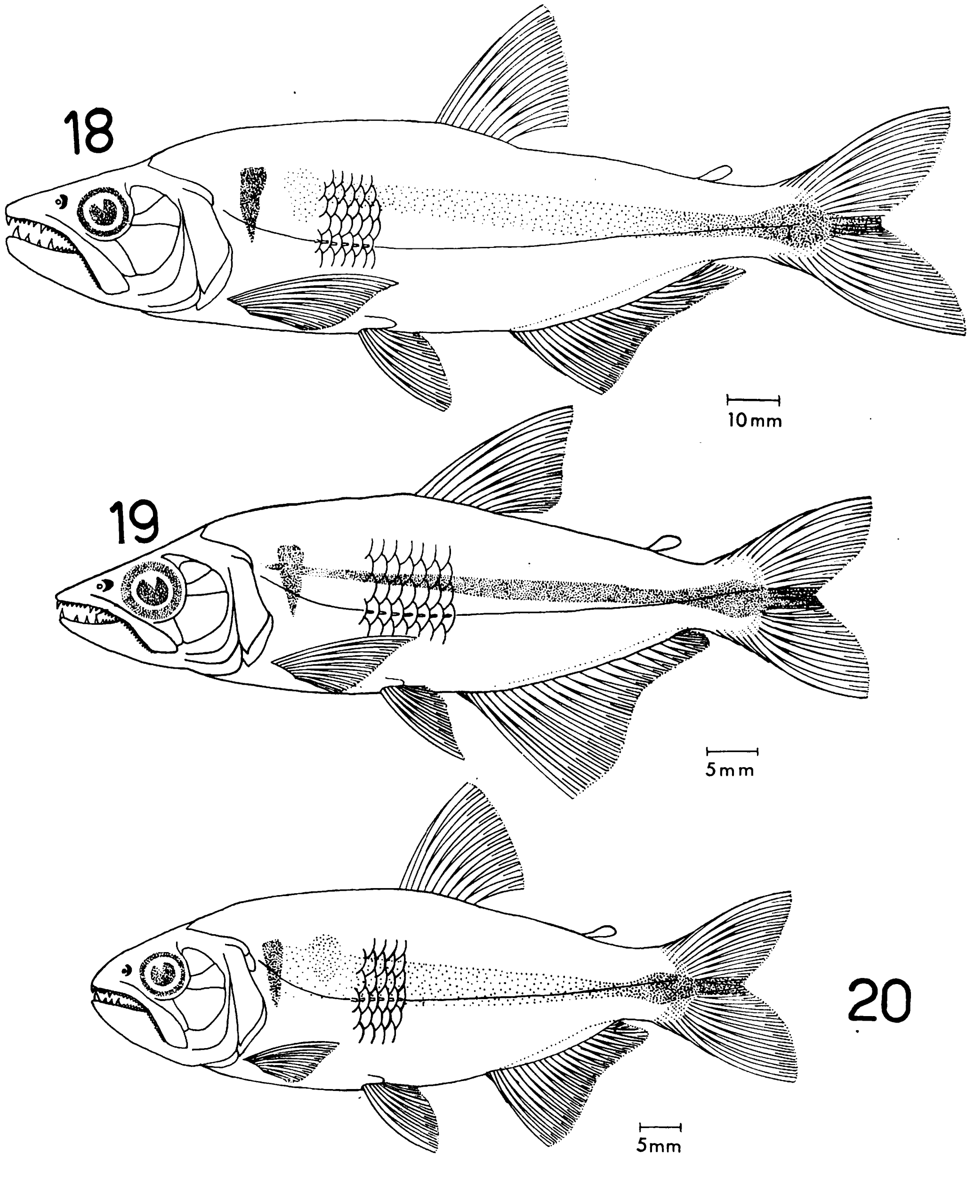


Fig. 18: *Oligosarcus robustus*, sp. n., male, 182 mm S.L., DZSP 4918; fig. 19: *macrolepis* (Steindachner), female, 77 mm S.L., MCZ 20607; fig. 20: *bolivianus* (Fowler), male, 102 mm S.L., ANSP 79790.

Oligosarcus macrolepis (Steindachner, 1876)

(Fig. 19)

Xiphorhamphus macrolepis Steindachner, 1876:594 (type-locality: Rio Jequitinhonha; type in Vienna Museum, not seen; topotypes examined); Eigenmann & Eigenmann, 1891:58 (listed).

Acestrorhamphus macrolepis; Eigenmann, 1910:447 (listed); ?Campos, 1945b:482 (Juquiá, São Paulo; probably a misidentification); Fowler, 1950:326 (synonymy); Fernandez-Yepez, 1955:5 (diagnosis).

Specimens studied (4): MCZ — Rio Jequitinhonha (1); DZSP — Itaobim, Minas Gerais, Rio Jequitinhonha (3).

Diagnosis

D. ii, 9; A. v, 24-26; P. 14; V. 8; 46-52 perforated scales in the lateral line; 8 scales from lateral line to origin of dorsal fin, 7 from lateral line to origin of anal; 14-15 gill rakers on the lower part of the first gill arch. This species is related to *O. jenynsii* (Günther) but has larger scales and consequently a fewer number of scales in, above, and below the lateral line. They are sympatric in the Jequitinhonha River.

Description

Body small (S.L. 53-77 mm). Dorsal and ventral outlines of the body similarly curved; dorsal outline from tip of snout to origin of dorsal fin evenly curved. Snout conical, shorter than orbital diameter; jaws equal when closed or lower jaw projecting slightly when opened. Maxillary curved, narrow anteriorly, gradually becoming wider posteriorly, weaker than that of *O. jenynsii.* Composition, size and shape of dentary and premaxillary teeth identical with those of *O. jenynsii.* Number of posterior small slightly tricuspid teeth on the dentary varying from 13-20 and on the ectopterygoid from 12-14. Number of gill rakers on the lower part of the first gill arch 14-15.

Lateral line with 46-48 scales; scales above lateral line 8, below lateral line 7. Single row of scales along anterior portion of anal fin base continued back to the thirteenth branched ray. Ventral axillary scale moderate about one fourth as long as ventral fin.

Anterior lobe of anal fin not very pronounced; origin of the fin behind dorsal fin. Number of anal fin rays, v, 24-26. Ventral fins almost reaching anal fin. Pectorals long, surpassing origin of ventrals.

Color in alcohol identical with that of *O. jenynsii.*

The measurements of the specimens are presented in appendix table 22; the regression data in figures 84-93 and appendix table 5.

Distribution (fig. 7)

Jequitinhonha River basin.

Oligosarcus bolivianus (Fowler, 1940)
(Fig. 20)

Acestrorhamphus bolivianus Fowler, 1940:53 (type-locality: Rio Lipeo, Bolivia; type and syntypes in ANSP, examined); 1950:324 (Bolivia).

Specimens studied (10): ANSP —Monte Bello, Tarija, Bolivia (6), Villa Montes, Tarija, Bolivia (4).

DIAGNOSIS

D. ii, 9; A. v, 20-24; P. 14; V. 8; 49-55 perforated scales in the lateral line; 10-11 from lateral line to origin of dorsal fin, 9-10 from lateral line to origin of anal; 14-15 gill rakers on the lower part of the first gill arch. This species is most similar to *O. argenteus* Günther in proportions and general body form. It has, however, a larger number of scales in, above, and below the lateral line.

DESCRIPTION

Body small (S.L. 82-147 mm). Dorsal outline somewhat more strongly curved than ventral. Dorsal outline from tip of snout to origin of dorsal fin strongly convex. Snout blunt, equal to orbital diameter in adults, shorter in young. Mouth terminal; jaws equal when closed or lower jaw projecting slightly when open. Maxillary strongly curved, narrow, a little wider posteriorly, with a slight depression on its upper edge; maxillary teeth weakly tricuspid. Premaxillary with a canine tooth in front, followed by a row of 4-5 (usually 4) small conical teeth; a canine similar to but slightly smaller than the anterior one follows this row. The anterior premaxillary canine is received by the lower jaw and remains slightly in front of the large first canine when mouth is closed. Dentary with a large canine in front, followed by 3 smaller canines, the size of which increases gradually from the first to the third and then a row of weakly tricuspid teeth of variably number (12-17). Number of ectopterygoid teeth varying from 8-13. 14-15 gill rakers on the lower part of the first gill arch.

Lateral line slightly curved in front, with 49-55 scales; 10-11 scales above lateral line, 9-10 below. Single row of scales along anal fin base continued back to the tenth or thirteenth branched ray. Ventral axillary scale about one fourth as long as ventral fin.

Anal fin slightly lobed anteriorly. Number of anal fin rays v, 20-24. Ventral fins reaching anal. Pectorals reaching ventrals.

Color in alcohol dark brown above, paler below; sides with metallic reflections, cheeks, postorbital region and opercles with scattered black pigment; a dark narrow vertical blotch in the humeral region, tapering below, followed by a contrasting light area and then a faded dark blotch; an axial band from about origin of dorsal fin to caudal base, thin under dorsal in base, becoming enlarged and blackier especially on sides of caudal peduncle and finally extending back over median caudal rays; all fins pale; dorsal, anal and caudal fins with scattered black pigment.

The measurements of the specimens are shown in appendix table 24; the regression data in figures 84-93 and appendix table 6.

DISTRIBUTION (fig. 7)

Rio Lipeo in Bolivia (Paraguay River basin).

Oligosarcus meadi, sp.n.

(Figs. 21, 61B)

Acestrorhamphus sp. B Menezes, 1969: 219, 221.

Type-locality: União de Caeté, Minas Gerais, Rio das Velhas basin.
Holotype: DZSP 4618, União de Caeté, Minas Gerais.
Paratypes: DZSP — União de Caeté, Minas Gerais (7); MCZ — União de Caeté, Minas Gerais (1).

DIAGNOSIS

D. ii, 9; A. v, 20-23; P. 11-14; V. 8; 46-49 perforated scales in the lateral line; 9 scales from lateral line to origin of dorsal fin, 7-8 from lateral line to origin of anal; 11-13 gill rakers on the lower part of the first gill arch. This species is most closely related to *O. argenteus* Günther and *O. bolivianus* (Fowler), differing from the former by having fewer scales in the lateral line and from the latter by having fewer pectoral rays and fewer scales in, above and below the lateral line.

DESCRIPTION

Body small (S.L. 64-79 mm). Dorsal outline more curved than ventral; dorsal curvature from tip of snout to origin of dorsal fin convex, with a very slight depression at the occipital region. Snout blunt, smaller than orbital diameter at all ages. Jaws equal when closed or lower jaw projecting when opened. Maxillary strongly curved, narrow anteriorly, gradually widening posteriorly, with a small depression on its upper edge to accomodate the lower edge of the small first infraorbital bone. Premaxillary with a canine in front followed by a row of 3-4 (mostly 4) small conical teeth; a canine similar to the first follows this row. Position of the first premaxillary canine in the mouth and composition, shape and size of the dentary teeth as in *O. bolivianus*. 10-13 teeth in the posterior row on the dentary, 9-14 on the ectopterygoid. 11-13 gill rakers on the lower part of the first gill arch.

Lateral line slightly curved in front, with 46-49 scales; 9 scales above lateral line, 7-8 below. Single row of scales along anal fin base continued back to the tenth or fifteenth branched ray. Ventral axillary scale about one third as long as ventral fin.

Anal fin with a rather weak anterior lobe. Number of anal fin rays v, 20-23. Ventral fins surpassing anus but not reaching anal fin. Pectorals reaching and surpassing slightly origin of ventrals.

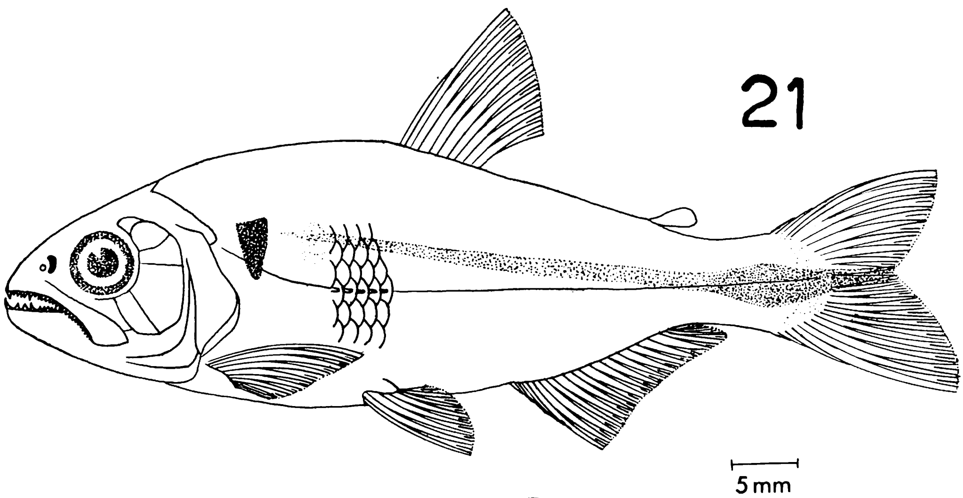
Color in alcohol identical to that of *O. bolivianus*.

The measurements of the specimens are shown in appendix table 23; the regression data in figures 84-93 and appendix table 7.

DISTRIBUTION (Fig. 7)

Small streams of the Rio das Velhas basin in Minas Gerais.

This species is named after Dr. Giles W. Mead, Curator of Fishes in the Museum of Comparative Zoology, Harvard University.



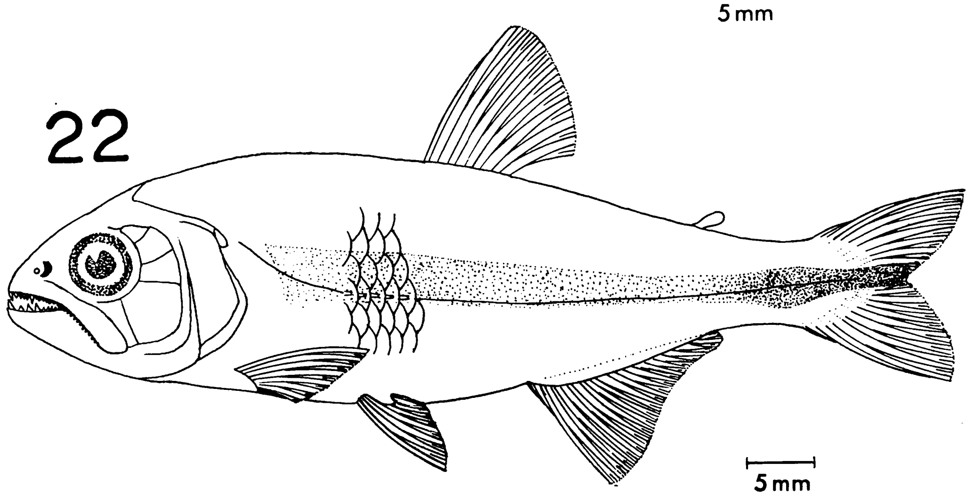


Fig. 21: *Oligosarcus meadi,* sp. n., male, 69 mm S.L., MCZ 45959; fig. 22: *argenteus* Günther, 70 mm S.L., BM(NH) 1967.1.24.2. Drawing based on photograph of syntype.

Oligosarcus argenteus Günther, 1864

(Fig. 22)

Oligosarcus argenteus Günther, 1864:353 (type-locality: Brazil; type in BM (NH), not seen; photographs of paratypes examined); Eigenmann & Eigenmann, 1891:58 (listed); Eigenmann, 1910:447 (listed); Campos, 1945b:479 (listed); Campos & Trewawas, 1949: 158-159 (redescription of Günther's specimens); Fowler, 1950:326 (synonymy); Fernandez-Yepez, 1955:6 (diagnosis).

Specimens studied — None.

DIAGNOSIS (based on Günther's description)

D. 11 (ii, 9); A. 25 (v, 21); P. 13; V. 8; 43 perforated scales in the lateral line; 9 scales from lateral line to origin of dorsal fin, 7 from lateral line to origin of anal.

DESCRIPTION (based on Günther's description and photographs of paratypes)

Body small. Dorsal outline of the body more strongly curved than ventral; dorsal outline from tip of snout to origin of dorsal fin strongly convex. Snout blunt, smaller than orbital diameter (measured on photographs). Jaws equal when mouth is closed. Maxillary curved, widening posteriorly. Premaxillary (intermaxillary of Günther) with one canine in front, followed by a short series of small conical teeth; a canine similar to the first one follows this row. The anterior premaxillary canine is received by the lower jaw and stays beside the first mandibular canine when mouth is closed.

Lateral line slightly curved in front, with 43 scales; 9 scales above lateral line, 7 below.

Anal fin with a short anterior lobe. Number of anal fin rays v, 21. Ventral fins extending to anus. Pectoral fins extend to slightly beyond origin of ventrals.

Color in alcohol light brownish with a silvery band running along the middle of the body, becoming enlarged and blackier on sides of caudal peduncle.

DISTRIBUTION

Unknown.

Genus **Acestrorhynchus** Eigenmann & Kennedy, 1903

(Figs. 68-70, 73)

Acestrorhynchus Eigenmann & Kennedy, Sept. 1903:527, new name for *Xiphorhynchus* Agassiz, preoccupied in Aves, Swainson, 1827 and for *Xiphorhamphus* Müller & Troschel preoccupied in Aves, Blyth,

TABLE 1 - TOTAL RANGE OF MERISTIC VALUES FOR ALL SPECIES OF THE GENUS OLIGOSARCUS.

SPECIES	ANAL RAYS	PECTORAL RAYS	GILL RAKERS	LAT. LINE SCALES	SCALES ABOVE LAT. LINE	SCALES BELOW LAT. LINE	POST. MAND. TEETH	ECTOPTERYGOID TEETH
O. jenynsii	23 - 31	13 - 16	12 - 16	51 - 71	10 - 13	8 - 10	10 - 27	9 - 22
O. hepsetus	24 - 32	13 - 17	13 - 16	69 - 80	14 - 15	10 - 13	12 - 23	11 - 22
O robustus, sp.n.	23 - 28	14 - 17	14 - 17	75 - 85	17 - 19	12 - 15	14 - 24	12 - 21
O. macrolepis	24 - 26	14	14 - 15	46 - 48	8	7	13 - 20	14 - 15
O. meadi, sp. n.	20 - 22	13 - 14	11 - 13	47 - 49	9	7 - 8	10 - 13	10 - 14
O. bolivianus	20 - 24	14	15 - 16	49 - 55	10	9 - 10	12 - 17	8 - 13
O. argenteus	20 - 22	13	13	43	9	7	—	—

TABLE 2 - TOTAL RANGE OF MERISTIC VALUES FOR ALL SPECIES OF THE GENUS ACESTRORHYNCHUS.

SPECIES	ANAL RAYS	PECTORAL RAYS	GILL RAKERS	LAT. LINE SCALES	SCALES ABOVE LAT. LINE	SCALES BELOW LAT. LINE	POST. MAND. TEETH
A. falcatus falcatus	21 - 26	15 - 18	20 - 26	80 - 91	18 - 24	10 - 14	10 - 17
A. falcatus varius, subsp. n.	21 - 23	14 - 16	24 - 26	84 - 88	20	12	8 - 10
A. lacustris	20 - 26	15 - 19	22 - 29	89 - 102	23 - 26	13 - 16	11 - 20
A. altus, sp. n.	21 - 27	14	20 - 27	98 - 115	26 - 34	15 - 18	13 - 18
A. britskii, sp. n.	23 - 27	14 - 19	21	92 - 103	18	12	16 - 17
A. falcirostris	18 - 23	14 - 18	30 - 39	140 - 176	30 - 38	17 - 22	10 - 16
A. microlepis	25 - 31	13 - 18	20 - 26	108 - 122	20 - 22	15 - 18	9 - 14
A. guianensis, sp. n.	25 - 30	14 - 17	20 - 25	93 - 106	17 - 19	13 - 15	9 - 14
A. heterolepis	23 - 25	15 - 17	38 - 40	130 - 144	52	31 - 35	13 - 21
A. nasutus	23 - 25	12 - 14	20 - 22	78 - 82	13 - 14	8 - 9	14 - 18
A. minimus sp. n.	21 - 25	12 - 14	15 - 23	74 - 85	12 - 14	8 - 10	12 - 16

1843: Eigenmann, Dec. 1903:146. Type-species: *Salmo falcatus* Bloch, 1794:120, subsequently designated by Eigenmann, 1910:447.

Xiphorhynchus Agassiz, 1829:76. Type-species: *Salmo falcatus* subsequently designated by Jordan & Evermann, 1917:132.

Xiphorhamphus Müller & Troschel, 1844:92. Type-species: *Salmo falcatus* Bloch, subsequently designated by Jordan, 1919:221.

Sphyraenocharax Fowler, 1906:460. Type-species: *Xiphorhamphus abbreviatus* Cope, by original designation.

NOMENCLATURAL NOTE

The name *Acestrorhynchus* was created by Eigenmann and Kennedy in 1903 as a substitute for *Xiphorhynchus* Agassiz, preoccupied in Aves. They did not indicate the type-species of the genus but as three nominal species (*Salmo falcatus* Bloch, *Salmo odoe* Bloch and *Hydrocyon falcirostris* Cuvier, 1819) were originally included in the genus *Xiphorhynchus* of Agassiz, all of them were eligible for subsequent type designation, according to the International Code of Zoological Nomenclature, 1964:69, art. 69a, (ii) (3). The type-species of *Acestrorhynchus* should then be selected from among the above mentioned species through the statement of any author (International Code, *idem* (iii). Eigenmann (1910:447) was the first author to designate *Salmo falcatus* Bloch as the type-species of the genus *Acestrorhynchus*.

Fowler's *Acestrorhamphus falcatus* (1950:325) is placed in *Acestrorhynchus* in the present study.

DESCRIPTION

Body elongate, large (S.L. 35-380 mm); snout long, much longer than orbital diameter; premaxillary with two foramina (one in adults of some species) to receive the first anterior teeth on the mandible; ethmoid, prevomer, antorbital, infraorbital, mesopterygoid and nasal long in consequence of snout elongation; first infraorbital very long, covering almost completely the maxillary when mouth is closed; rhinosphenoid large, in close contact with lateral ethmoid anteriorly, orbitosphenoid posteriorly at all ages and with parasphenoid in adults only; branch of the laterosensory canal present on premaxillary; nasal bone laminar; anterior portion of maxillary with strong canines; lower jaw with two teeth rows, the inner being shorter and with few small conical teeth; teeth on premaxillary, maxillary and dentary all conical; ectopterygoid tooth row long, with very small close-set conical teeth; lower jaw much shorter than upper jaw when mouth is closed; spiny gill rakers short, broad, with many small spines on their surface (Figs. 23A, 36A, 38A, 42A, 43A, 50A, 57A, 59A, 60A); opercle with a notch in its upper edge; supraopercle fused with subopercle; supraoccipital short, posteriorly round.

Scales small, 74-175 in the lateral line; anal fin falcate with v, 18-31 rays, its anterior part (Fig. 23B) without hooks in males; origin of dorsal fin much nearer to caudal base than tip of snout.

DISTRIBUTION (Fig. 4)

The species of *Acestrorhynchus* are heavily concentrated in the Amazon basin and in the rivers of the Guianas. Two species within the genus [*Acestrorhynchus lacustris* (Reinhardt) and *A. altus*, sp.n.] are widespread, having been recorded from the Paraná, Paraguay, and São Francisco River basins.

KEY TO THE SPECIES OF *ACESTRORHYNCHUS*

1. First premaxillary tooth small 2
   First premaxillary tooth a conical, strong and sharp canine 3

2. Opercle with two dark patches; 140-175 scales in the lateral line; A. v, 18-24; 30-39 gill rakers on the lower part of the first gill arch .... *A. falcirostris*
   No dark patches on opercle; a dark horizontal stripe from tip of snout to caudal base; a second dark horizontal stripe from end of maxillary to inferior surface of caudal peduncle; 78-82 scales in the lateral line; A. v, 23-25; 20-22 gill rakers on the lower part of the first gill arch .... *A. nasutus*

3. A well-defined large black bloth at the humeral region 4
   Large black blotch absent from humeral region 6

4. Black blotch at the humeral region oval, vertically elongated; 80-96 scales in the lateral line; A. v, 21-26; 20-26 gill rakers on the lower part of the first gill arch .... *A. falcatus*
   Black blotch at the humeral region nearly round, not vertically elongated 5

5. 89-102 scales in the lateral line; 23-26 scales from lateral line to origin of dorsal fin, 13-16 from lateral line to origin of anal .... *A. lacustris*

   98-115 scales in the lateral line; 27-34 scales from lateral line to origin of dorsal fin, 15-18 from lateral line to origin of anal .... *A. altus*, sp.n.

6. Lateral line scales with two divergent branches of the laterosensory canal; 130-143 scales in the lateral line; A. v, 23-25; 38-40 gill rakers on the lower part of the first gill arch .. *A. heterolepis*
   Lateral line scales with one branch of the laterosensory canal which is inclined either upward or downward 7

7. A very small, indistinct dark blotch at the origin of the lateral line behind the opercle 8
   Small dark blotch absent from origin of lateral line 9

8. 108-122 scales in the lateral line; 20-22 scales from lateral line to origin of dorsal fin, 15-18 from lateral line to origin of anal .... *A. microlepis*
   93-106 scales in the lateral line; 17-19 scales from lateral line to origin of dorsal fin, 13-15 from lateral line to origin of anal .... *A. guianensis*, sp.n.

9. A distint wide black band on sides of body from upper end of opercle to caudal base; A. v, 23-27; 93-103 scales in the lateral line; 18 scales from lateral line to origin of dorsal fin, 12 from lateral line to origin of anal .... *A. britskii*, sp. n.
Black band absent on sides of body; a rather narrow dark stripe from upper end of opercle to caudal base; A. v, 21-25; 74-85 scales in the lateral line; 12-14 scales from lateral line to origin of dorsal fin, 8-10 from lateral line to origin of anal .... *A. minimus*, sp. n.

Acestrorhynchus falcatus (Bloch, 1794)

The study of the geographic variation of this species revealed the presence of two distinct subspecies: *A. falcatus falcatus* (Bloch), and *falcatus varius*, subsp. n.

Acestrorhynchus falcatus falcatus (Bloch, 1794)

(Figs. 23, 61E, 68-70, 73)

Salmo falcatus Bloch, 1794:120 (type-locaty:Surinam; type not seen; topotypes examined); Cuvier, 1817:167 (listed); 1819:353 (listed); 1829:312 (listed).
Xiphorhynchus falcatus; Agassiz, 1829:76 (listed); Cuvier & Valenciennes, 1849:337 (part; description); Castelnau, 1855:75 (Amazonas).
Xiphorhamphus falcatus; Müller & Troschel, 1844:92 (Brazil; description); 1845:17 (listed); ?Kner, 1860:57 (Caiçara, Mato Grosso; description); Günther, 1864:354 (description); Eigenmann & Eigenmann, 1891 (listed); Ulrey, 1895:295 (listed); Vaillant, 1899: 154 (French Guiana); Puyo, 1949:137 (French Guiana; diagnosis).
Acestrorhynchus falcatus; Eigenmann & Kennedy, 1903:527 (listed); Eigenmann & Ogle, 1907:34 (Surinam); Eigenmann, 1910:447 (listed); 1912b:407 ([British] Guyana; diagnosis); ?Pearson, 1924:49 (Lake Rogoagua, Cachuela Esperanza); Di Caporiacco, 1935:66 (Demerara River); Eigenmann & Allen, 1942:276 (distribution); Campos, 1945b:476 (diagnosis); Boeseman, 1953:22 (Surinam, Saramacca and Corantyne rivers); 1956:188 (Surinam); Fernandez-Yepez, 1955:3 (diagnosis); Géry, 1965:118 (Surinam); Menezes, 1969:219.
Xiphorhamphus ferox Günther, 1863:443 (type-locality: Essequibo River, [British] Guyana; types in BM(NH) not seen; photographs of paratypes examined); 1864:355 (description); 1868:229 (listed).

Specimens studied (96): FMNH — Barima River, [British] Guyana (4), Maduni Creek, [British] Guyana (3), Christianburg, [British] Guyana (1), Wismar, [British] Guyana (1), Hubabu Creek, [British] Guyana (1), Amatuk, [British] Guyana (1), Tukeit, [British] Guyana (1), Potaro, Landing, [British] Guyana (1), Gluck Island, [British] Guyana (1), Konawaruk, [British] Guyana (1), Packeoo Falls [British]

Guyana (1), New River, [British] Guyana (8); BM(NH) — Lama Stop-Off, [British] Guyana (3), Maduni Creek, [British] Guyana (3), Christianburg, [British] Guyana (1) Packeoo Falls, [British] Guyana (1); MCZ — Lama Stop-Off, [British] Guyana (1), Surinam (2), Codajás, Amazonas (4), Manacapuru, Amazonas (1), Tabatinga, Amazonas (2), Boa Vista, Pará (8), Cachoeira do Arari, Ilha de Marajó (6), Belém, Pará (6); ANSP — Rio Capahuari, Ecuador (2), Rio Shiono, Ecuador (4), Rio Bufeo, Ecuador (2), Rio Panayacu, Ecuador (2); DZSP — Rio Shiono, Ecuador (1), Rio Panayacu, Ecuador (1), Utinga, Pará (20).

Diagnosis

D. ii, 9; A. v, 21-26; P. 15-18; V. 8; 80-96 perforated scales in the lateral line; 18-24 scales from lateral line to origin of dorsal fin, 10-14 from lateral line to origin of anal; 20-26 gill rakers on the lower part of the first gill arch; a large vertically elongated black blotch at the humeral region, level with upper edge of opercle and continued below to a short distance from the first pectoral ray; a small black round blotch at the caudal base.

Description

Body large (S.L. 72-272 mm) and deep; head massive, much wider and depressed above. Snout conical, always longer than orbital diameter. Mouth terminal, gape long; jaws equal when open or upper jaw projecting when closed. Maxillary curved, wider posteriorly, ending in an acute angle, anteriorly with a large sharp canine which is followed by three small conical teeth; a canine similar to but larger than the

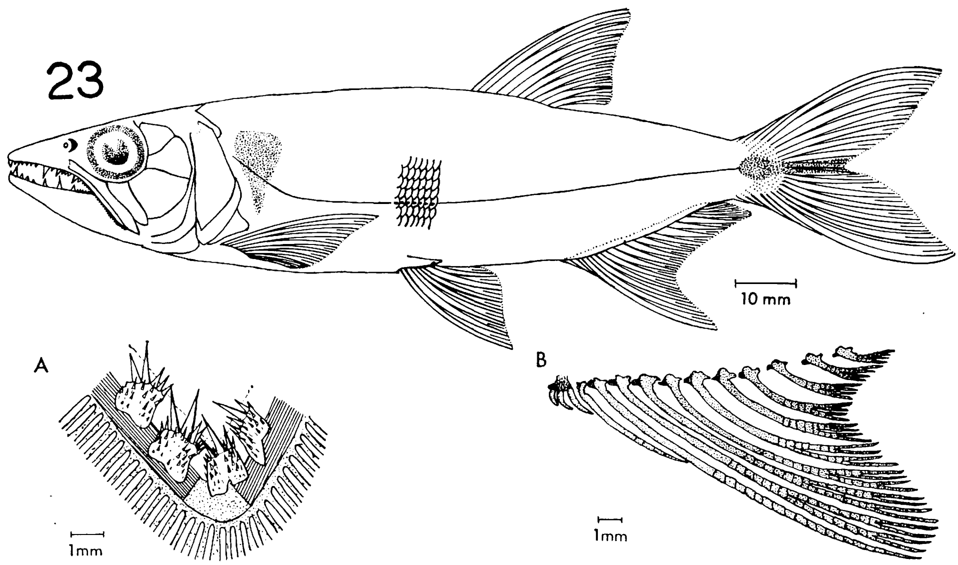


Fig. 23: *Acestrorhynchus f. falcatus* (Bloch), male, 151 mm S.L., MCZ 45240; A, gill rakers on first gill arch; B, anterior anal fin rays.

anterior one and a small conical tooth follow these teeth and finally a row of close-set conical teeth. Premaxillary with a canine in front, followed by a row of small conical teeth variable in number (6-10); a canine larger than the first and a conical tooth similar to the anterior ones follow this row; there are two premaxillary foramina to receive the first two teeth on the dentary in young specimens, while in adults only the second foramen remains to receive the large first dentary canine; dentary with a conical tooth in front, followed by a large canine; two or three conical teeth and three spaced canines smaller than the first follow this tooth and finally a row of small close-set conical teeth highly variable in number (10-17); two or three small conical teeth seem to represent an inner series; ectopterygoid with a long row of very small conical teeth, curved posteriorly. Spiny gill rakers (Fig. 23a) with two or three prominent spines on their free upper edge and other smaller ones beside and in between them; surface of gill rakers almost entirely covered with small spines which decrease in size toward the lower part; 20-26 gill rakers on the lower part of the first gill arch.

Scales moderately large. Lateral line nearly straight from caudal base toward the trunk, rising abruptly a short distance from the opercle, with 80-96 scales; 18-24 scales from lateral line to origin of dorsal fin, 10-14 from lateral line to origin of anal. A single row of scales along each side of the base of anal fin between its origin and the fourteenth

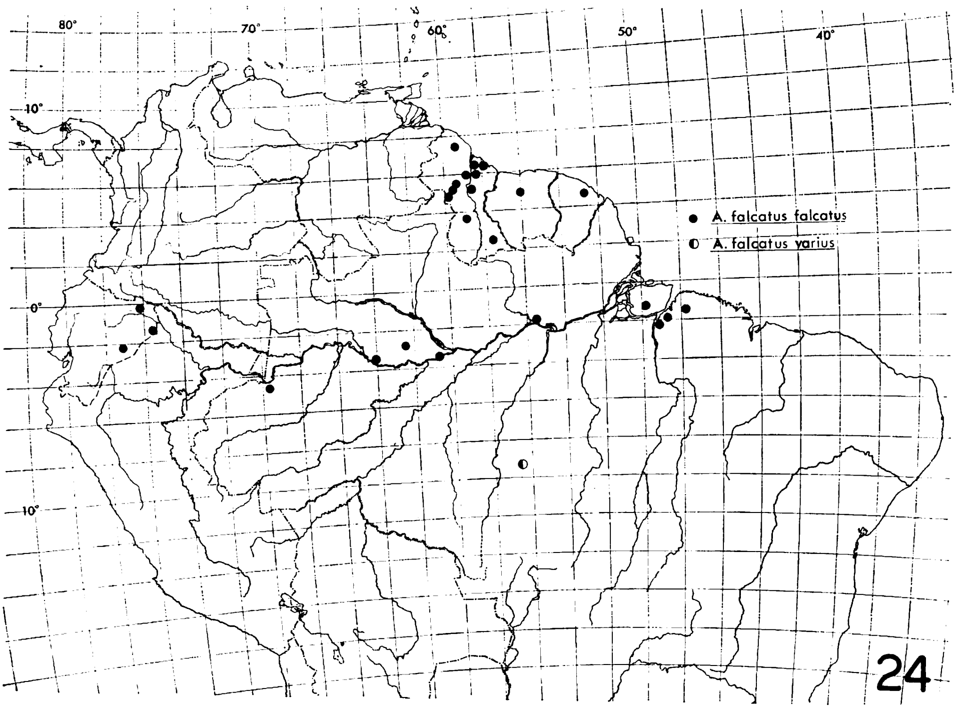


Fig. 24: geographic distribution of *Acestrorhynchus falcatus falcatus* (Bloch) and *falcatus varius*, subsp. n.

or fifteenth branched ray. Ventral axillary scale about one third as long as ventral fin.

Anal fin strongly falcate anteriorly, with the first branched ray reaching the end of anal fin base; its origin under the last dorsal fin rays. Number of anal fin rays v, 21-26. Ventral fins reaching anus but not anal. Pectorals longer than, and never reaching origin of, ventrals. Lower caudal lobe slightly longer than upper.

Color in alcohol dark brown above, lighter below; snout and top of head dark; a large oval vertically elongated black blotch at the humeral region, inmediately followed by a light area; a small round black blotch at the caudal base; a small horizontal light area on each scale contributes to form a general pattern of horizontal stripes along sides of trunk. All fins punctate with black pigment.

In specimens long preserved in alcohol the humeral blotch tends to lose its characteristic shape, becoming less elongated, the horizontal stripes disappear and the fins become pale.

The measurements of the specimens are shown in appendix table 25; the regression data in figures 95-104, and appendix table 8.

DISTRIBUTION (Fig. 24)

Amazon River basin; rivers of [British] Guyana, Surinam and French Guyana; Orinoco basin.

Acestrorhynchus falcatus varius, subsp. n.

(Fig. 25)

Type-locality: Cachimbo, Pará, Tapajós River basin.
Holotype: DZSP 4560.
Paratypes: DZSP — Cachimbo, Pará (7).

DIAGNOSIS AND DESCRIPTION

D. ii, 9; A. v, 21-23; P. 14-16; V. 8; 84-88 perforated scales in the lateral line; 20 scales from lateral line to origin of dorsal fin, 12 from lateral line to origin of anal; 24-26 gill rakers on the lower part of the first gill arch.

This form is kept distinct of *A. falcatus falcatus* (Bloch) because it possesses fewer branched anal rays, pectoral rays, teeth in the posterior row on the dentary and a larger number of gill rakers (Figs. 26, 27, 30, 32). The regressions of pectoral fin length on standard length (Fig. 101) and number of maxillary teeth on standard length (Fig. 104) also shows a considerable difference between the two forms. In other respects it agrees well with *A. falcatus falcatus*.

The measurements of the specimens are presented in appendix table 26; the regression data in figures 95-104 and appendix table 9.

GEOGRAGHIC VARIATION OF A. FALCATUS

1. Meristic characters. In the Amazon basin the number of scales below the lateral line does not vary significantly (Fig. 29). The sample

from Cachimbo has fewer branched anal and pectoral rays, fewer teeth in the posterior row on the dentary and a larger number of gill rakers (Figs. 26, 27, 30, 32). In number of pectoral rays, lateral line scales, gill rakers and teeth in the posterior row on the dentary, the other samples seem to be relatively homogeneous, but the remaining characters tend to vary clinally from east to west (Figs. 26 and 28).

In [British] Guyana there is no variation in number of branched anal and pectoral rays and teeth but the number of scales in the lateral line show a tendency toward clinal variation from north to south (Fig. 33) and the sample from New River tends to more scales above and below the lateral line (Figs. 34 and 35).

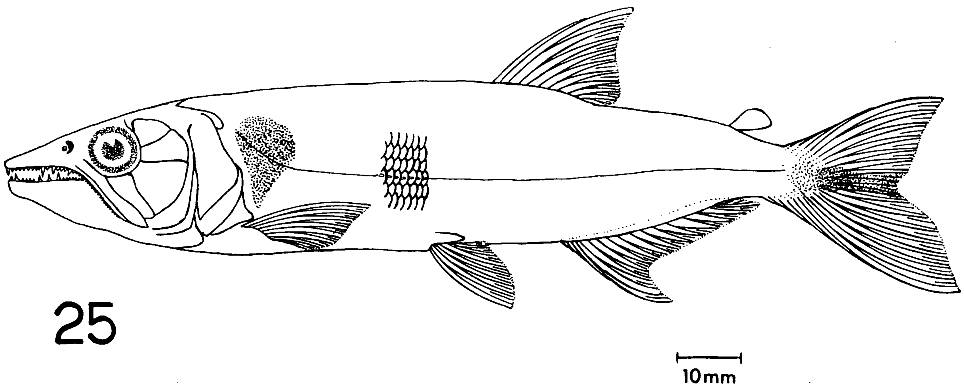


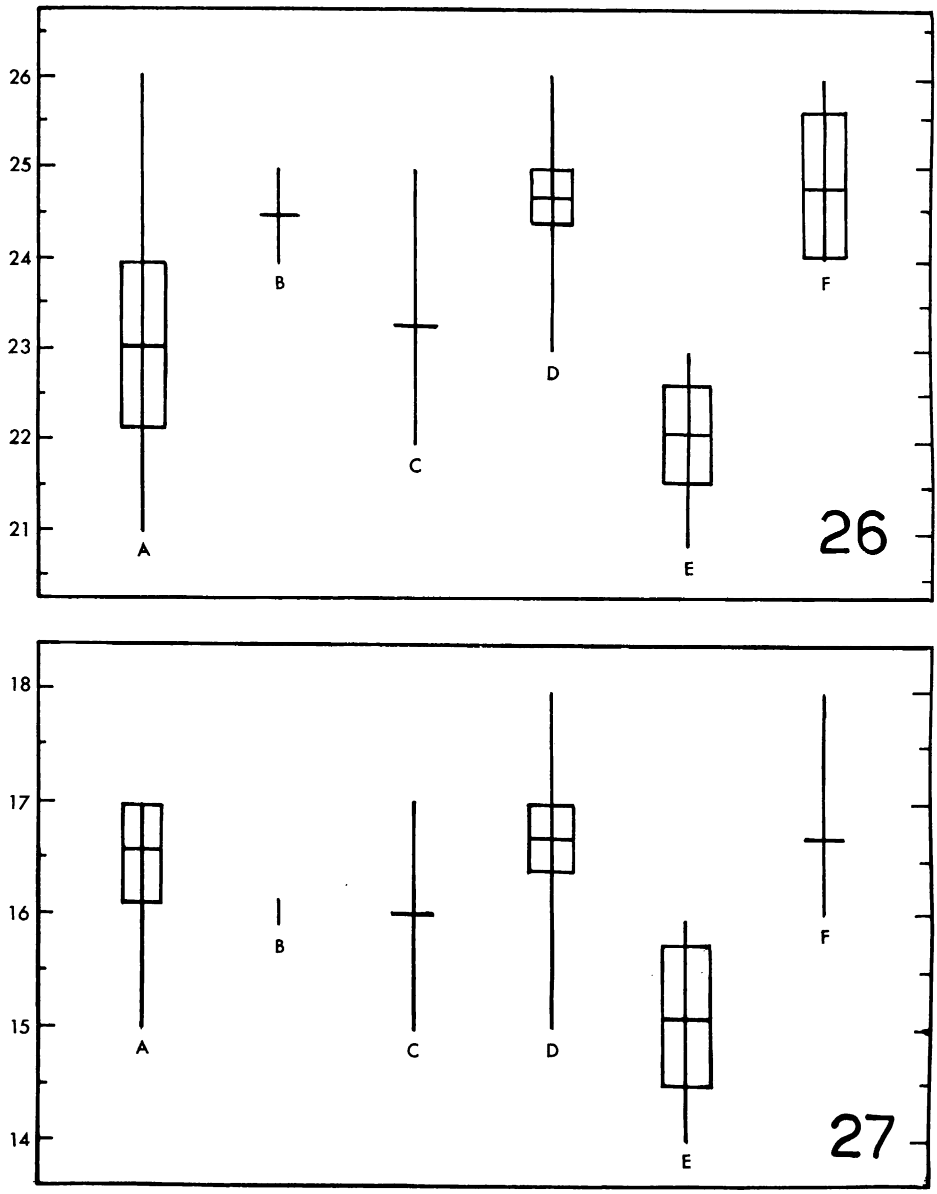
Fig 25: *Acestrorhynchus falcatus varius*, subsp. n., female, 126 mm S.L., DZSP 4560.

Two specimens from French Guiana and three from Surinam showed close agreement with the material from [British] Guyana in every meristic character analysed.

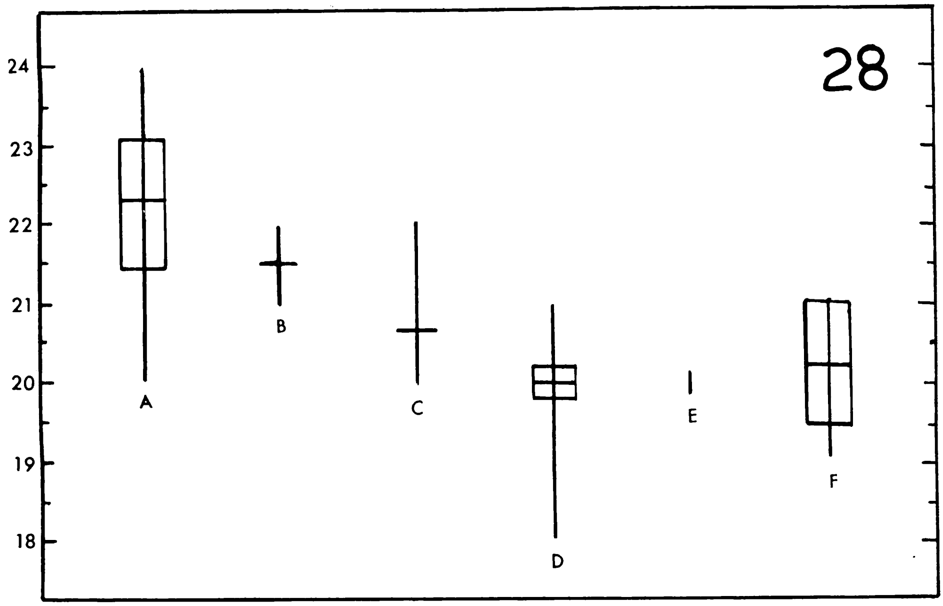
The comparison of the material from the Guyanas with that of the Amazon basin (tables 3 to 9) revealed complete agreement in all meristic characters. In this comparison, the sample from Cachimbo was introduced separately, and it also proved to be different from the Guyanean material.

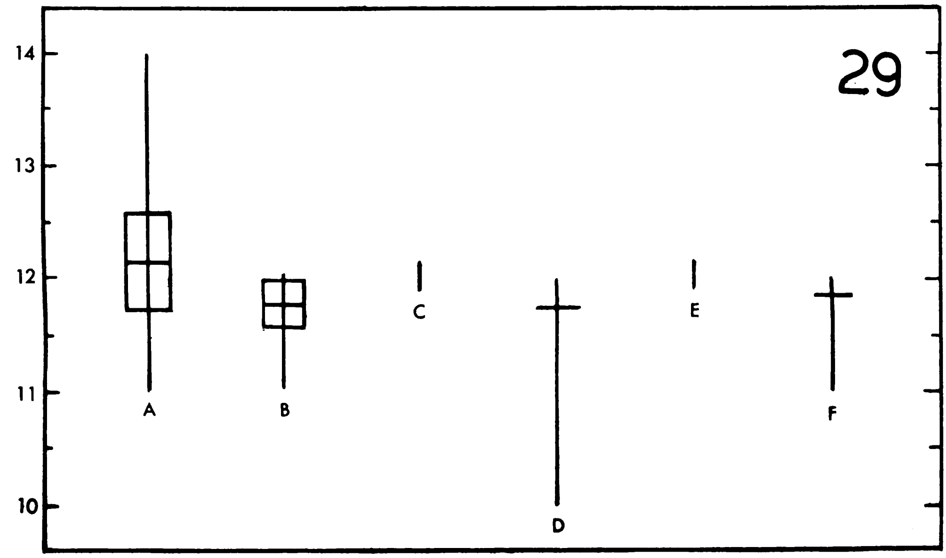
2. Body proportions. The regression analysis revealed that the sample from Cachimbo differed considerably from the others in the regressions of pectoral fin length on standard length (Fig. 101) and number of maxillary teeth on standard length (Fig. 104). In other proportions there was no substantial difference.

If we consider the total range of the species, one sample, that from Cachimbo, is sufficiently different to warrant recognition as a subspecies. In at least two characters (number of posterior dentary teeth and number of maxillary teeth) statistical analysis revealed that there is no overlap between Cachimbo and the other samples of the species (Figs. 32 and 104). However, in these and other characters Cachimbo sample is more similar to other *A. falcatus* populations than other sympatric species of *Acestrorhynchus* are to *A. falcatus*. Unfortunately no material from critical intermediate barriers between the Amazon and Cachimbo is available.

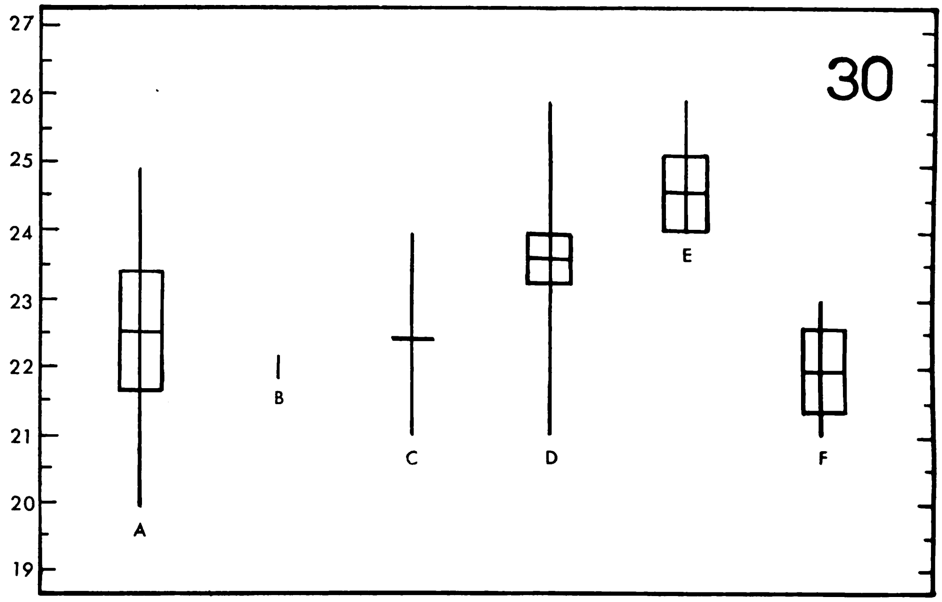


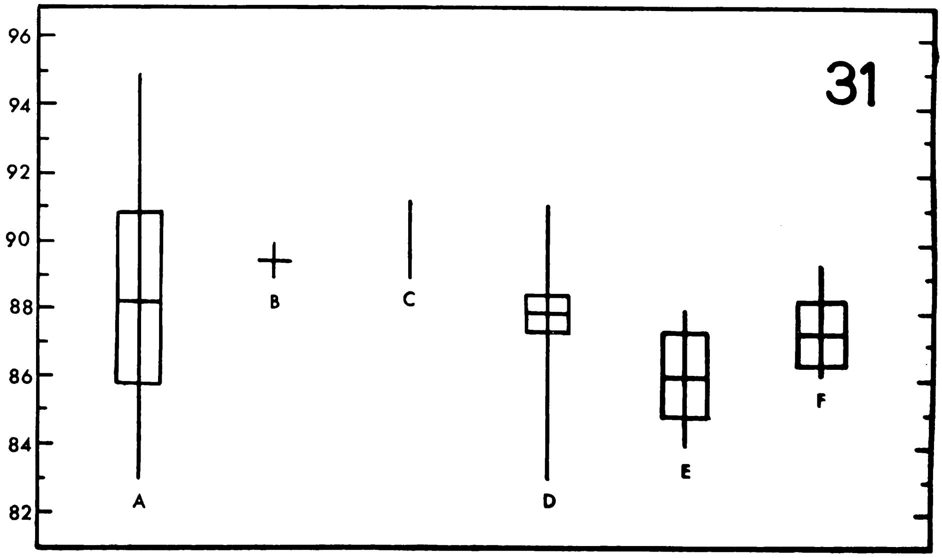
Acestrorhynchus falcatus (Bloch). Fig, 26: variation in number of anal fin rays in the samples from the Amazon Basin. The samples are arranged from west (A) to east (F). In each sample the crossbar indicates the mean and the hollow rectangle *t* standard deviations on either side of the mean. A, Ecuador; B, High Amazon; C, Middle Amazon; D, Guamá; E, Cachimbo; F, Arari. Fig. 27: variation in number of pectoral fin rays in the samples from the Amazon Basin. Localities as in fig. 26



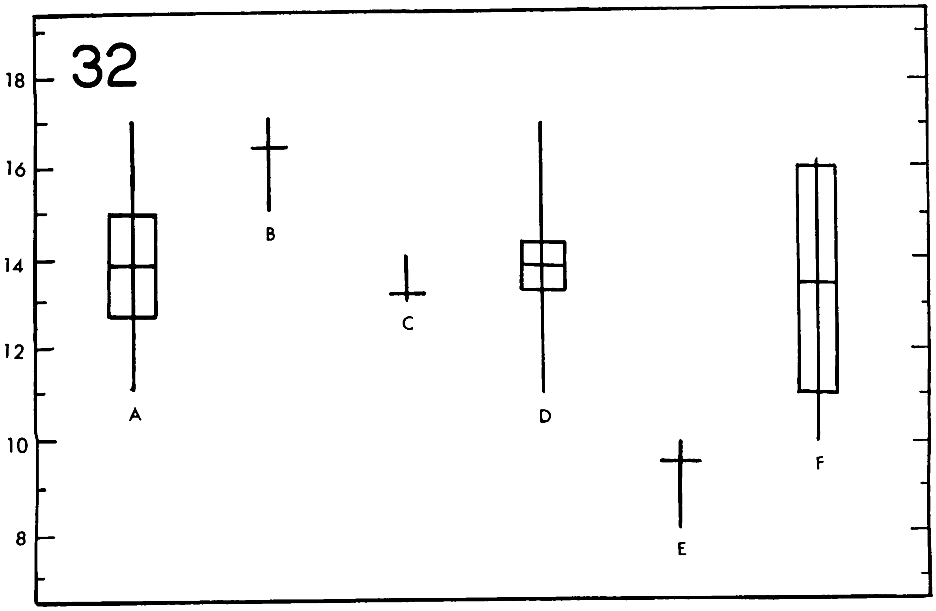


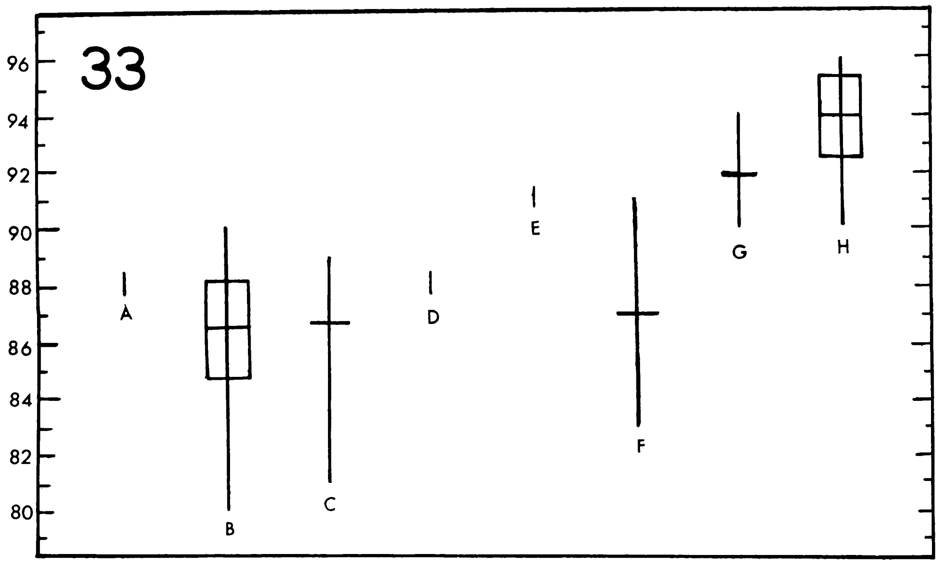
Acestrorhynchus falcatus (Bloch) Fig. 28: variation in number of scales above the lateral line in the samples from the Amazon Basin. Fig. 29: variation in number of scales below the lateral line in the samples from the Amazon Basin. Localities as in fig. 26.



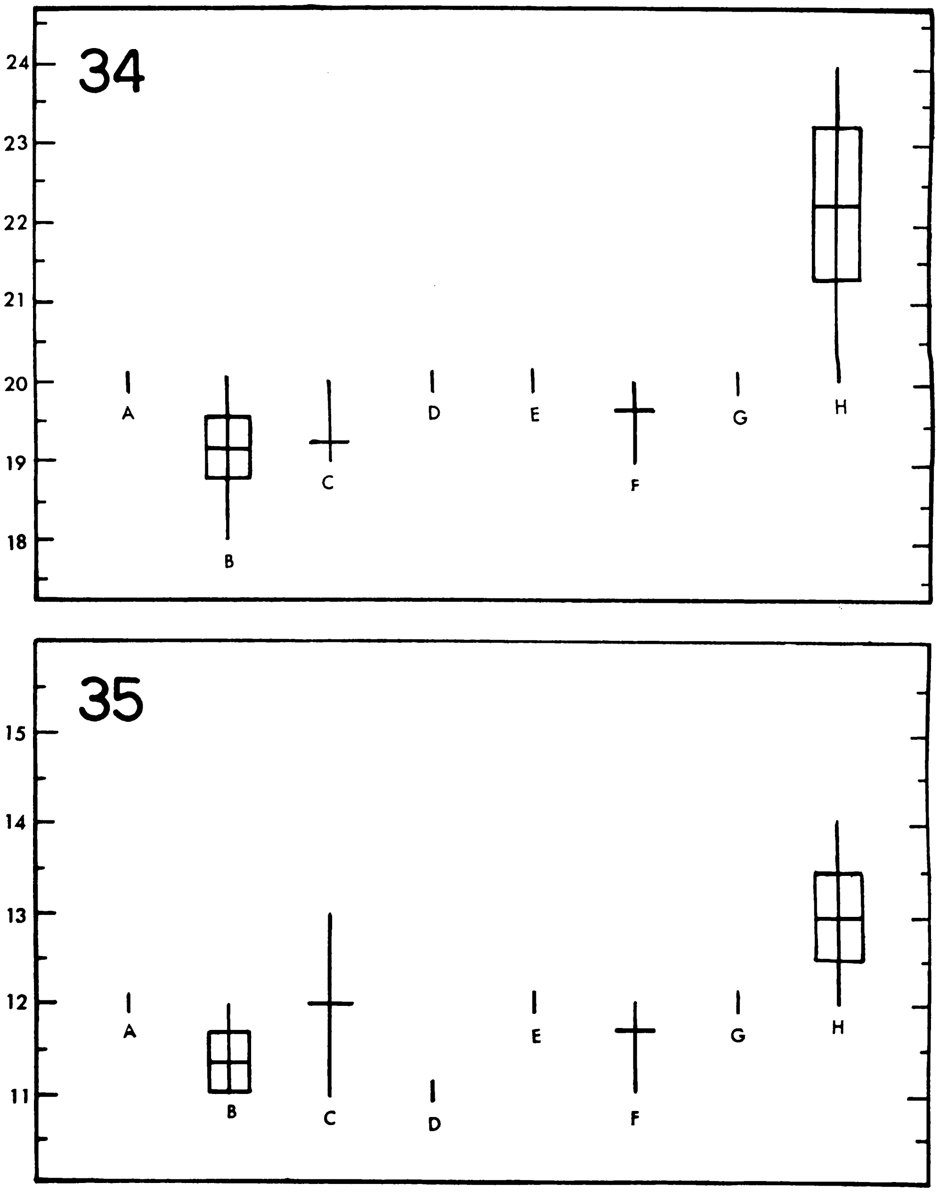


Acestrorhynchus falcatus (Bloch). Fig. 30: variation in number of gill rakers in the samples from the Amazon Basin. Fig. 31: variation in number of lateral line scales in the samples from the Amazon Basin. Localities as in fig. 26.





Acestrorhynchus falcatus (Bloch). Fig. 32: variation in number of teeth in the posterior part of the dentary in the samples from the Amazon Basin. Localities as in fig. 26. Fig. 33: variation in number of lateral line scales in the samples from [British] Guyana. The samples are arranged from north (A) to south (H). In each sample the crossbar indicates the mean and the hollow rectangle *t* standard deviations on either side of the mean. A, Barima River; B, Mahaica River; C, Middle Demerara River; D, Rockstone; E, Konawaruk; F, Middle Potaro River; G, Rupununi River; H, New River.



Acestrorhynchus falcatus (Bloch). Fig. 34: Variation in number of scales above the lateral line in the samples from [British] Guyana. Fig. 35: variation in number of scales below the lateral line in the samples from [British] Guyana. Localities as in fig. 33.

TAB_E 3 -NUMBER OF ANAL FIN RAYS - Frequency distribution for *Acestrorhynchus falcatus* in the total range of the species.

	ANAL RAYS						
LOCALITY	21	22	23	24	25	26	TOTAL
AMAZON	2	3	8	17	21	1	52
GUIANAS		4	12	18	6	1	41
CACHIMBO	1	5	2				8
TOTAL							101

TABLE 4 -NUMBER OF PECTORAL FIN RAYS - Frequency distribution for *Acestrorhynchus falcàtus* in the total range of the species.

	PECTORAL RAYS					
LOCALITY	14	15	16	17	18	TOTAL
AMAZON		3	24	26	6	59
GUIANAS		8	21	8	1	38
CACHIMBO	1	5	2			8
TOTAL						105

TABLE 5 - NUMBER OF LATERAL LINE SCALES - Frequency distribution for Acestrorhynchus falcatus in the total range of the species.

LOCALITY	LATERAL LINE SCALES																	
	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	
AMAZON BASIN	–	–	1	3	2	–	3	12	9	19	6	4	–	–	1	1	–	61
GUIANAS	1	1	2	1	–	3	1	4	5	4	6	3	2	–	3	2	2	40
CACHIMBO	–	–	–	–	1	2	–	3	1	–	–	–	–	–	–	–	–	8
TOTAL																		109

TABLE 6 - NUMBER OF POSTERIOR DENTARY TEETH - Frequency distribution for Acestrorhynchus falcatus in the total range of the species.

LOCALITY	POSTERIOR DENTARY TEETH										
	8	9	10	11	12	13	14	15	16	17	TOTAL
AMAZON BASIN	–	–	1	2	15	6	7	9	10	2	52
GUIANAS	–	–	–	3	11	8	10	4	2	1	39
CACHIMBO	1	1	6	–	–	–	–	–	–	–	8
TOTAL											99

TABLE 7 - NUMBER OF SCALES ABOVE THE LATERAL LINE - Frequency distribution for *Acestrorhynchus falcatus* in the total range of the species

	SCALES ABOVE LATERAL LINE							
LOCALITY	18	19	20	21	22	23	24	TOTAL
AMAZON	1	11	16	1	4	5	2	52
GUIANAS	3	11	16	1	4	5	2	42
CACHIMBO			6					6
TOTAL								100

TABLE 8 - NUMBER OF SCALES BELOW THE LATERAL LINE - Frequency distribution for *Acestrorhynchus falcatus* in the total range of the species

	SCALES BELOW LATERAL LINE					
LOCALITY	10	11	12	13	14	TOTAL
AMAZON	1	9	45	1	1	57
GUIANAS		13	19	7	1	40
CACHIMBO			7			7
TOTAL						104

TABLE 9 - NUMBER OF GILL RAKERS - Frequency distribution for *Acestrorhynchus falcatus* in the total range of the species.

	GILL RAKERS							
LOCALITY	20	21	22	23	24	25	26	TOTAL
AMAZON	1	6	15	12	14	10	1	59
GUIANAS	2	1	6	12	10	7	1	39
CACHIMBO					4	3	1	8
TOTAL								104

With respect to meristic characters, there seem to be two different trends of variations. In [British] Guyana the number of scales in the lateral line increases from north to south, and in the Amazon basin there is an increase in the number of scales above and below the lateral line and in the number of branched anal rays from east to west. These possible clines may be related to temperature changes associated with changes in altitude. In [British] Guyana altitude increases from north to south and in the Amazon basin there is an identical variation but in an east-west direction.

Material from the Orinoco was not available for comparisons.

Acestrorhynchus lacustris (Reinhardt, 1874)

(Fig. 36)

Xiphorhamphus lacustris Reinhardt, 1874:136 (type-locality: Lagoa Santa, Rio das Velhas basin in Minas Gerais; type not seen; topotype examined); Lütken, 1875:232 (description); Eigenmann & Eigenmann, 1891:58 (listed).

Acestrorhynchus lacustris; Eigenmann & Ogle, 1907:35 (listed); Eigenmann, 1910:447 (listed); Fernandez-Yepez, 1955:4 (diagnosis).

Sphyraenocharax lacustris; Fowler, 1906:460 (listed); 1950:327 (synonymy).

Xiphorhamphus abbreviatus Cope, 1878:687 (type-locality: Nauta, Peru, Rio Marañon; type and paratypes in ANSP, examined); Eigenmann, & Eigenmann, 1891:58 (listed).

Acestrorhamphus abbreviatus; Eigenmann, 1910:447 (listed).

Acestrorhynchus abbreviatus; Fowler, 1939:274 (Boca Chica, Peru; description); 1945:172 (listed); Eigenmann & Allen, 1942:275 (distribution); Campos, 1945b:478 (diagnosis); Menezes, 1969:219.

Sphyraenocharax abbreviatus; Fowler, 1906:461 (based on types of Cope); Fernandez-Yepez, 1955:4 (diagnosis).

Xiphorhamphus falcatus; Günther, 1864:354 (description).

Acestrorhamphus falcatus; Fowler, 1950:325 (synonymy).

Acestrorhynchus falcatus; Eigenmann & Kennedy, 1903:527 (part; Paraguay); Bertoni, 1914:43 (Paraguay); Fowler, 1932:361 (Descalvados, Mato Grosso; description); Campos, 1945a:455 (Rio Mogi-Guaçu; specimens examined); 1945:476 (diagnosis); Gomes & Monteiro, 1955:82-154.

Xiphorhamphus ferox; Boulenger, 1892:12 (Santa Cruz); 1896b:37 (Paraguay); 1900:3 (Corumbá).

Acestrorhynchus ferox; Eigenmann & Ogle, 1907:35 (Paraguay, Bahia, Pará).

Specimens studied (103): ANSP — Peruvian Amazon (8), Boca Chica, Peru (2); BM(NH) — Asunción, Paraguay (2), Lagoa Santa, Minas Gerais (1); FMNH — Descalvados, Mato Grosso (3); MCZ — Santarém, Pará (1), Óbidos, Pará (1), Coari, Amazonas (1), Parintins, Amazonas (1), Rio Javari, Amazonas (3); DZSP — Pirassununga, São

Paulo (5), Corumbataí, São Paulo (16); Olímpia, São Paulo (3), Piracicaba, São Paulo (9), Varnhagen, São Paulo (3), Alfredo de Castilho, São Paulo (2), Três Lagoas, Mato Grosso (1), Ilha Solteira, São Paulo (1), Rio São Francisco, Bahia (12), Pirapora, Minas Gerais (2), Rio São Francisco, Pernambuco (3), Reprêsa de Três Marias, Minas Gerais (11), Três Marias, Minas Gerais (11).

DIAGNOSIS

D. ii, 9; A. v, 20-26; P. 15-19; V. 8; 89-102 perforated scales in the lateral line; 23-26 scales from lateral line to origin of dorsal fin, 13-16 from lateral line to origin of anal; 22-29 gill rakers on the lower part of the first gill arch; a large nearly round black blotch at the humeral region; a small black round blotch at the caudal base. This species is closely related to *A. falcatus falcatus* (Bloch) but it is readily recognized by its round humeral blotch. Besides, it has a higher body (Fig. 94) and more scales in, above and below the lateral line. Both are sympatric in several places in the Amazon basin.

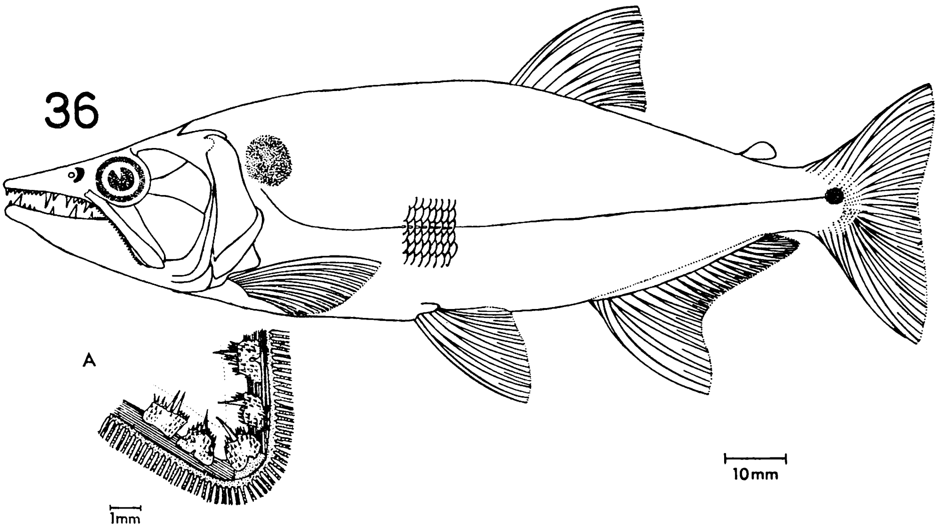


Fig. 36: *Acestrorhynchus lacustris* (Reinhardt), female, 225 mm S.L., BM(NH) 1935.6.4 28-33a; A, gill rakers on the first gill arch.

DESCRIPTION

Body large (S.L. 35-270 mm.) and very deep; head massive, much wider and depressed above. Dorsal and ventral outlines of the body similarly curved. Snout conical, longer than orbital diameter at all sizes. Mouth terminal, gape long; jaws equal when opened or upper jaw projecting when closed. Maxillary curved, wider posteriorly. Composition, shape and sizes of teeth on maxillary, premaxillary and dentary identical with those of *A. falcatus falcatus*. Two premaxillary foramina in young, one in adults. Number of teeth in the posterior row on the dentary varying from 11-20. Ectopterygoid with a long row of very small close-set conical teeth, curved posteriorly. General structure of spiny gill rakers (Fig. 36A) as in *A. falcatus falcatus;* 22-29 gill rakers on the lower part of the first gill arch.

Scales moderately large. Lateral line as in *A. falcatus falcatus;* number of lateral line scales, 89-102; 23-26 scales above lateral line, 13-16 below. Single row of scales on either sides of anal fin base, continued back to the fifteenth or sixteenth branched ray. Ventral axillary scale about one third as long as ventral fin.

Anal fin falcate anteriorly, with its last unbranched ray very strong and laterally flat in adults; its origin under end of dorsal fin base. Ventral fins reaching anus but not anal. Pectorals longer than, and in some specimens reaching origin of, ventrals. Lower caudal lobe much longer than upper.

Ground color in alcohol as in *A. falcatus falcatus.* A large nearly round black humeral blotch, immediately followed by a light area; a small round black blotch at the caudal base. Sides with a silvery dark band. All fins punctate with black pigment.

The measurements of the specimens are shown in appendix table 27; the regression data in figures 95-104 and appendix table 10.

DISTRIBUTION (Fig. 37)

Amazon, Paraguay, Paraná, Uruguay, and São Francisco river basins.

GEOGRAPHIC VARIATION

The samples from different localities in every large river basin did not show significant differences and comparisons of material from the different river systems revealed close similarity in both meristic characters and body proportions.

Acestrorhynchus altus, sp. n.

(Fig. 38)

Xiphorhamphus falcatus (not of Bloch, 1794:120) Goeldi, 1898:483 (Ilha de Marajó, Pará, diagnosis).

Acestrorhynchus falcatus (not of Bloch, 1794:120) Devincenzi & Teague, 1924:81 (Uruguay); Aramburu, 1953:315 (description).

Acestrorhamphus falcatus (not of Bloch, 1794:120) Pozzi, 1945:257 (listed).

Acestrorhamphus ferox (not of Günther, 1863:443) Eigenmann, 1907: 452 (La Plata).

Acestrorhynchus sp. A. Menezes 1969:219.

Type-locality: Rio Arari in Cachoeira do Arari, Ilha de Marajó, Pará.

Holotype: MCZ 45256.

Paratypes (57): BM(NH) — Bahia de Asunción, Paraguay (4), Asunción, Paraguay (2), Carandàsinho, Mato Grosso (1); USNM — Las Palmas, Argentina (1), Bahia de Asunción, Paraguay (1); FMNH — Descalvados, Mato Grosso (10); DZSP — São Luís de Cáceres, Mato Grosso (1), Lago Arari, Ilha de Marajó, Pará (3); MCZ — Rosário, Argentina (2), Cachoeira do Arari, Ilha Marajó, Pará (28), Óbidos, Pará (1); Parintins, Amazonas (1), Rio Javari, Amazonas (1).

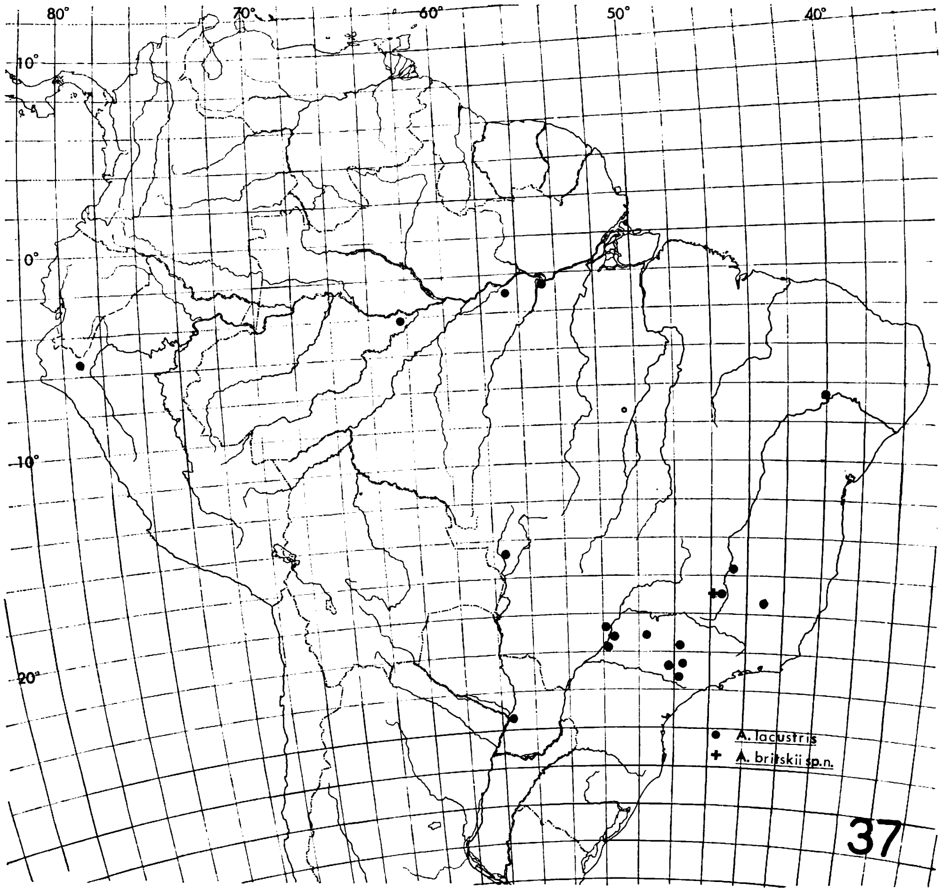


Fig. 37: geographic distribution of *Acestrorhynchus lacustris* (Reinhardt) and *A. britskii*, sp. n.

DIAGNOSIS

D. ii, 9; A. v, 21-27; P. 15-19; V. 8; 98-115 perforated scales in the lateral line; 27-34 scales from lateral line to origin of dorsal fin, 15-18 from lateral line to origin of anal; 20-27 gill rakers on the lower part of the first gill arch; a conspicuous nearly round black blotch at the humeral region; a small black round blotch at the caudal base. This species is closely related to *A. lacustris* (Reinhardt) in color and body proportions. It has, however, more scales in, above and below the lateral line. They are sympatric, occurring together in several places within the Amazon and Paraguay river basins.

DESCRIPTION

Body large (S.L. 29-235 mm) and very deep; head massive, much wider and depressed above. Dorsal and ventral outlines of the body similarly curved. Snout conical, always longer than orbital diameter. Mouth terminal, gape long; jaws equal when opened or lower jaw projecting when closed. Maxillary curved, widening posteriorly. Composition, shape and sizes of teeth on maxillary, premaxillary, and dentary as in *A. falcatus falcatus*. Young with two premaxillary foramina; adults with just one. Number of teeth in the posterior row on the dentary varying from 13-18. Ectopterygoid tooth row long, with very small close-set teeth. Structure of spiny gill rakers (Fig. 38A) similar to that of *A. lacustris;* 20-27 gill rakers on the lower part of the first gill arch.

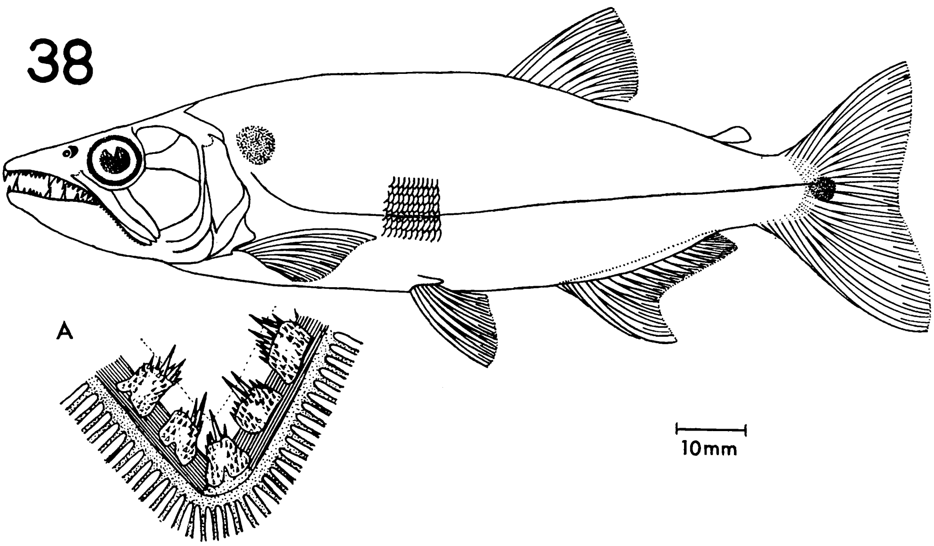


Fig. 38: *Acestrorhynchus altus,* sp. n., female, 130 mm S.L., MCZ 45253; A, gill rakers on first gill arch.

Scales moderately large. Lateral line curved along the sides of the body, rising abruptly anteriorly toward the upper part of the opercle, with 98-115 scales; 27-34 scales from lateral line to origin of dorsal fin, 15-18 from lateral line to origin of anal. Single row of scales along anal fin base, continued back to the thirteenth or fourteenth branched ray. Ventral axillary scale about one third as long as ventral fin.

Anal fin falcate, with its last unbranched ray enlarged and laterally flat; its origin under or immediadiately after end of dorsal fin base. Ventral fins just reaching anus. Pectorals longer than ventrals and in some specimens reaching origin of the latter. Lower caudal lobe longer than upper.

Ground color in alcohol as in *A. falcatus falcatus*. A nearly round black humeral blotch, surrounded by a light area; a small black blotch at the caudal base; a very small oval black spot in front of the first dorsal fin ray; a silvery dark band along sides of body. Some small specimens have a black blotch at tip of mandible. All fins with scattered black pigment.

The measurements of the specimens are presented in appendix table 28; the regression data in figures 95-104 and appendix table 11.

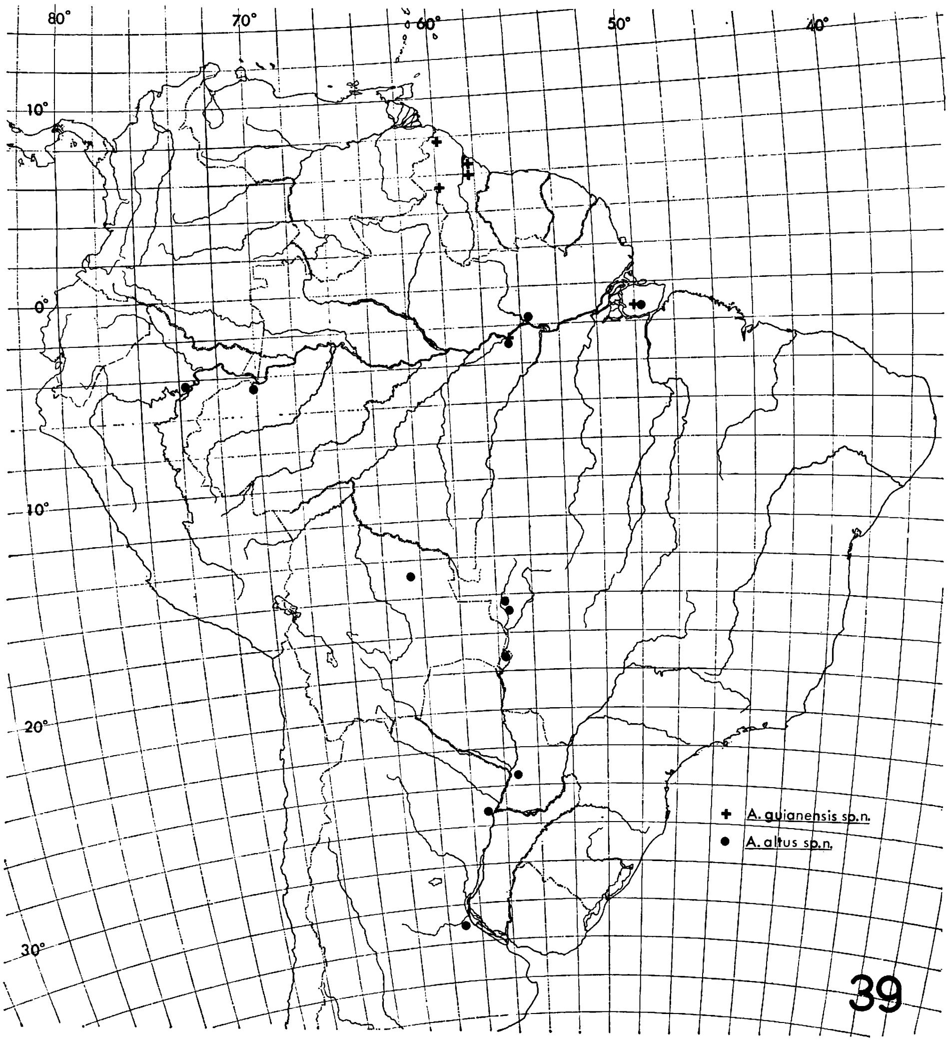


Fig. 39: geographic distribution of *Acestrorhynchus guianensis*, sp. n., and *A. altus*, sp. n.

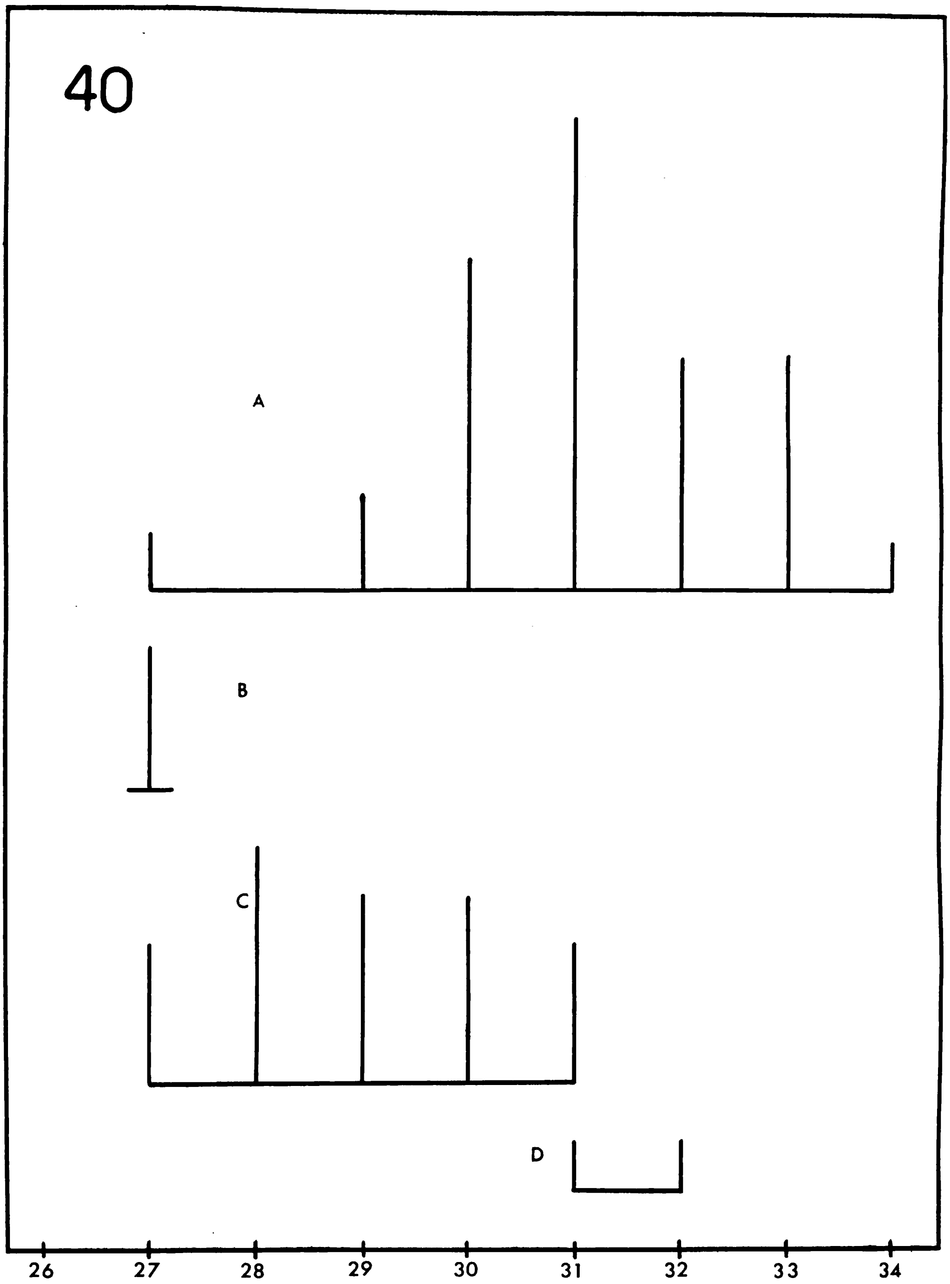


Fig. 40: variation in number of scales above the lateral line in *Acestrorhynchus altus,* sp. n., from the major river basins within the total range of the species. A, Arari, B, Amazon River Basin; C, Paraguay River Basin; D, Lower Paraná River Basin.

DISTRIBUTION (Fig. 39)

Amazon, Paraguay, Lower Paraná and Uruguay river basins.

GEOGRAPHIC VARIATION

1. Meristic characters. The samples taken from the different localities in every basin of the total distribution proved to be quite homogeneous in all meristic characters analysed.

Within the species range, specimens from the Amazon (Arari included) and Paraguay basins show a slight tendency toward lower scale counts above the lateral line (Fig. 40), otherwise, meristic variation seems to have no geographical significance.

2. Body proportions. A close agreement in body proportions was obtained in the regression analysis for all samples within each river basin. When specimens from the different basins were compared with each other, the regression of head length against trunk length revealed that two specimens from Rosário, Argentina (Lower Paraná) differed considerably from the rest (Fig. 41). In other proportions, these specimens did not show any differences.

In view of the above evidence we may conclude that *A. altus*, sp. n., is also a rather widespread species without significant geographic variation.

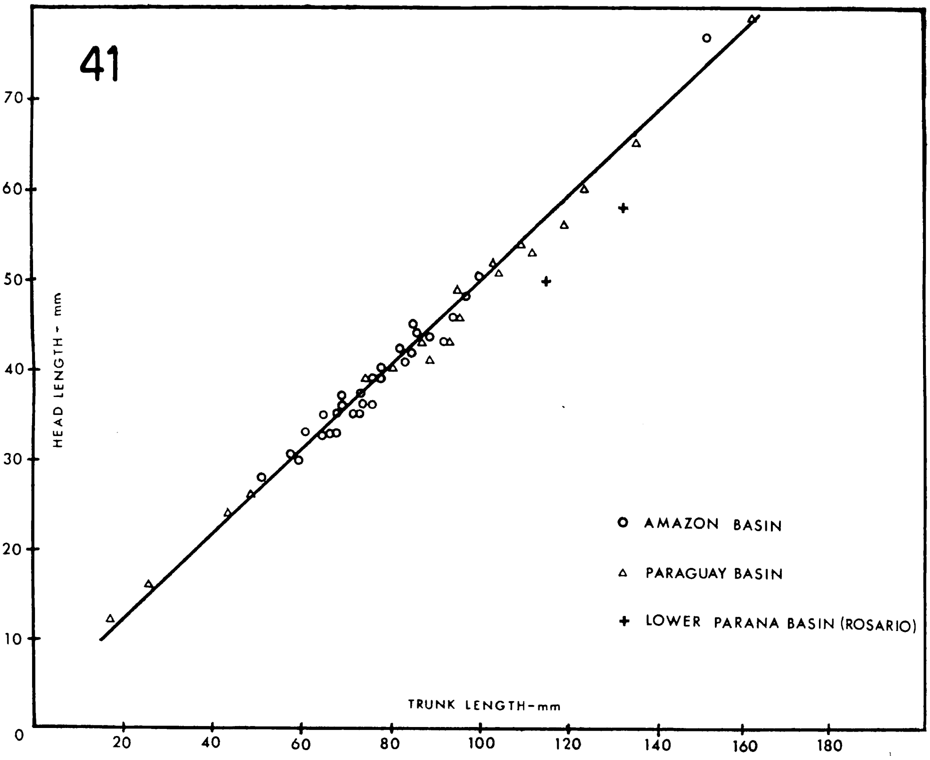


Fig. 41: linear regression of head length on trunk length in *Acestrorhynchus altus*, sp. n., from the major river basins within the total range of the species.

Acestrorhynchus britskii, sp. n.

(Fig. 42)

Type-locality: Reprêsa de Três Marias, Rio São Francisco basin in Minas Gerais.

Holotype: DZSP 4406, collected by Heraldo Britski.

Paratype: DZSP 4405, Reprêsa de Três Marias, Minas Gerais.

Diagnosis

D. ii, 9; A. v, 23-27; P. 14; V. 8; 92-103 perforated scales in the lateral line; 18 scales from lateral line to origin of dorsal fin, 12 from lateral line to origin of anal; 21 gill rakers on the lower part of the first gill arch; a dark band from the upper part of the opercle to caudal base, where it becomes enlarged; a black blotch on middle of caudal fin, anteriorly fused with the dark band and continued back on median caudal rays. This species is most closely related to *A. falcatus falcatus* (Bloch) from which it differs by having the dark band on sides of body, fewer pectoral rays and a larger number of scales in the lateral line.

Description

Body moderate (S.L. 157-165 mm.); head moderately massive, wider and depressed above. Dorsal and ventral body outlines about equally curved. Snout conical, longer than orbital diameter. Mouth terminal, gape long; jaws equal when opened or upper jaw projecting when closed. Maxillary curved, with its toothed edge convex, ending in an acute angle. Composition, shape and sizes of maxillary, premaxillary, dentary and ectopterygoid teeth as in *A. falcatus falcatus*. Two premaxillary foramina present at all ages. Posterior tooth row on dentary with 15-17 teeth. Upper edge of spiny gill rakers with a variable number of spines, one of them being much longer and stronger than the others; surface of every flat gill raker covered with spines, the size of which decrease toward the lower part (Fig. 42A). 21-22 gill rakers on the lower part of the first gill arch.

Scales moderately large. Lateral line nearly straight on sides of body, gradually curving anteriorly toward the upper part of the opercle, with 92-103 scales; 18 scales above lateral line, 12 below. Single row of scales along anal fin base continued back to the ninth or tenth branched ray. Ventral axillary scale about one fourth as long as ventral fin.

Anal fin strongly falcate, with first branched ray reaching middle of anal fin base; its origin just behind dorsal fin base. Number of anal fin rays v, 23-27. Ventral fins reaching beyond anus but not insertion of anal fin; the second ray filamentous. Pectorals equal to or slightly shorter than ventrals, never reaching origin of the latter. Lower caudal lobe slightly longer than upper.

Color in alcohol dark above, light yellow on sides; snout and top of head dark; a dark band along sides of body from upper part of opercle to caudal base, narrower on sides of caudal peduncle and enlarged at the caudal base; a black blotch on middle of caudal fin, anteriorly fused to the end of dark band and continued back on median caudal rays. Sides of body with silvery white reflections. All fins pale.

The measurements of the specimens are shown in appendix table 29.

DISTRIBUTION (Fig. 37)

Rio São Francisco in Minas Gerais.

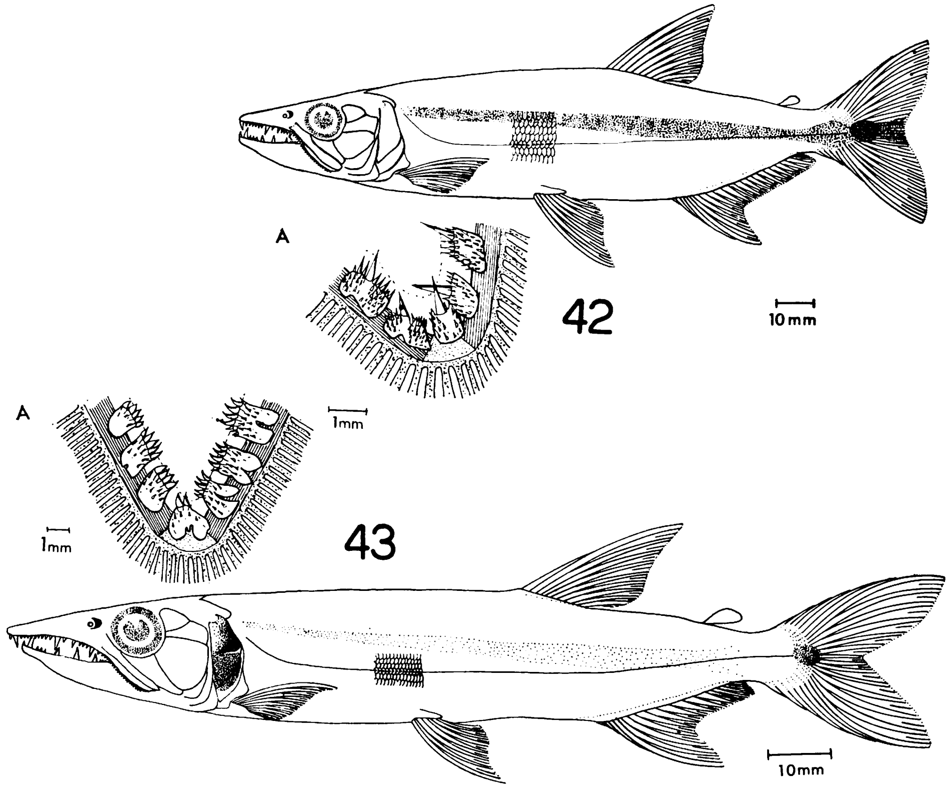


Fig. 42: *Acestrorhynchus britskii,* sp. n., female, 165 mm S.L., DZSP 4405; A, gill rakers on first gill arch. Fig. 43: *falcirostris* (Cuvier), female, 157 mm S.L., MCZ 45282; A, gill rakers on first gill arch.

Acestrorhynchus britskii, sp. n., is named after Heraldo A. Britski of the Departamento de Zoologia, Secretaria da Agricultura, São Paulo, who collected the specimens at the Represa de Três Marias in Minas Gerais.

Acestrorhynchus falcirostris (Cuvier, 1819)

(Figs. 43, 61F)

Hydrocyon falcirostris Cuvier, 1819:361 (type-locality: Brazil; type not seen); Cuvier, 1829:312 (listed).

Xiphorhynchus falcirostris; Agassiz, 1829:76 (listed); Cuvier & Valenciennes, 1849:341 (description).
Xiphorhamphus falcirostris; Müller & Troschel, 1844:92 (Brazil: description); 1845:18 (Brazil); Kner, 1860:58 (Mato Grosso; description); Günther, 1864:354 (Demerara River; Cupai; description); 1868:247 (Xeberos, Peru); Cope, 1878:688 (Peruvian Amazon); Steindachner, 1883:15 (Rio Huallaga, Peru); Ulrey, 1895:295 (Brazil; synonymy); Goeldi, 1898:483 (Rio Capim; diagnosis); Regan, 1905:190 (Rio Negro).
Acestrorhynchus falcirostris; Fowler, 1906:462 (description of Cope's specimens); 1914:254 (Rupununi); 1939:91 (Boca Chica, Peru; description); 1945:172 (Peru); Eigenmann, 1910:447 (listed); 1912b:410 ([British] Guyana; diagnosis); Campos, 1945b:456 (diagnosis); Fernandez-Yepez, 1955:3 (diagnosis); Géry, 1964:30 (Peruvian Amazon; diagnosis); Lowe, 1964:142 (listed); Menezes, 1969:219.
Hydrocyon armatus Schomburgk, 1841, pl. 25 (not the description).

Specimens studied (80): CAS(IUM) — Konawaruk, [British] Guyana (1), Twoca Pan, [British] Guyana (1), Rockstone, [British] Guyana (3), Lama Stop-Off, [British] Guyana (1), Maduni Creek, [British] Guyana (1), Malali, [British] Guyana (1); BM(NH) — Rockstone, [British] Guyana (1); USNM — Rio Pacaya, Peru (1); FMNH — Twoca Pan, [British] Guyana (1), Konawaruk, [British] Guyana (1), Rockstone, [British] Guyana (2), Lama Stop-Off, [British] Guyana (1), Maduni Creek, [British] Guyana (1), Malali, [British] Guyana (2), Wismar, [British] Guyana (1); DZSP — Rio Chimire, Venezuela (4), Rio Guariquito, Venezuela (4), Belém, Pará, Lago Agua Preta (2), Belém, Pará (1), Rio Tapajós, Pará (5), Lago Jacaré, Pará (5); ANSP — Boca Chica, Peru (4); MCZ — Cachoeira de Arari, Ilha de Marajó, Pará (3), Boa Vista, Pará, Rio Apeú (5), Gurupá, Amazonas (17), Santarém, Pará (2), Codajás, Amazonas (1), Rio Xingu (1), Tefé, Amazonas (6).

DIAGNOSIS

D. ii, 9; A. v, 18-24; P. 14-19; V. 8; 140-175 scales in the lateral line; 30-37 scales from lateral line to origin of dorsal, 17-22 from lateral line to origin of anal; 30-39 gill rakers on the lower part of the first gill arch; opercle with two dark patches, the upper being separated from the lower by a narrow light strip; a nearly round black blotch at caudal base. This species is sympatric with *A. falcatus falcatus* (Bloch) in many areas.

DESCRIPTION

Body very large (S.L. 90-380 mm) and relatively low; head very massive, wider and depressed above. Dorsal outline of the body somewhat more curved than ventral. Snout conical and much longer than orbital diameter at all ages. Mouth subterminal, gape very long; upper jaw projecting, always longer than lower jaw. Maxillary curved, slightly convex on its posterior toothed edge, ending in a very pronounced acute angle; composition, shape and sizes of maxillary teeth as in *A. falcatus falcatus* (Bloch). Premaxillary with a small conical tooth in front, followed by a canine and a row of small conical teeth variable in number (6-13); a large canine and a conical tooth slightly longer than the anterior ones follow this row; there are two premaxillary foramina to receive the first two teeth on the dentary at all ages. Teeth on dentary and ectopterygoid as in *A. falcatus falcatus* (Bloch). Teeth in the posterior row on the dentary with a highly variable number (10-16). Spines of free upper edge of gill rakers small, none of them prominent; surface of flat gill rakers with just a few spines (Fig. 43A); 30-39 gill rakers on the lower part of the first gill arch.

Scales very small. Ltaeral line nearly straight along sides of body, little curved in front toward the upper part of opercle, with a highly variable number of scales (140-175); 30-37 scales above lateral line, 17-22 below. Single row of scales along base of anal fin continued back to the eighth or tenth branched ray. Ventral axillary scale about one fourth as long as ventral fin.

Anal fin strongly falcate, its first branched ray reaching slightly beyond the end of anal fin base. Number of anal fin rays v, 18-24. Ventral fins never reaching anus. Pectorals equal to or shorter than ventral fins and not reaching the insertion of the ventrals. Caudal fin lobes equal.

Color in alcohol dark brown on sides and above, light yellow below; snout and top of head dark; two dark patches on opercles, separated by a narrow light stripe, the upper being oval shaped posteriorly and black on its posterior edge; the lower is approximately squared in shape and uniformly black; a faded dark stripe on sides of body from upper part of opercle to caudal base; a nearly round black blotch at caudal base; toothed part of mandible with two thin stripes of dark pigment. Pectorals, ventrals and anal fins pale; tip of uppermost dorsal fin and tip of caudal rays black. In very young specimens there is a wide axial band from tip of snout to caudal base.

In specimens kept long in alcohol, the two dark patches on the opercle tend to disappear, leaving a thin dark stripe on the free edge of the opercle; the dark stripe along the sides also tend to disappear and pectorals and caudal become pale.

The measurements of the specimens are shown in appendix table 30; the regression data in figures 95-104 and appendix table 12.

DISTRIBUTION (Fig. 44)

Amazon River basin, rivers of [British] Guyana and Orinoco River basin.

GEOGRAPHIC VARIATION

1. Meristic characters. In the Amazon basin, one sample from Lago Jacaré tended to have more scales above the lateral line (Fig. 46)

and once more, the number of scales in the lateral line tended to vary clinally from east to west (Fig. 45). In other characters there was no significant difference among the samples.

In [British] Guyana most of the meristic characters did not show significant variation but as should be expected, an increase in number of scales in the lateral line was evident from north to south (Fig. 47).

The comparisons of material from [British] Guyana, Amazon and Orinoco (represented by seven specimens from a single locality) basins revealed no major differences although the [British] Guyana and the Orinoco material did show a slight tendency toward fewer anal rays and lateral line scales (Figs. 48 and 49).

2. Body proportions. There were no significant differences in body proportions among the samples from [British] Guyana, Amazon and Orinoco.

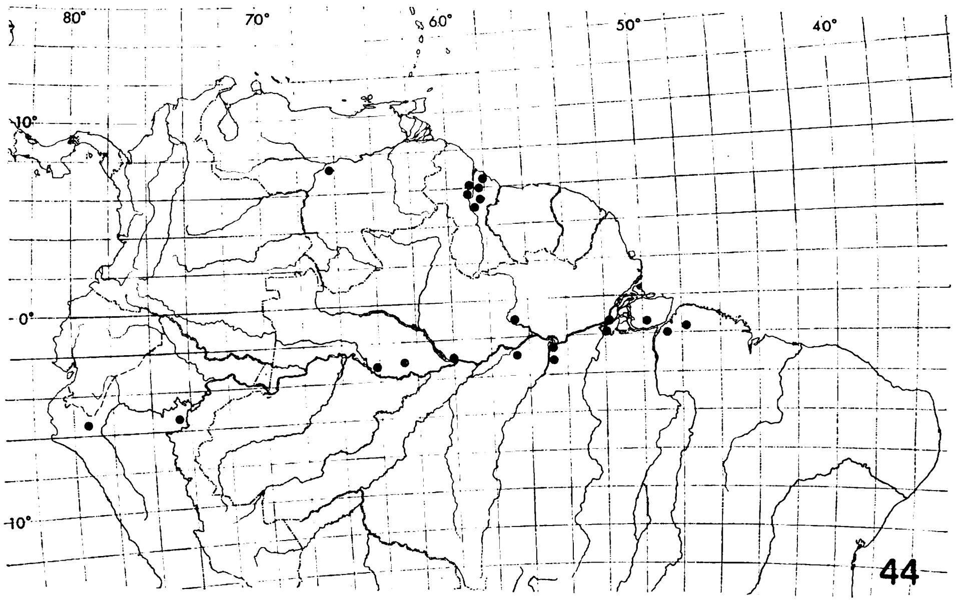


Fig. 44: geographic distribution of *Acestrorhynchus falcirostris* (Cuvier)

The above results seem to indicate an almost complete identity of forms in the total range of the species. The apparent clinal variation related to scale counts found, reinforces the assumption that these and perhaps other characters are influenced by physical factors of the environment.

Acestrorhynchus microlepis (Schomburgk, 1841)

(Fig. 50)

Xiphorhamphus microlepis Schomburgk, *in* Jardine, 1841:247 (not plate 25; type-locality: Essequibo River; type not seen, topotypes examined); Müller & Troschel, 1845:17 (Guyana; description); 1848:

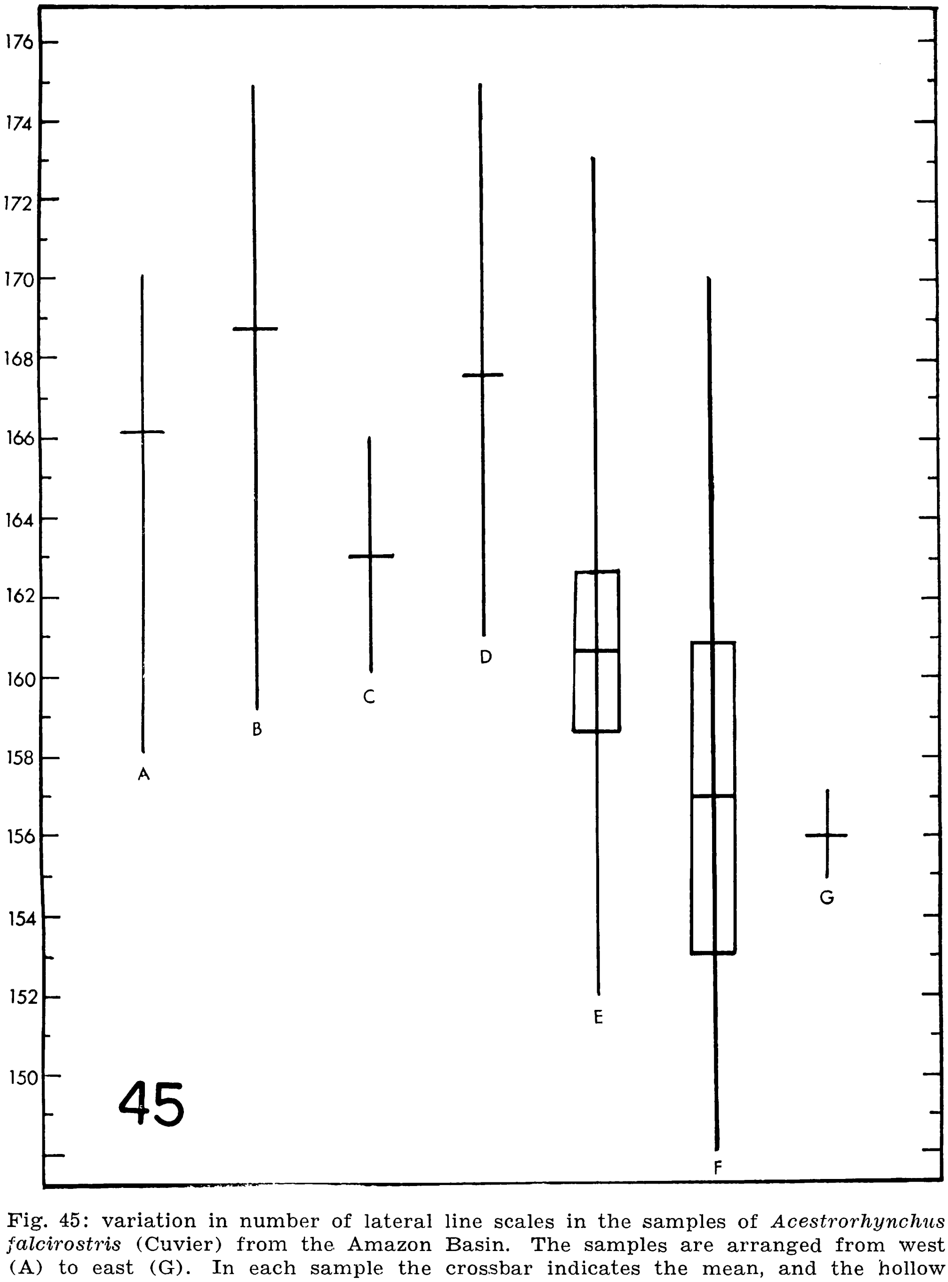
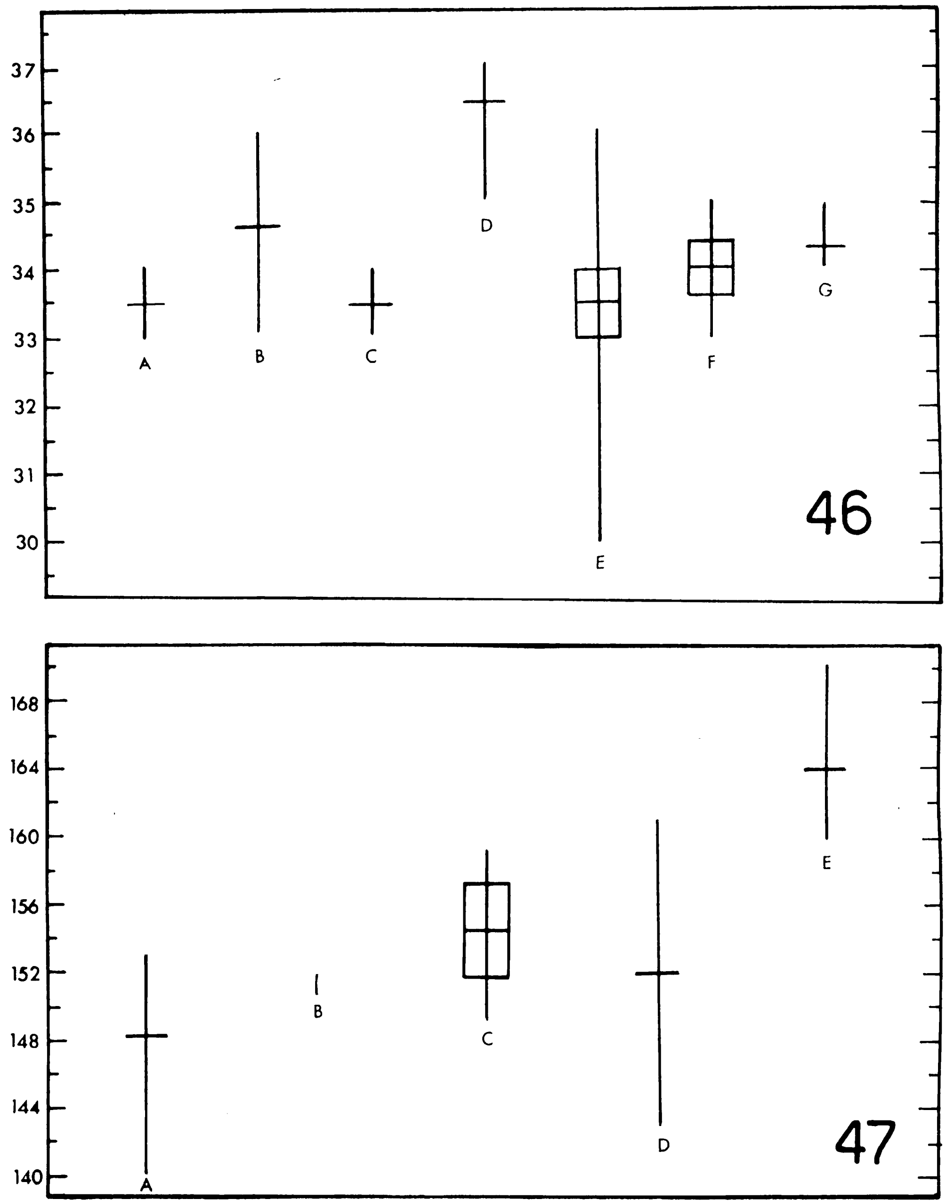


Fig. 45: variation in number of lateral line scales in the samples of *Acestrorhynchus falcirostris* (Cuvier) from the Amazon Basin. The samples are arranged from west (A) to east (G). In each sample the crossbar indicates the mean, and the hollow rectangle *t* standard deviations on either side of the mean. A, Peruvian Amazon; B, High Amazon; C, Middle Amazon; D, Jacaré; E, Lower Amazon; F, Guamá; G, Arari.



Acestrorhynchus falcirostris (Cuvier). Fig. 46: variation in number of scales above the lateral line in the samples from the Amazon Basin. Localities as in Fig. 45. Fig. 47: variation in number of lateral line scales in the samples from [British] Guyana. The samples are arranged from north (A) to south (E). In each sample the crossbar indicates the mean and the hollow rectangle *t* standard deviations on either side of the mean. A, Mahaica River; B, Wismar; C, Rockstone; D, Malali; E, Lower Essequibo River.

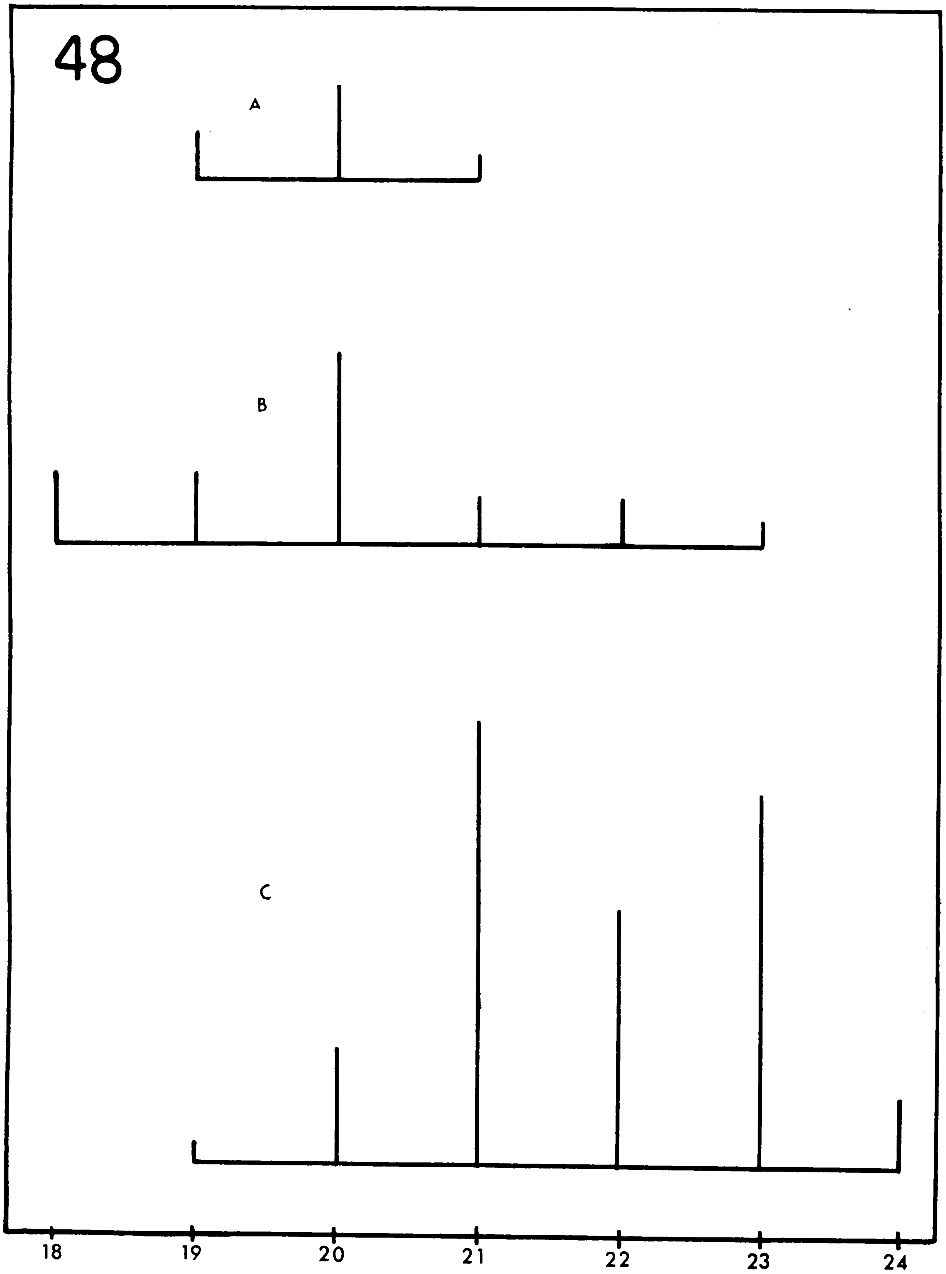


Fig. 48: variation in number of anal fin rays in *Acestrorhynchus falcirostris* (Cuvier) from the Amazon River Basin (C), [British] Guyana (B) and Orinoco River Basin (A).

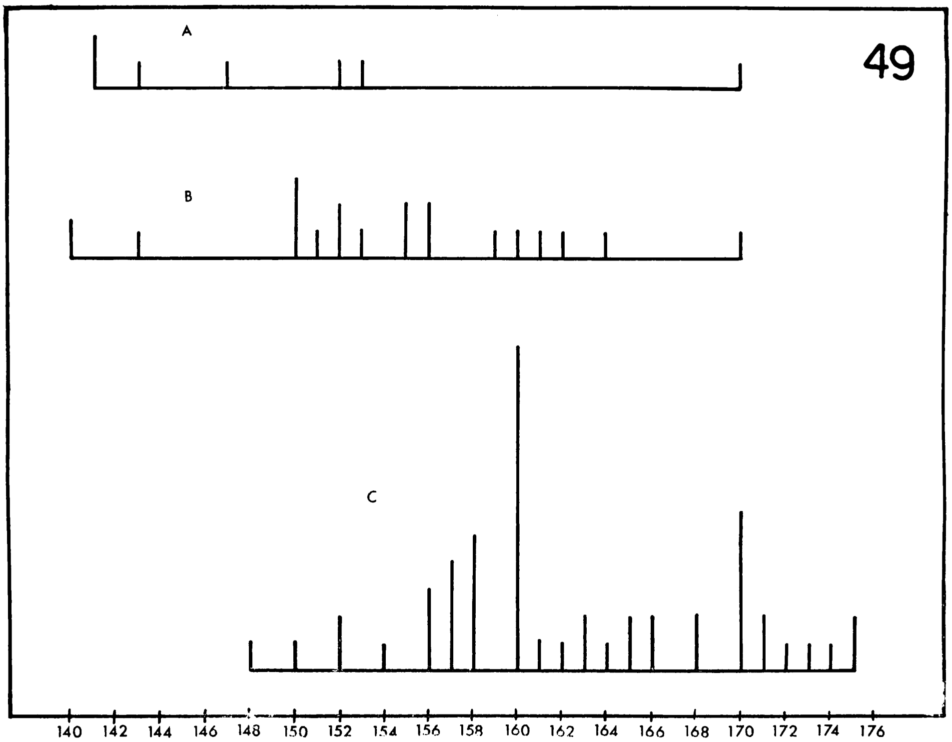


Fig. 49: variation in number of lateral line scales in *Acestrorhynchus falcirostris* (Cuvier) from the Amazon Basin (C), [British] Guyana (B) and Orinoco River Basin (A).

636 (Pomeroon; Essequibo; Rupununi; Takutu); Günther, 1864:355 (Essequibo River, [British] Guyana; description); Steindachner, 1883:14 (Rio Huallaga; Rio Amazonas in Iquitos); Eigenmann & Eigenmann, 1891:58 (listed); Puyo, 1949:136 (French Guyana).

Xiphorhynchus microlepis; Cuvier & Valenciennes, 1849:342 (Guyana; description).

Acestrorhynchus microlepis; Eigenmann, 1910:447 (listed); 1912b:408 (part; [British] Guyana; diagnosis); Rachow, 1914:25 (description); Di Caporiacco, 1935:66 (Demerara; Essequibo); Eigenmann & Allen, 1942:276 (synonymy; distribution); Fowler, 1945:173 (Peru); Campos, 1945b:481 (diagnosis); Boeseman, 1952:191 (Surinam River); Fernandez-Yepez, 1955:4 (diagnosis); Géry, 1964:31 (Peruvian, Amazon; diagnosis); Lowe, 1964:142 (Rupununi, [British] Guyana); Menezes, 1969:219.

Acestrorhynchus cachorro Fowler, 1939:274 (type-locality: Rio Ucayali basin, Boca Chica, Peru; type in ANSP, examined); 1945:172 (Peru); Eigenmann & Allen, 1942:276 (distribution).

Xiphorhynchus falcatus (not of Bloch, 1794:120) Cuvier & Valenciennes, 1849:337 (part; Mana?).

NOMECLATURAL NOTE

Hydrocyon armatus represented in first plate 25 of Jardine's book (there are two plates numbered 25, by mistake) which is said to correspond to Schomburgk's description of *Hydrocyon microlepis* is certainly an *Acestrorhynchus falcirostris*, as noted by Eigenmann (1912b: 410).

The type-locality of *Hydrocyon microlepis* in the above synonymic list (Essequibo River) is restricted from the original description, which presents as type-localities the rivers Branco, Negro and Essequibo.

Specimens studied (70) : ANSP — Boca Chica, Peru (1) ; BM(NH) — Surinam (1), Tumatumari, [British] Guyana (1), Crab Falls, [British] Guyana (1), Rockstone, [British] Guyana (1) ; IUM — Lama Stop-Off, [British] Guyana (1) ; FMNH — Tumatumari, [British] Guyana (3), Potaro Landing, [British] Guyana (1), Konawaruk [British] Guyana (4), Crab Falls [British] Guyana (7), Rockstone, [British] Guyana (5), Malali, [British] Guyana (1), Lama Stop-Off, [British] Guyana (1), Hubabu Creek, [British] Guyana (6), Georgetown, [British] Guyana (1), Erukin, [British] Guyana (1) ; MCZ — Codajás, Amazonas (3), Gurupá, Amazonas (3), Jatuarana, Amazonas (2), Tefé, Amazonas (5), Parintins, Amazonas (16), Óbidos, Pará (1), Pôrto do Moz, Pará (2).

DIAGNOSIS

D. ii, 9; A. v, 25-31; P. 13-18; V. 8; 108-122 perforated scales in the lateral line; 20-22 scales from lateral line to origin of dorsal fin, 15-18 from lateral line to origin of anal; 20-26 gill rakers on the lower part of the first gill arch; a very small indistinct dark blotch at the origin of lateral line, behind opercle; a nearly round black blotch at the caudal base. This species is sympatric with *A. falcirostris* (Cuvier)

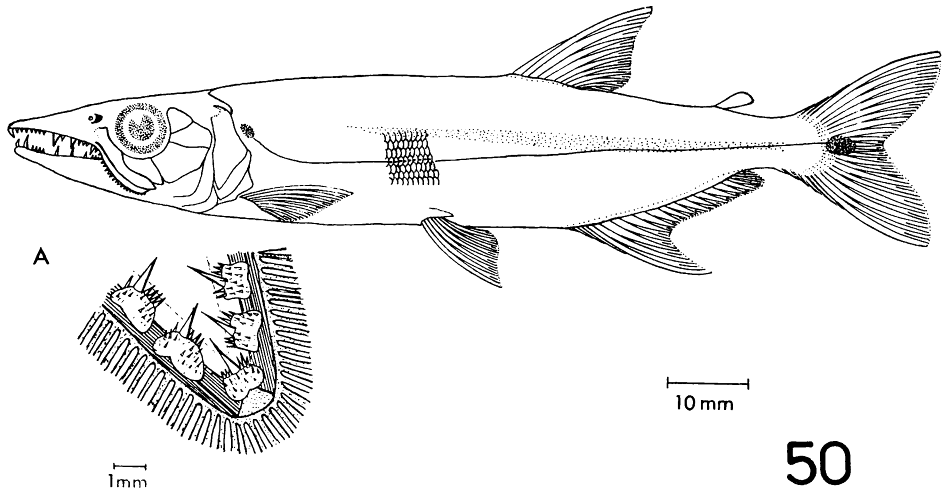


Fig. 50: *Acestrorhynchus microlepis* (Schomburgk), female, 100 mm S.L., FMNH 54925a; A, gill rakers on first gill arch.

and *A. falcatus falcatus* (Bloch) in several places, both in [British] Guyana and in the Amazon.

Description

Body moderately large (S.L. 53-151 mm) and low; head massive, a little wider and depressed above. Ventral outline of the body more strongly curved than dorsal. Snout conical, longer than orbital diameter. Mouth terminal, gape moderately long; jaws equal when opened or upper jaw projecting when closed. Maxillary curved, strongly convex on its posterior toothed edge, ending in an acute angle; composition of maxillary teeth as in *A. falcatus falcatus* but median teeth on the posterior convex part, longer than the ones in the extremes. Teeth on premaxillary, dentary and ectopterygoid as in *A. falcatus falcatus,* 9-14 teeth is the posterior row on the dentary; inner row on dentary with 2-4 teeth; 7-10 small conical teeth between the canines on premaxillary. Premaxillary foramina, two at all ages. Spiny gill rakers (Fig. 50a) with a prominent inclined spine and some smaller ones on their free edges; surface of each gill raker with many small spines; 20-26 gill rakers on the lower part of the first gill arch.

Scales small. Lateral line approximately straight on sides of body, little curved anteriorly, with 108-122 scales; 20-22 scales above lateral line, 15-18 below. Single row of scales along anal fin base continued back to the tenth or eleventh branched ray. Ventral axillary scale about one third as long as ventral fin.

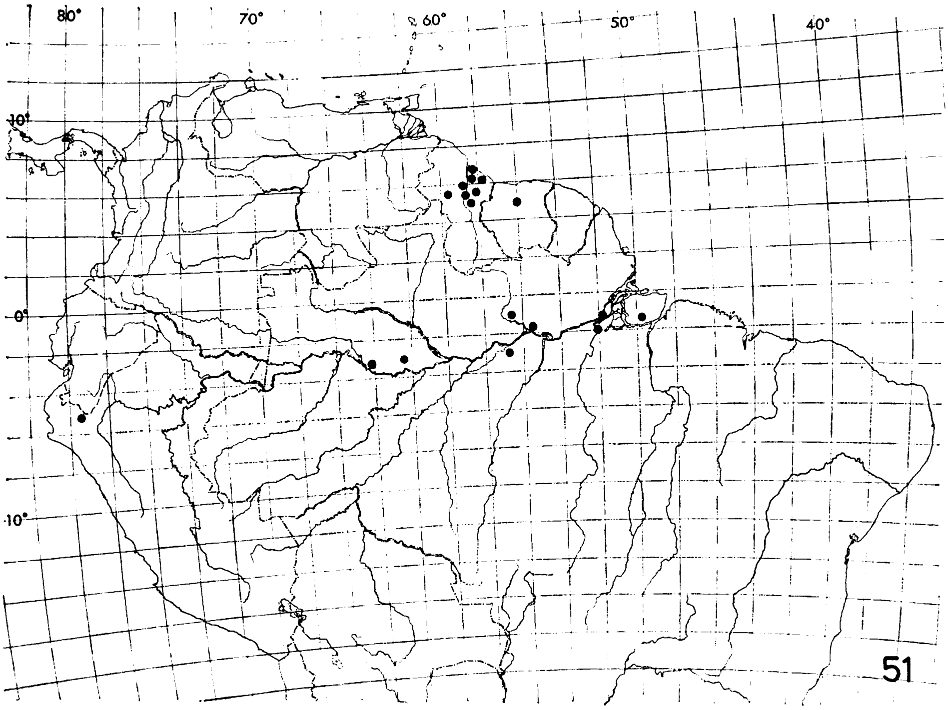
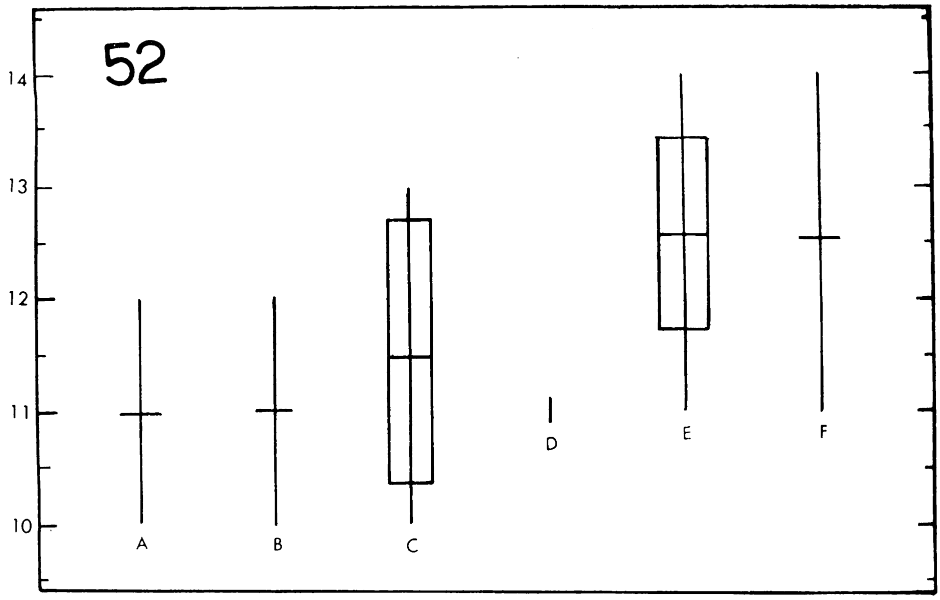
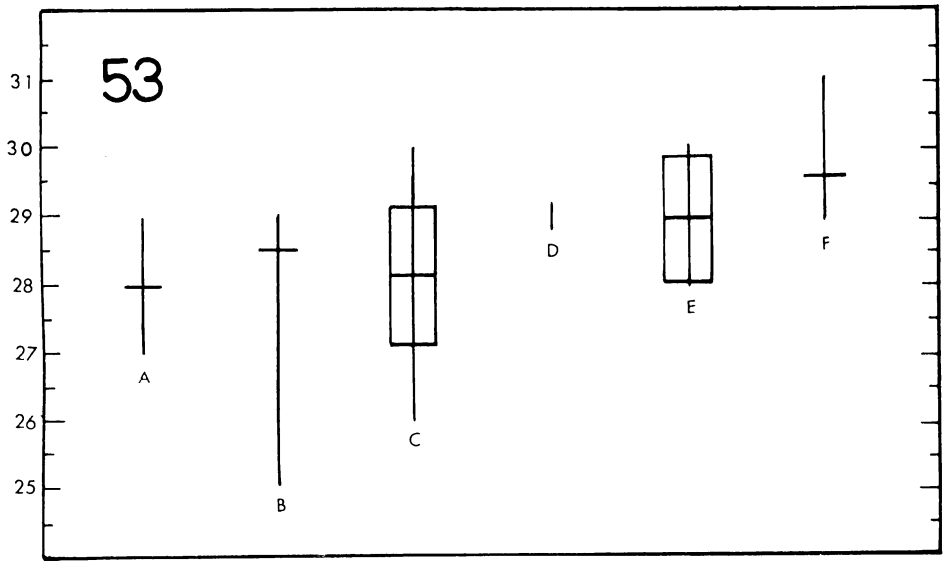


Fig. 51: geographic distribution of *Acestrorhynchus microlepis* (Schomburgk).





Acestrorhynchus microlepis (Schomburgk). Fig. 52: variation in number of teeth in the posterior row on the dentary in the samples from [British] Guyana. The samples are arranged from north (A) to south (F). In each sample the crossbar indicates the mean, and the hollow rectangle *t* standard deviations on either side of the mean. A, Upper Demerara River; B, Mahaica River; C, Middle Essequibo River; D, Malali; E, Lower Essequibo River; F, Potaro River. Fig. 53: variation in number of anal fin rays in the samples from [British] Guyana. Localities as in fig. 52.

Anal fin falcate, its first branched ray reaching beyond middle of base of anal fin. Number of anal fin rays v, 25-31. Ventral fins not reaching anus. Pectorals longer than ventrals and never reaching origin of the latter. Caudal fin lobes equal.

Color in alcohol light yellow, dark above; top of snout and head dark; a very small indistinct dark blotch behind opercle, at the origin of lateral line; a nearly round black blotch at the caudal base; a narrow silvery white band along sides of body. All fins punctate with black pigment; tip of dorsal fin, pectorals and caudal rays dark.

The measurements of the specimens are shown in appendix table 31; the regression data in figures 95-104 and appendix table 13.

DISTRIBUTION (Fig. 51)

Amazon River basin; rivers of [British] Guyana, Surinam and French Guiana.

GEOGRAPHIC VARIATION

1. Meristic characters. Within the Amazon basin, scales, teeth and branched anal rays did not show any significant variation. In [British] Guyana the number of branched anal rays and teeth in the posterior row on the dentary show a tendency to vary clinally (Fig. 52 and 53). In other characters the samples were quite homogeneous. One specimen from Surinam agreed in all meristic characters with the specimens from [British] Guyana. Specimens from French Guiana were not available for comparison.

A close similarity was obtained when the material of the three different regions was compared.

2. Body proportions. There where no significant differences in body proportions.

Meristic characters and body proportions reveal then a close identity of forms for the Guianas and the Amazon basin.

Acestrorhynchus guianensis, sp. n.

(Fig. 54)

Acestrorhynchus microlepis (not of Schomburgk, 1841:247) Eigenmann, 1912:408 (part; [British] Guyana; diagnosis).

Type-locality: Botanic Garden, [British] Guyana (trenches in Georgetown with water from the Demerara River).

Holotype: FMNH 74359, collected by C.H. Eigenmann.

Paratypes (21): USNM — Rio La Clarita, Venezuela (1), FMNH — Lama Stop-Off, [British] Guyana (1), Maduni Creek, [British] Guyana (2), Botanic Garden, [British] Guyana (3), Issororo Rubber Plantation, [British] Guyana (1); MCZ — Cachoeira do Arari, Ilha de Marajó, Pará (3), Parintins, Amazonas (10).

DIAGNOSIS

D. ii, 9; A. v, 25-30; P. 14-17; V. 8; 93-106 perforated scales in the lateral line; 17-19 scales from lateral line to origin of dorsal fin, 13-15 from lateral line to origin of anal; 20-25 gill rakers on the lower part of the first gill arch; a very small indistinct dark blotch at the origin of the lateral line; an almost round black blotch at the caudal base. This species is extremely close to *A. microlepis* (Schomburgk) from which it differs in number of scales. It has fewer scales in, above, and below the lateral line. The two species are found together in some rivers in [British] Guyana and in the Amazon basin.

DESCRIPTION

Body moderately large (S.L. 67-160 mm) and relatively low. Head as in *A. microlepis*. Ventral outline of the body more curved than dorsal. Mouth terminal, gape moderately long; jaws equal when opened or upper jaw projecting slightly when closed. Maxillary curved, prominently convex on its posterior toothed border, ending in an acute angle. Maxillary, premaxillary, dentary and ectopterygoid teeth as in *A. microlepis;* posterior tooth row on dentary with 9-14 teeth, inner row on dentary with 3-4; 6-10 small conical teeth between the premaxillary canines. Premaxillary foramina two, at all ages. Spiny gill rakers (Fig. 54A) structurally identical with those of *A. microlepis*. 20-25 gill rakers on the lower part of the first gill arch.

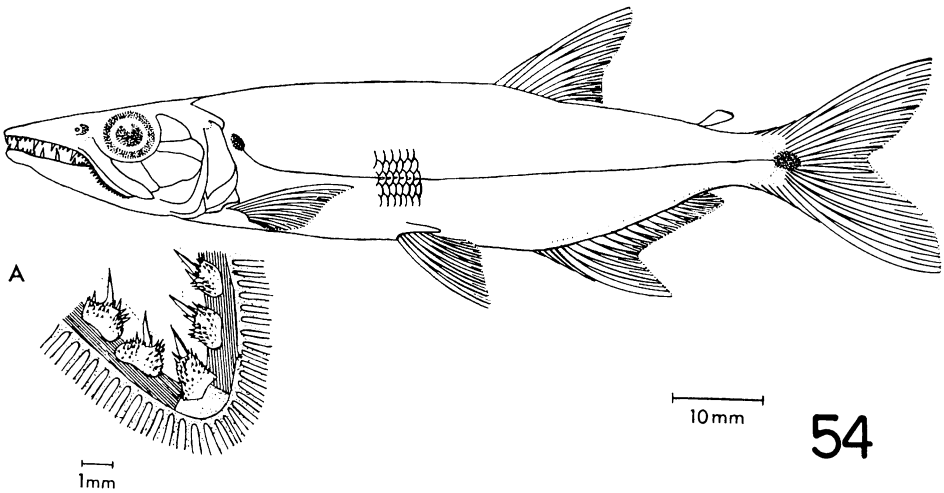
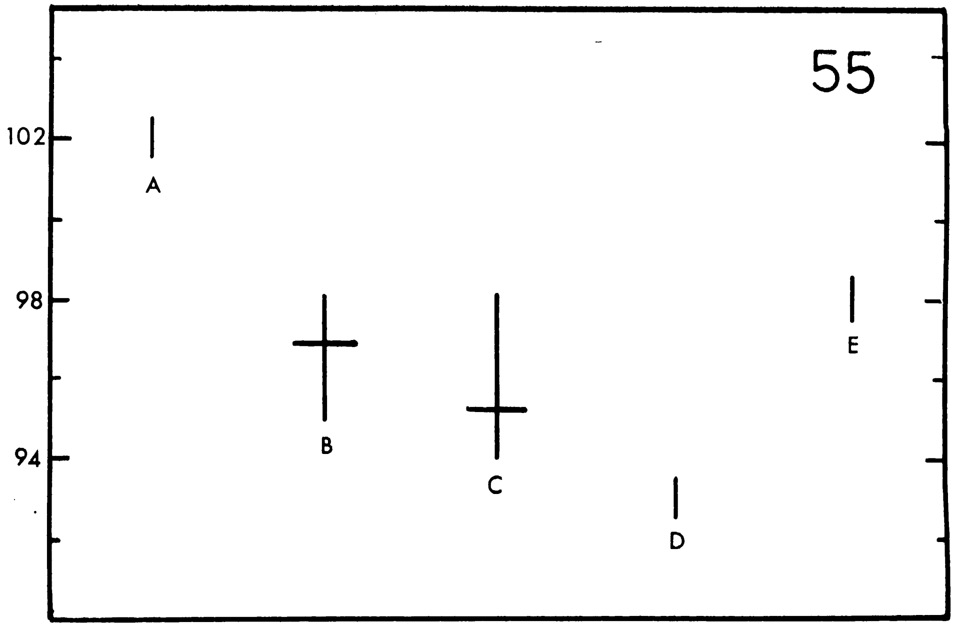
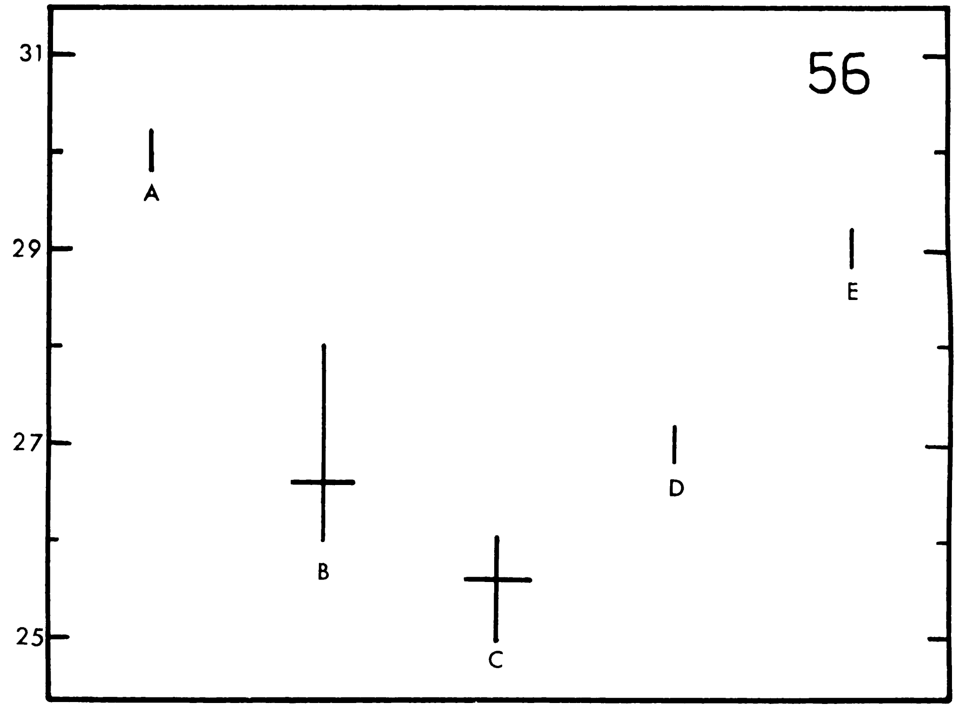


Fig. 54: *Acestrorhynchus guianensis*, sp. n., female, 80 mm S.L., FMNH 54922; A, gill rakers on first gill arch.

Scales small. Lateral line virtually straight on sides of body, rising gradually toward upper end of opercle, with 93-106 scales; 17-19 scales above lateral line, 13-15 below. Single row of scales on either side of anal fin base continued back to the tenth or eleventh branched ray. Ventral axillary scale as long as that of *A. microlepis*.





Acestrorhynchus guianensis, sp. n. Fig. 55: variation in number of lateral line scales in the samples from [British] Guyana. The samples are arranged from north (A) to south (E). In each sample the crossbar indicates the mean. A, Aruka River; B, Upper Demerara River; C, Mahaica River; D, Hububu Creek; E, Potaro River. Fig. 56: variation in number of anal fin rays in the samples from [British] Guyana. Localities as in fig. 55.

Anal fin falcate, its first branched ray almost reaching the end of anal fin base. Anal fin rays v, 25-30. First branched ray of ventral fins extending beyond origin of anus. Pectorals slightly longer than ventrals but not reaching origin of these fins. Caudal fin lobes equal.

Ground color in alcohol as in *A. microlepis* but top of head and snout not quite as dark as in that species.

The measurements of the specimens are shown in appendix table 32; the regression data in figures 95-104 and appendix table 14.

DISTRIBUTION (Fig. 70)

Amazon River basin; rivers of [British] Guyana; Orinoco River basin.

GEOGRAPHIC VARIATION

1. Meristic characters. The samples taken from the different localities in the Amazon Basin proved to be almost completely uniform in all meristic characters analyzed. In [British] Guyana, one specimen from the Aruka River and another from the Potaro River showed some disagreement with the other samples, having a higher number of branched anal rays (Fig. 56); two specimens from Hubabu Creek showed the least number of lateral line scales the same specimen from the Aruka River, on the other extreme, has the highest number (Fig. 55). In other characters all samples revealed a close uniformity.

When the materials from [British] Guyana and from the Amazon Basin were compared no significant meristic differences were found, although in the number of lateral line scales the Amazonian specimens showed slight tendency toward higher counts. A single Orinocan specimen did not differ from the other samples.

2. Body proportions. No differences in body proportions were found and the Amazonian and Guyanean materials and the single Orinocan specimen showed a close agreement in all regressions.

Thus there seems to be little geographialc variation. No evidence of clinal variation was found but this could be possibly due to the small size of each sample. This could also explain at least in part the lack of homogeneity in the material from [British] Guyana. *A. guianensis*, sp. n., is not as common as *A. microlepis* (Schomburgk).

Acestrorhynchus nasutus Eigenmann, 1912

(Fig. 57)

Acestrorhynchus nasutus Eigenmann, 1912b:411 (type-locality: Rockstone, [British] Guyana, Essequibo River; type in FMNH, examined); Steindachner, 1917:53 (Igarapé Rio Branco in Boa Vista, Pará); Fowler, 1950:324 (synonymy); Campos, 1945b:477 (listed); Fernandez-Yepez, 1955:3 (diagnosis).

Specimens studied (6): FMNH — Rockstone, [British] Guyana (1); BM(NH) — Monte Alegre, Amazonas (6).

DIAGNOSIS

D. ii, 9; A. v, 23-25; P. 12-14, V. 8; 78-82 perforated scales in the lateral line; 13-14 scales from lateral line to origin of dorsal fin, 8-9 from lateral line to origin of anal; 20-22 gill rakers on the lower part of the first gill arch; a dark horizontal stripe from tip of snout to caudal base; a second horizontal dark stripe below the first, from end of maxillary to inferior part of caudal peduncle, indistinct on its anterior part, quite evident and enlarged above anal fin base; a small black blotch at the caudal base, continued back to median caudal rays. This species is sympatric with *A. falcirostris* (Cuvier), *A. microlepis* (Schomburgk) and *A. falcatus falcatus* (Bloch) in [British] Guyana.

DESCRIPTION

Body small (S.L. 51-69 mm) and very low; head relatively massive, slightly wider and depressed above. Dorsal and ventral outlines of the body nearly evenly curved. Snout pointed, very long, twice as long as orbital diameter. Mouth subterminal, gape long; upper jaw projecting, much longer than lower. Maxillary curved, convex on its posterior

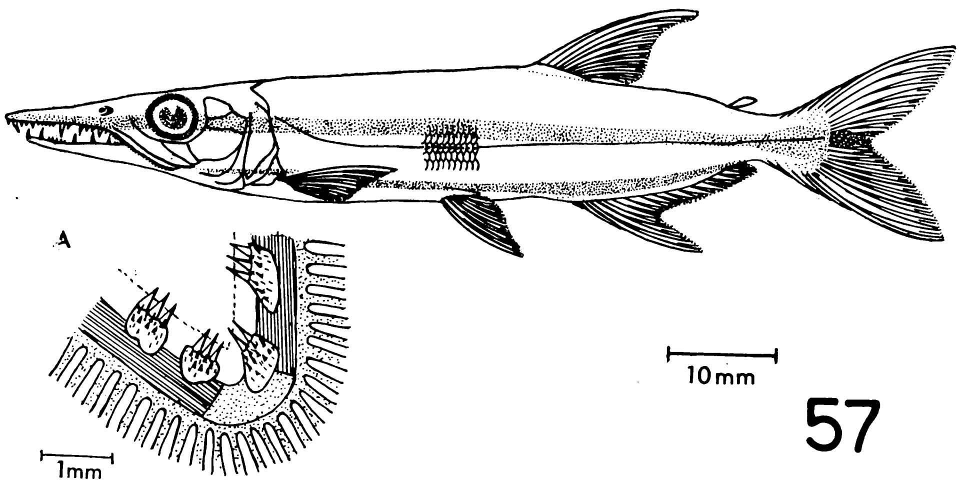


Fig. 57: *Acestrorhynchus nasutus* Eigenmann, female, 69 mm S.L. BM(NH) 1926.10.27 9-17a. A, gill rakers on first gill arch.

toothed border, ending in a very prominent acute angle; maxillary teeth as in *A. falcatus falcatus* (Bloch). Premaxillary with one or two conical teeth in front, followed by a canine, two small conical teeth, one or two canines slightly shorter than the first, a short row of 3-5 small conical teeth and finally one large canine which is immediately followed by a small conical tooth; there are two premaxillary foramina, at all ages. Teeth on dentary and ectopterygoid as in *A. falcatus falcatus;* posterior dentary tooth row with 14-16 teeth. Spiny gill rakers (Fig. 57A) small and spaced, with 2-4 relatively small spines of about equal size on their free upper edge and a few smaller ones on their surface, 20-22 gill rakers on the lower part of the first gill arch.

Scales relatively large. Lateral line approximately straight on sides of body, barely rising anteriorly toward upper end of opercle, with 78-82 scales; 13-14 scales above lateral line, 8-9 below. Single row of scales along anal fin base continued back to about the tenth or eleventh branched ray. Ventral axillary scale one third as long as ventral fin.

Anal fin strongly falcate, its first branched ray almost reaching the end of anal fin base, its origin under last dorsal fin rays. Number of anal fin rays v, 23-25. Ventral fins reaching origin of anus. Pectorals slightly longer than ventrals but not reaching origin of these fins. Caudal fin lobes equal.

Color in alcohol dark brown above, light yellow below; back, top of head and snout dark; a dark stripe from tip of snout to caudal base, enlarged on sides of caudal peduncle; a second dark stripe below, from end of maxillary to inferior part of caudal peduncle, rather diffuse anteriorly, becoming enlarged above anal fin base; a small black blotch at the caudal base, prolongated into median caudal rays. Sides of body with silvery white reflections. All fins with scattered black pigment.

The measurements of the specimens are presented in appendix table 34; the regression data in figures 95-104 and appendix table 15.

DISTRIBUTION (Fig. 58)

Essequibo River in [British] Guyana (Rockstone); Amazon Basin (Monte Alegre and Boa Vista).

GEOGRAPHIC VARIATION

The specimens from the Amazon Basin were shown not to differ from the type specimen from [British] Guyana both in meristic characters and body proportions.

Acestrorhynchus heterolepis (Cope, 1878)

(Fig. 59)

Xiphorhamphus heterolepis Cope, 1878:687 (type-locality: Peruvian Amazon; type in ANSP, examined); Eigenmann & Eigenmann, 1891:58 (listed).

Acestrorhynchus heterolepis; Fowler, 1906:462 (description of Cope's types); 1939:91 (listed); 1945:172 (Peru); Eigenmann & Allen, 1942:276 (distribution); Fernandez-Yepez, 1955:4 (diagnosis)

Specimens studied (6): ANSP — Peruvian Amazon (4); DZSP — Rio Chimire, Venezuela (1); MCZ — Rio Içá, Amazonas (1).

DIAGNOSIS

D. ii, 9; A. v, 23-25; P. 15-17; V. 8; 130-143 perforated scales in the lateral line; 52 scales from lateral line to origin of dorsal fin, 31-35 from lateral line to origin of anal; 38-40 gill rakers on the lower part of the first gill arch; laterosensory canal with an upper and a lower small branch on each scale of the lateral line; a small round dark spot on the upper end of opercle; a black nearly round blotch at the caudal base.

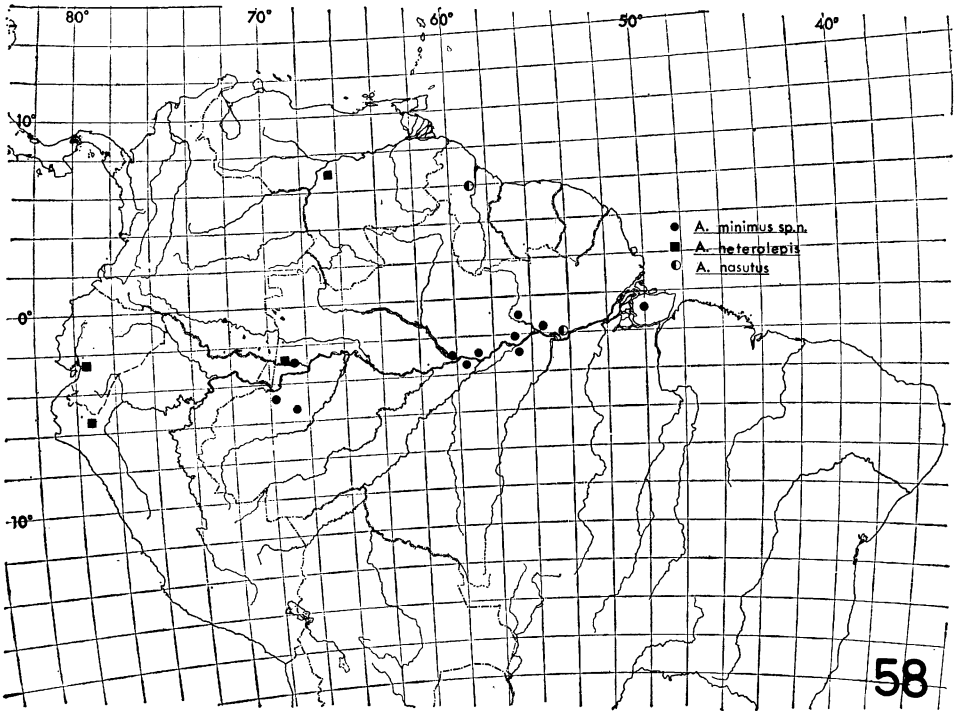


Fig. 58: geographic distribution of *Acestrorhynchus nasutus* Eigenmann, *heterolepis* (Cope) and *minutus*, sp. n.

Description

Body very large (S.L. 163-321 mm) and deep; head massive, slightly wider and depressed above. Ventral outline of the body considerably more curved than dorsal. Snout conical, much longer than orbital diameter at all ages. Mouth subterminal, gape very long; upper jaw projecting slightly when mouth is closed or lower jaw a little longer when mouth is fully opened. Maxillary curved, slightly convex on its posterior toothed border, ending in a very prominent acute angle. Teeth on premaxillary, maxillary, dentary and ectopterygoid as in *A. falcatus falcatus* (Bloch); 9-11 small conical teeth between the premaxillary canines; number of teeth in the posterior row on the dentary highly variable (13-21); two premaxillary foramina at all ages. Spiny gill rakers (Fig. 59A) somewhat long, with a variable number of short spines on their free upper border; surface of flat gill rakers smooth; 38-40 gill rakers on the lower part of the first gill arch.

Scales very small. Lateral line almost straight on sides of body, rising gradually toward upper part of opercle, with 130-143 scales, each of which bearing an upper and a lower inclined branch of the laterosensory canal; 52 scales above lateral line, 31-35 below. Single row of scales along anal fin base reaching the thirteenth or fifteenth branched ray. Ventral axillary scale about one fifth as long as ventral fin.

Anal fin falcate, its first branched ray reaching middle of anal fin base. Anal fin rays v, 23-25. Ventral fins never reaching origin of anus. Pectorals not reaching origin of ventrals and always longer than these fins. Caudal fin nearly truncate, its lower lobe slightly longer than upper.

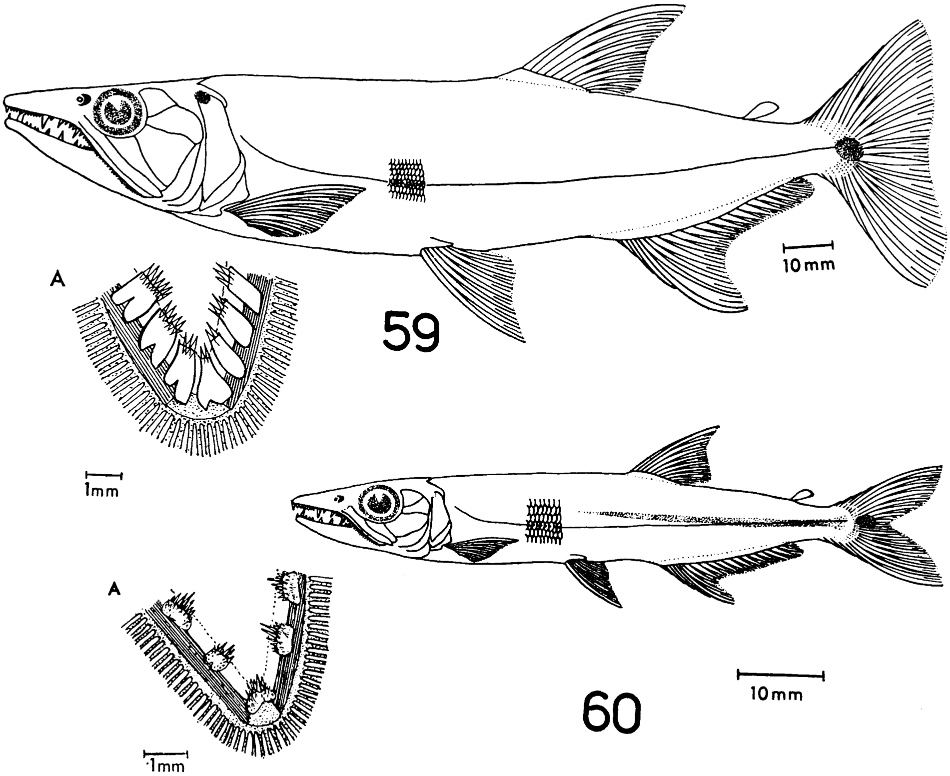


Fig. 59: *Acestrorhynchus heterolepis* (Cope), female, 252 mm S.L., DZSP 5184. Fig. 60: *minimus,* sp. n., female, 63 mm S.L., DZSP 4608. A, gill rakers on first gill arch.

Color in alcohol dark brown above, light yellow below; head dark above, light yellow on sides and below; a small round dark blotch on the upper end of opercle; an indistinct dark band on sides of body, from upper part of opercle to caudal base; an almost round black blotch at the base of caudal fin. All fins with scattered black pigment. The small dark blotch on the upper end of opercle tends to become indistinguishable in specimens preserved in alcohol for a long period of time.

The measurements of the specimens are shown in appendix table 33; the regression data in figures 95-104 and appendix table 16.

DISTRIBUTION (Fig. 58)

Upper and Peruvian Amazon Basin; Orinoco River Basin.

GEOGRAPHIC VARIATION

No differences were detected in meristic characters or body proportions in the comparison of the single Orinocan specimen with the Amazonian specimens.

Acestrorhynchus minimus, sp. n.

(Fig. 60)

Acestrorhynchus nasutus (not of Eigenmann, 1912b:411) Fowler, 1939b; (Amazon basin?; description; specimen in ANSP, examined).
Acestrorhynchus sp. B Menezes, 1969:220.

Type-locality: Lago Jacaré, Rio Trombetas, Amazon River Basin.
Holotype: DZSP 4608, collected by Dr. Paulo E. Vanzolini.
Paratypes (57): ANSP — Amazon basin (1); DZSP — Lago Jacaré, Pará (1); MCZ — Lago Januari, Amazonas (12), Óbidos, Pará (3), Lago do Máximo, Amazonas (15), Rio Içá, Amazonas (1), Jutaí, Amazonas (2), Lago Aleixo, Amazonas (1), Itacoatiara, Amazonas (13), Lago Saracá, Amazonas (1), Jatuarana, Amazonas (4), Parintins, Amazonas (1).

DIAGNOSIS

D. ii, 9; A. v, 21-25; P. 12-14; V. 8; 74-85 perforated scales in the lateral line; 12-14 scales from lateral line to origin of dorsal fin, 8-10 from lateral line to origin of anal; 15-23 gill rakers on the lower part of the first gill arch; a narrow dark stripe from upper end of opercle to caudal base; a round black blotch at the caudal base. This species is sympatric with *A. falcatus falcatus* (Bloch), *A. microlepis* (Schomburgk), *A. guianensis*, sp. n., and *A. falcirostris* (Cuvier) in the Middle Amazonas.

DESCRIPTION

Body small (S.L. 36-84 mm) and low. Head moderately large, depressed and slightly wider above. Dorsal and ventral body outlines evenly curved. Snout conical, equal to or slightly longer than orbital diameter. Mouth terminal, gape long; lower jaw a little longer when mouth is fully opened or upper jaw projecting for a short distance when mouth is closed. Maxillary curved, convex on its posterior toothed edge, ending in a very noticeable acute angle. Teeth on maxillary, premaxillary, dentary and ectopterygoid as in *A. falcatus falcatus* (Bloch) but inner row on dentary with a number of teeth slightly higher (2-5); 5-10 small conical teeth between the two premaxillary canines; posterior dentary tooth row with 12-16 teeth. Spiny gill rakers small (Fig. 60A), set quite apart from each other on the gill arch, with a variable number of alternating short and large spines on their free border; surface of gill rakers covered with many short spines; 15-23 gill rakers on the lower part of the first gill arch.

Scales relatively large. Lateral line anteriorly with a slight curvature, nearly straight toward the end of the body; number of lateral line scales 74-82; 12-14 scales above lateral line, 8-10 below. Single row of scales along anal fin base, reaching the seventh or eighth branched rays. Ventral axillary scale about one third as long as ventral fin.

Anal fin falcate, first branched ray surpassing middle of base of anal fin. Anal fin rays v, 21-25. Ventral fins reaching anus. Pectorals equal to or just a little longer than ventrals and not reaching origin of these fins. Lobes of caudal fin equal.

Color in alcohol dark on back,light yellow on sides and below; head dark above, nearly yellow on sides; a dark line running dorsally from back of the head to beginning of first caudal rays; a narrow dark stripe from upper end of opercle to caudal base; a round black blotch on caudal base. All fins punctate with black pigment.

The measurements of the specimens are shown in appendix table 34; the regression data in figs. 95-104 and appendix table 17.

DISTRIBUTION (Fig. 58)

Amazon River Basin.

GEOGRAPHIC VARIATION

No differences were found in meristic characters and body proportions for the samples taken from the different localities within the Amazon Basin.

TAXONOMIC POSITION AND RELATIONSHIPS OF THE TRIBE ACESTRORHYNCHINI

Paroligosarcus (including one species formerly placed in *Oligosarcus*), *Oligosarcus* (=*Acestrorhamphus*) and *Acestrorhynchus* have been considered by many authors (Eigenmann, 1910, 1912; Regan, 1911; Fowler, 1914, 1939, 1940, 1950; Campos, 1945a, 1945b, and Aramburu, 1953) to belong to a separate subfamily within the family Characidae, and Fernandez-Yepez (1955) considered the group a distinct family. Weitzman (1962), basing his work on *Brycon* and on the study of an impressive number of characid skeletons, changed the whole concept of characid subfamilies including many of Eigenmann's classical subfamilies (including Acestrorhamphinae) in his large subfamily Characinae. He carefully and correctly emphasized, however, that many of the subgroups included in that large subfamily are little known and could possibly be polyphyletically derived from generalized characid types. Much work remains to be done until all subgroups can be adequately defined, and although they all show great similarities in cranial anatomy, as Weitzman (1962) emphasized, there are considerable differences, principally in number, arrangement and shape of teeth. Only recently (Alexander, 1964) has there been some attempt to correlate arrangement and structure of teeth with types of food and feeding mechanism in characids. Teeth are structures that enable fishes to obtain their food, so changes in arrangements and shapes are important and can reveal much about evolution and intergroup relationship.

Weitzman (1964) on the basis of preliminary observation suggested that the relationships of *Acestroorhynchus* and *Acestrorhamphus* (=*Oligosarcus*) are with *Charax, Roeboides* and other closely related genera in the Characinae, and Géry (1955) proposed the possible origin of *Acestrorhynchus* from *Brycon* through *Charax* and *Cyrtocharax.* Later (1963) he considered *Cyrtocharax* synonymous with *Cynopotamus*. *Oligosarcus* and *Acestrorhynchus* do have some similarities with *Charax, Cynopotamus* and *Roeboides* but these latter genera show osteological features not found in any of the former. Preliminary examination shows that *Charax* has an incomplete circumorbital series of bones, the sixth infraorbital being much reduced or almost absent, maxillary without teeth and two premaxillary rows of teeth. *Cynopotamus* has two rows of premaxillary teeth and in some species there is a second row behind the large canines on the dentary. *Roeboides* has two rows of premaxillary teeth, some conical teeth outside the mouth fixed on the premaxillary and maxillary, and an incomplete circumorbital series, the sixth infraorbital being completely absent. In all these genera the anal fin is very long, having always more than 40 rays, and none of them have a well-developed row of teeth on the ectopterygoid.

We found no such morphological differences among *Acestrorhynchus, Oligosarcus* and *Paroligosarcus.* They have always a complete series of circumorbital bones, a complete row of teeth on the maxillary and only one row of premaxillary teeth. There are no additional rows of teeth behind the anterior dentary teeth, no teeth outside the mouth and the anal fin never has more than 32 branched rays. In all species of these genera there is always a well-developed row of teeth on the ectopterygoid.

It is thus clearly evident that *Oligosarcus* and *Acestrorhynchus* are much more closely related to *Paroligosarcus* than to any other genus of the subfamily Characinae. They seem to form an homogeneous group in which *Paroligosarcus,* with its short body and skull, appears to be the most conservative form. This genus is very close to *Brycon,* which has been regarded lately as a primitive characid (see for example, Myers, 1958, Weitzman, 1962 and Alexander, 1964). A comparison of the two forms (Figs. 61a, 62, 63, 64 and 71 of this work and Weitzman, 1962) reveals indeed many osteological similarities, the only essential difference being that *Paroligosarcus* has only one row of premaxillary teeth and a well-developed row of teeth on the ectopterygoid. *Paroligosarcus* seems to be only a slightly modified *Brycon.* The species of *Oligosarcus* and especially those of *Acestrorhynchus,* in contrast, have much longer bodies and heads and show other characters which appear to reflect specialization.

I believe that *Acestrorhynchus* evolved from a *Brycon*-like ancestor *not* through *Charax, Cynopotamus* or *Roeboides* but through *Paroligosarcus* and *Oligosarcus* with which it is closely related. It seems to represent only a highly specialized form within the group. It is my opinion that these three genera must be placed in a separate tribe within the subfamily Characinae as redefined by Weitzman (1962).

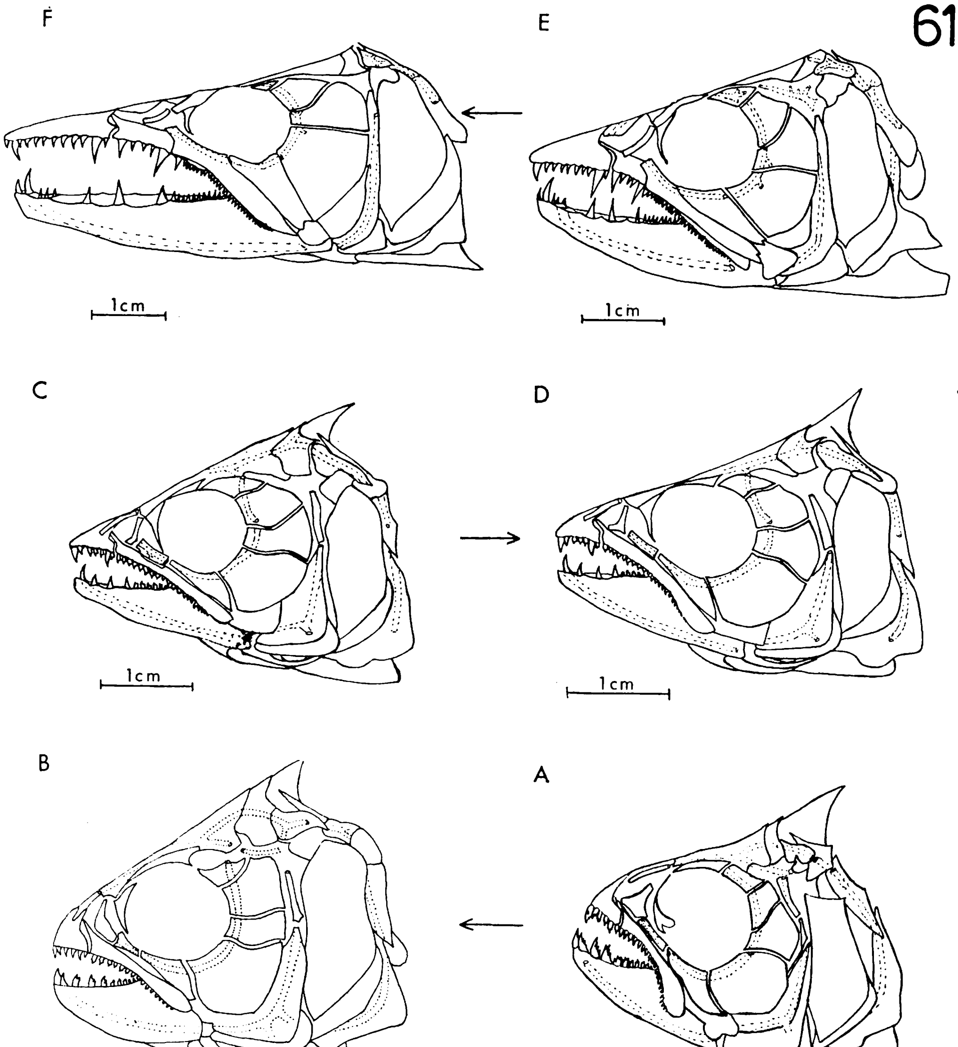


Fig. 61: lateral view of the skulls of some species in the tribe Acestrorhynchini to show the main evolutionary line within the group. A, *Paroligosarcus pintoi* (Campos), the most primitive form; B, *Oligosarcus meadi*, sp. n.; C, *O. jenynsii* (Günther); D, *O. hepsetus* (Cuvier); E, *Acestrorhynchus falcatus falcatus* (Bloch); F, *A. falcirostris* (Cuvier), the most advanced form.

EVOLUTION AND RADIATION OF THE TRIBE ACESTRORHYNCHINI

Evolution within the tribe Acestrorhynchini seems to have proceeded gradually from *Paroligosarcus* through *Oligosarcus* to *Acestrorhynchus,* and to have been oriented toward predation. The present pattern of distribution of the tribe in South America, on the other hand, appears to be the result of three "waves" which appear to have been associated with the alternate pluvial and interpluvial periods that once affected equatorial South America.

The sequence of species representing the three genera (Fig. 61) illustrates the possible main evolutionary line within the group. A definite trend toward predation through a general elongation of the skull can be readily seen. Correlated with the elongatoin of the skull there were important osteological modifications, for the main structures involved in these evolutionary changes were jaws and jaw articulation, anterior skull bones, and teeth and gill rakers. Other evidence which helps to support the evolutionary trend comes from food habits and distribution.

The more advanced species of the genus *Acestrorhynchus* have very elongate bodies. Elongation of the body is common in all predatory species, and it certainly evolved independently as an adaptation for the improvement of swimming ability. Apparently correlated with the elongation of the body that occurred in the Acestrorhynchini, there was a change in the position of the dorsal and anal fins. These fins in *Paroligosarcus* (Fig. 5) and all species of *Oligosarcus* (Figs. 6, 14 and 18-22) are placed almost in the middle of the body but in all species of *Acestrorhynchus* (Figs. 23, 36, 38, 42, 43, 50, 54, 57, 59, 60) they are situated much nearer the base of the tail than to tip of the snout. Posterior placement of unpaired fins, also typical of some *Acestrorhynchus*-like predators, appears to be an adaptation for short-fast attacks useful to these fishes.

The premaxillary, maxillary and dentary (Fig. 61) are short in *Paroligosarcus,* moderate in *Oligosarcus* and long in *Acestrorhynchus.* The premaxillary which in all species of this genus is longer than the dentary, is especially lengthened and the gape consequently enlarged. The premaxillary bone in all species of *Acestrorhynchus* carries a branch of the laterosensory canal (Fig. 69). The presence of such a branch is very unusual and could be an adaptation developed by these long snouted species for better location of moving prey since the most important function of the laterosensory canal is to locate moving objects in the water by "distant touch". The branch of the laterosensory canal is absent on the premaxillary of the two other less specialized genera and, to my knowledge, in all other members of the family Characidae.

Figs. 71, 72 and 73 illustrate the gradual change in relative position of the jaw articulation. In *Paroligosarcus* (Fig. 71) the mesopterygoid is short, the hyomandibular broad and the metapterygoid, quadrate, horizontal limb of preopercle and interopercle are elongate. A straight line passing through hyomandibular, metapterygoid and quadrate-lower jaw articulation is inclined backward due to the forward posi-

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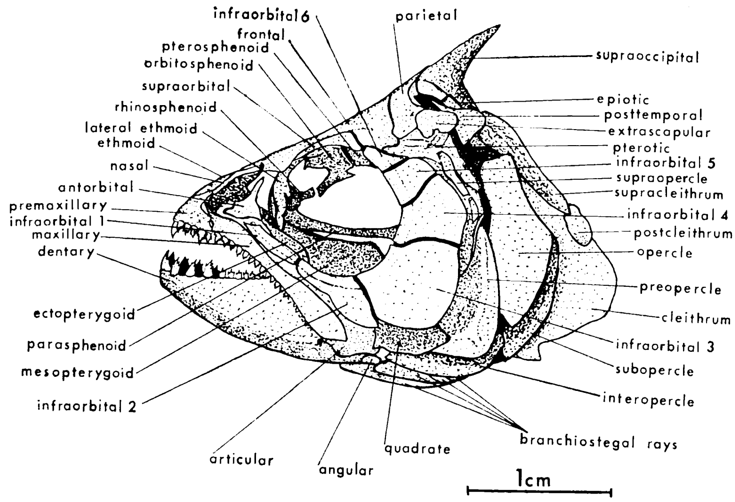

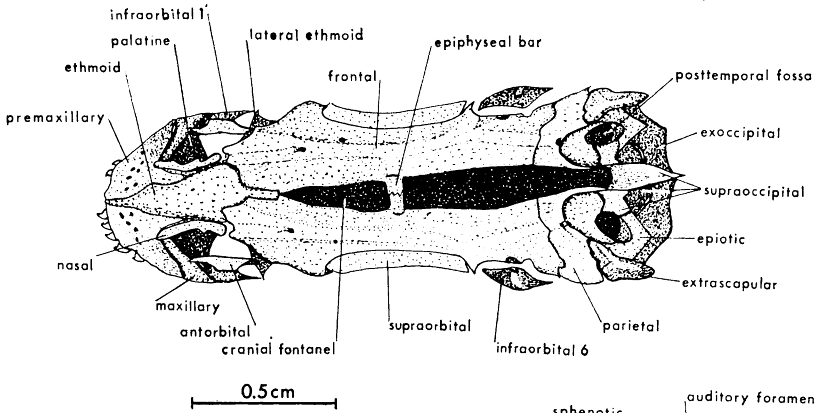

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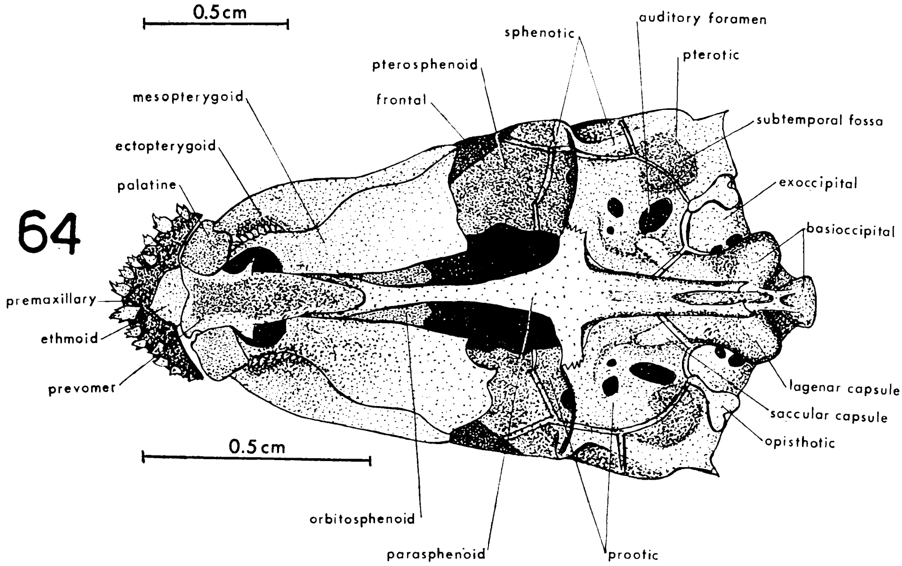
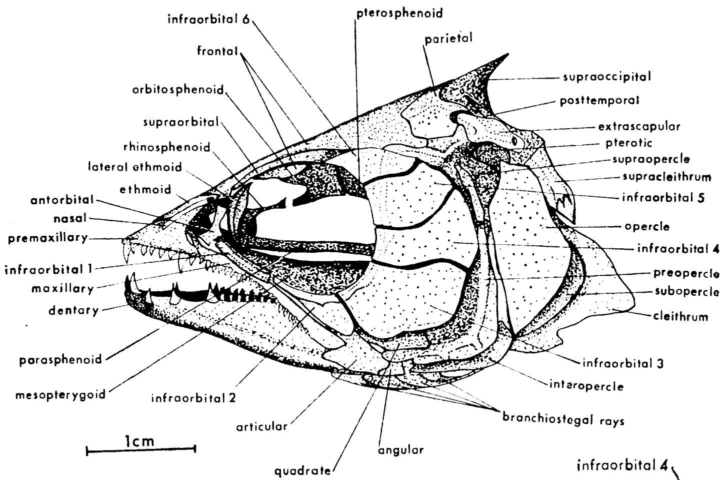


Paroligosarcus pintoi (Campos), DZSP 4663. Fig. 62: lateral view of the skull. Fig. 63: dorsal view of the cranium. Fig 64: ventral view of the cranium.



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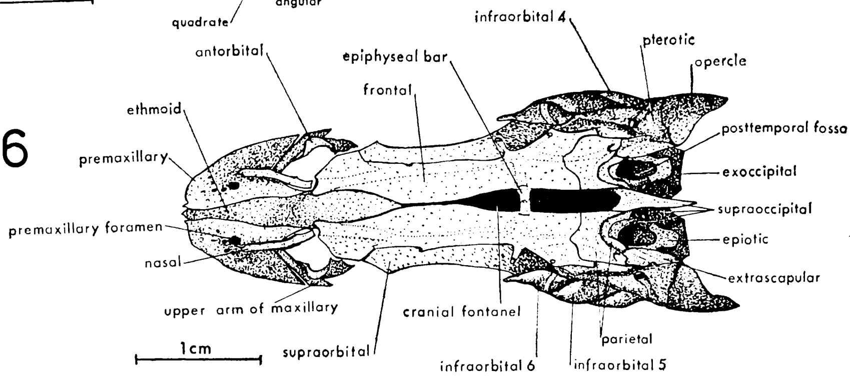

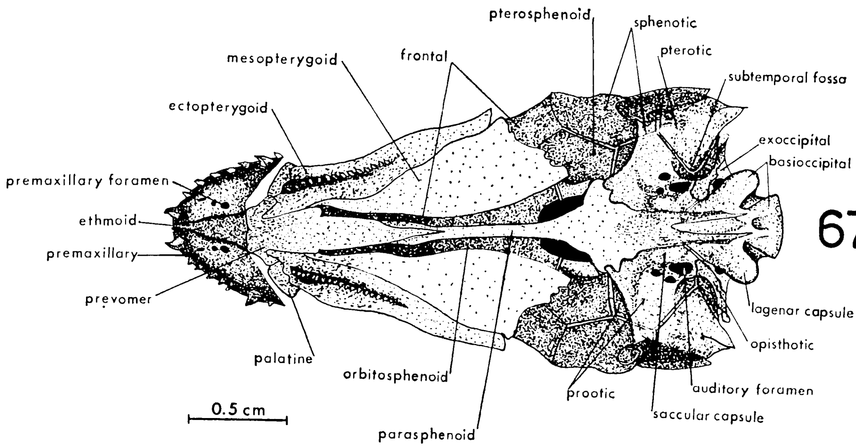

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Oligosarcus jenynsii (Günther), DZSP 4751. Fig. 65: lateral view of the skull. Fig. 66: dorsal view of the cranium. Fig. 67: ventral view of the cranium.

tion of the jaw articulation. In *Oligosarcus* (Fig. 72) the mesopterygoid has become elongate, causing as a consequence a shortening of the metapterygoid and quadrate, especially the posterior parts. The hyomandibular has become less broad and the horizontal limb of preopercle and interopercle shorter. The straight line in this case is less inclined than in *Paroligosarcus* due to the displacement of the jaw articulation to a more posterior position. In *Acestrorhynchus* (Fig. 73) the extreme elongation of the mesopterygoid has caused substantial shortening and deepening of the metapterygoid and quadrate, and the hyomandibular has become considerably shorter. The jaw articulation has moved to a far posterior position and the straight line passing through suspensorium and jaw articulation is consequently almost vertical.

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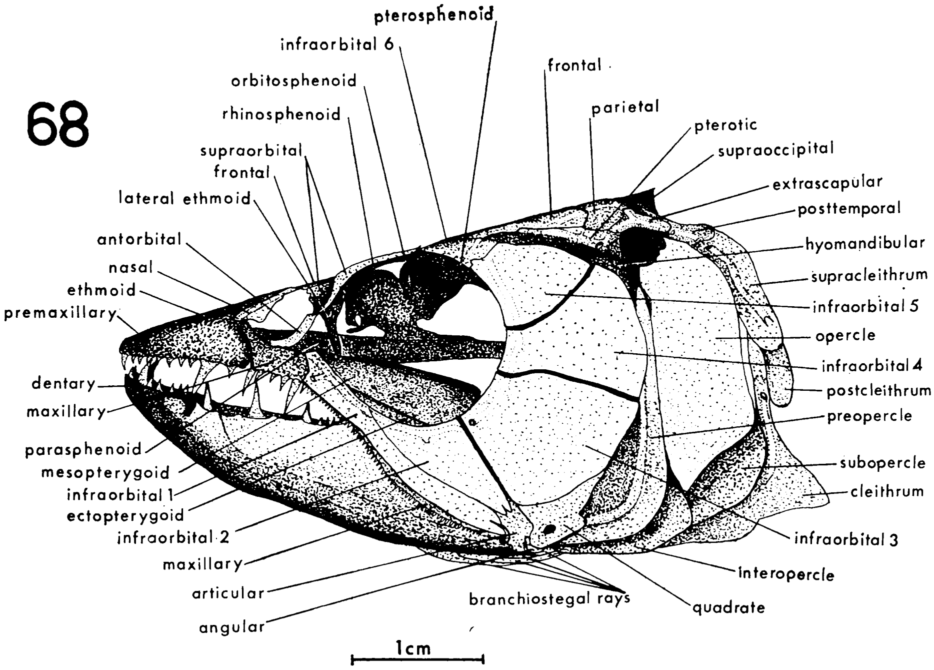
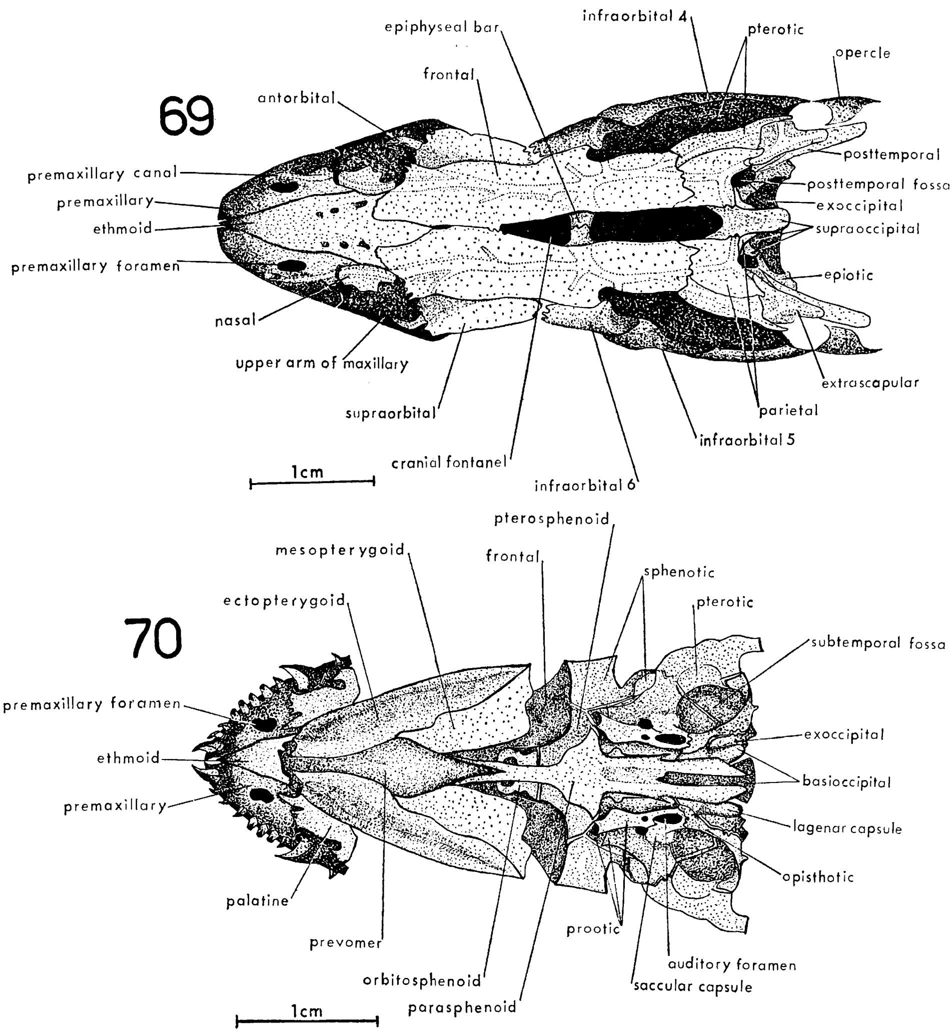


Fig. 68: lateral view of the skull of *Acestrorhynchus falcatus falcatus* (Bloch), MCZ 45231.

The nasal bone in *Paroligosarcus* (Fig. 63) and *Oligosarcus* (Fig. 66) largely consists of the laterosensory canal whereas in *Acestrorhynchus* (Fig. 69) in addition to the canal there is a wide laminar projection of the bone.

Some of the infraorbital bones have undergone striking modification. The first infraorbital in *Paroligosarcus* is a small bone simply apposed to the maxillary (Fig. 62). In the most generalized species of *Oligosarcus* this bone is still small and only touches the upper edge of the maxillary (Fig. 61B). The more advanced species, however, possess a longer first infraorbital which covers a small part of the maxillary anteriorly (Figs. 61C-D). In all species of *Acestrorhynchus* this bone is very long and covers the maxillary for almost its entire length (Figs. 61E-F). The long first infraorbital seems to reinforce and protect the long maxillary when the mouth is closed. The supraorbital is in contact with the sixth infraorbital in *Paroligosarcus* (Fig. 65) and in the most generalized species of *Acestrorhynchus* (Fig. 68). In the extremely elongated forms (Fig. 61F) of the latter genus, however, the sixth infraorbital is exclused from the orbit. The frontal bone, in close contact with the supraorbital, replaces the sixth infraorbital as a major component of the upper edge of the orbit. The presence of the frontal as a component of the orbit apparently is a secondary adaptative character (Géry, 1959:



Cranium of *Acestrorhynchus falcatus falcatus* (Bloch), MCZ 45231. Fig. 69: dorsal view. Fig. 70: ventral view.

407). The infraorbitals posterior to the orbit have become gradually less deep. The ethmoid, prevomer, palatine, mesopterygoid and ectopterygoid (Figs. 64, 67, 70) have gradually become elongate, following the general elongation of the anterior part of the skull.

The evolution of dentition seems to have been from low multicuspid to high unicuspid form. *Paroligosarcus* (Figs. 62, 64, 71) has large tricuspid to pentacuspid teeth anteriorly and small tricuspid teeth posteriorly on the dentary. The teeth on the premaxillary and maxillary are mostly tricuspid, and they are tricuspid to pentacuspid on the ectopterygoid. All of the species of *Oligosarcus* have conical teeth on the premaxillary, conical teeth anteriorly on the dentary and *slightly* tricuspid teeth on the maxillary, ectopterygoid and posterior part of dentary (Figs. 65, 67, 72). In *Acestrorhynchus* (Figs. 68, 70, 73) *all* teeth are conical,

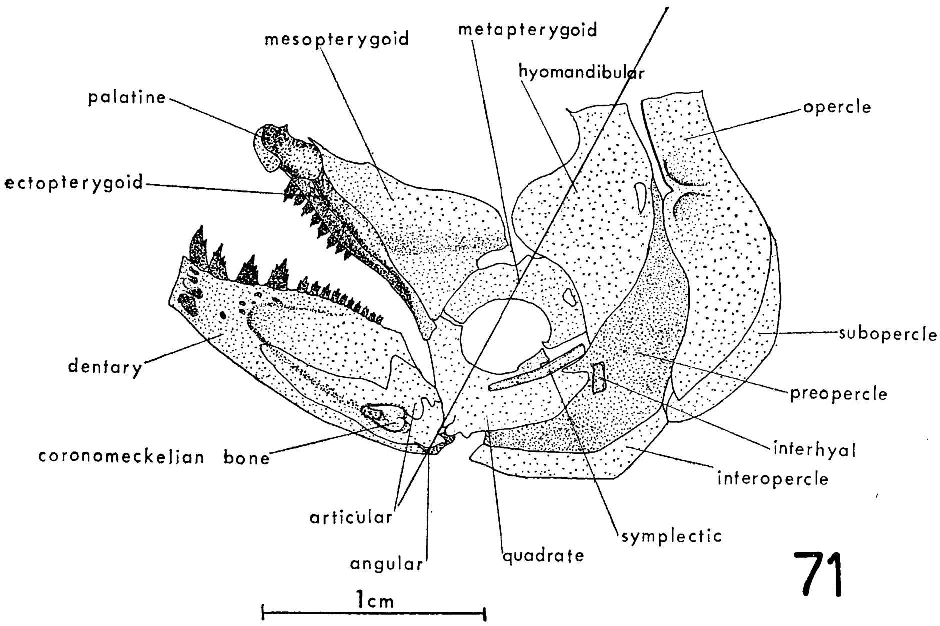


Fig. 71: lateral bones of the face of *Paroligosarcus pintoi* (Campos), DZSP 4663, to show position of articulation of lower jaw.

and some of those on the premaxillary, anterior part of maxillary and dentary are extremely large. The most drastic modification in this genus, however, occurred in the gill rakers. These are represented in all species by small spiny bony plates (Figs. 23A, 36A, 38A, 42A, 43A, 50A, 54A, 57A, 59A, 60A), which are extraordinarily effective holding structures in the gill chamber. An soon as a fish enters the gill chamber it is immediately grasped by the spiny gill rakers in such a way that it can only continue toward predator's stomach. The structure of these gill rakers is very remarkable and not found to the best of my knowledge in any other characid group. Some unrelated predatory marine fishes in the families Paralepididae (Rofen, 1966) and Gempylidae (Matsubara & Iwai, 1952) developed the same kind of adaptation.

In a paper recently published (Menezes, 1969), I show that *Paroligosarcus* is omnivorous with a strong preference for insects, *Oligosarcus* also omnivorous but with a strong preference for fishes, and that *Acestrorhynchus* is carnivorous and feeds almost exclusively on fishes. The species of *Brycon,* which have more than on premaxillary tooth row and multicuspid teeth, were shown to be essentially herbivorous. Their teeth are mostly adapted for shearing (Alexander, 1964:174) and I believe that the anterior multicuspid teeth of *Paroligosarcus* are used in the same fashion although less efficiently, because this species does not have as many series of premaxillary teeth as *Brycon.* The small teeth on the maxillary, ectopterygoid and posterior part of dentary, however, seem to be adapted to hold prey. This genus seems to have next developed the first adaptations toward predatory habits. A further improvement toward predation evolved in *Oligosarcus* with the development of pointed conical teeth on moderately long jaws. The large anterior canine on the dentary fits into the premaxillary foramen, and the premaxillary canines are lodged in grooves in the external surface of the mandible when mouth is closed. Sharp canines and conical teeth on the premaxillary and anteriorly on the dentary are used primarily, I believe, to grab fish and other animals; while the slightly tricuspid teeth on the maxillary, ectopterygoid and posterior part of dentary are certainly used for holding prey. In *Acestrorhynchus* predation definitely and strikingly has been improved through the development of huge conical teeth on very elongated jaws. The first canine on the premaxillary remains outside the lower jaw when the mouth is closed. The second large canine is lodged in a groove in the outer anterior surface of the mandible. The excessive growth of this tooth seems to have pushed some of the small conical teeth on the dentary internally (Fig. 70) so that these teeth actually appear to represent an inner short tooth row on the dentary. The first two dentary canines are received by two premaxillary foramina in most of the species and the three large dentary canines close behind the premaxillary and first maxillary teeth. All these adaptations, as Alexander (1964) suggested, apparently evolved to provide accurate lodging of the pointed canine teeth during closing of the mouth. Otherwise they would cause serious damage to their possessors. These powerful teeth on both jaws are efficiently used for catching fishes. The ectopterygoid tooth row has small teeth and it is much longer than in the other two genera. Ectopterygoid teeth, small teeth on maxillary and small teeth on the posterior part of the dentary are involved in holding prey. These teeth, as in the other two genera, are curved in such a way that once in the mouth the prey can never move outwards.

The present distributions of the three genera (Fig. 4) suggest the possible origin and history of the radiation within the group.

The monotypic genus *Paroligosarcus* and the most generalized species of the genus *Oligosarcus* (*O. meadi,* sp.n. and *O. bolivianus*) are confined strictly to small streams. *P. pintoi* is restricted to small streams of the Upper Paraná Basin. It was first discovered in a small tributary off the Rio Mogi Guaçu in São Paulo but collected later in other streams near São Paulo. Adequate sampling of small streams of the Paraguay and Uruguay rivers, however, may reveal its presence

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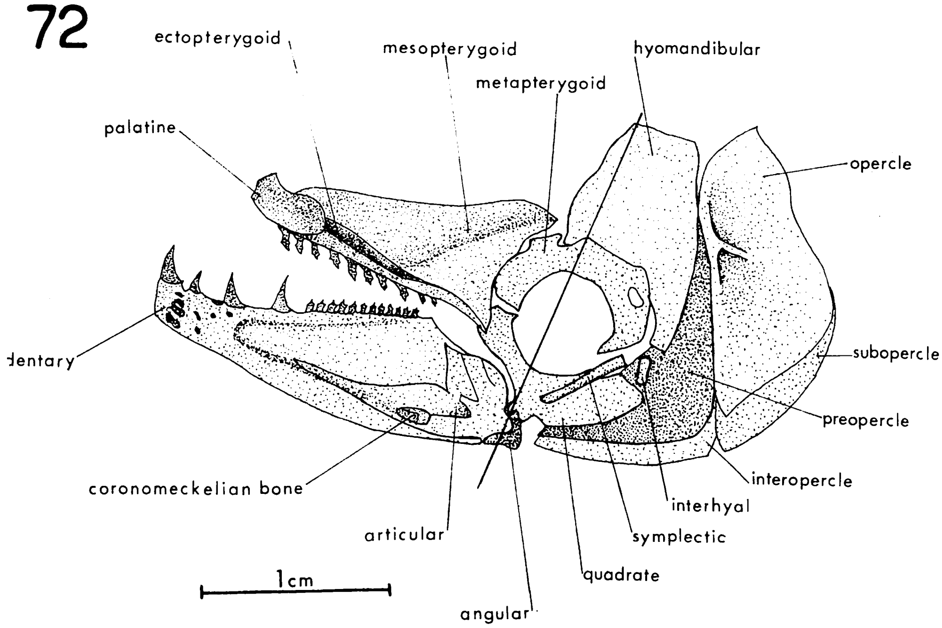

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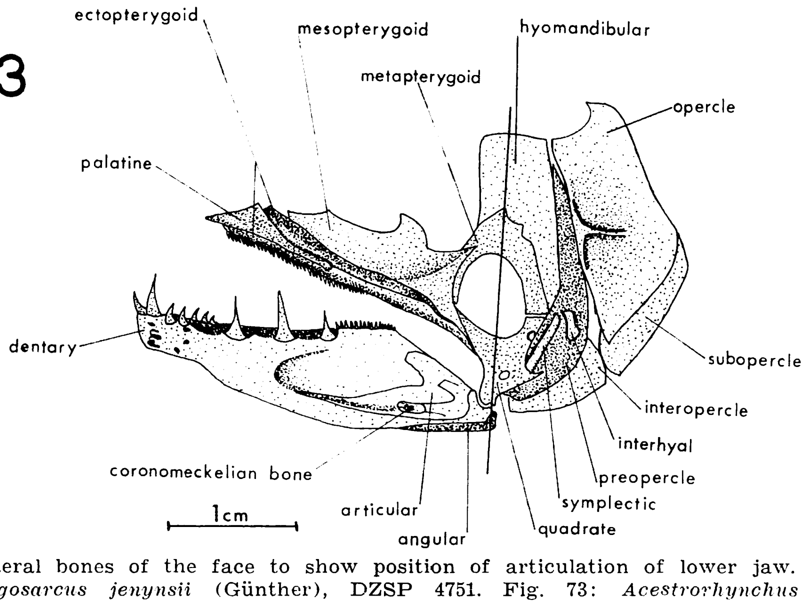


Lateral bones of the face to show position of articulation of lower jaw. Fig. 72: *Oligosarcus jenynsii* (Günther), DZSP 4751. Fig. 73: *Acestrorhynchus falcatus falcatus* (Bloch), MCZ 45231.

in these river basins. *O. meadi*, sp.n., also came from a small stream, a tributary of the Rio das Velhas in the São Francisco Basin, and *O. bolivianus* from a small tributary of the Rio Camblaya in the Paraguay River Basin of Bolivia. These two species, although far apart geographically, are very closely related and both are related to *O. argenteus*, the exact locality of which is unknown.

The less generalized species of *Oligosarcus* are heavily concentrated in the rivers of Eastern and Southeast Brazil and Uruguay with one or two species occurring in the Paraná, one in the Paraguay and one in the São Francisco River Basins.

Acestrorhynchus is predominant in the Amazon and in the Guianas, but *A. lacustris* is found in the Paraguay, Paraná, and São Francisco River Basins and *A. altus*, sp.n., in the Paraguay, Lower Paraná and Uruguay River Basins. *A. britskii*, sp.n., is restricted to the Rio São Francisco.

This apparently complex distribution can be reasonably understood if we postulate an Amazonian origin for the group. *Paroligosarcus* may once have been widespread, occurring perhaps also in the Amazon region. The same could be true for *Oligosarcus* which is represented by a few species in the Paraná, São Francisco, Paraguay and Uruguay Basins; and these basins are known to maintain a connection with the large Amazon Basin. The presence of these species in those river systems and the occurrence of two of the most generalized closely related species of *Oligosarcus* in two widely separated river basins can only be explained if we assume that they came from the Amazon and are now relicts of a predominant group in the past. It is much more difficult to assume that they are recent pioneers which came from the rivers of Eastern and Southeast Brazil and Uruguay, since there is geological evidence (see for instance Ab'Sáber, 1962) that these rivers have been isolated from those large river systems by a series of mountain chains since the Tertiary.

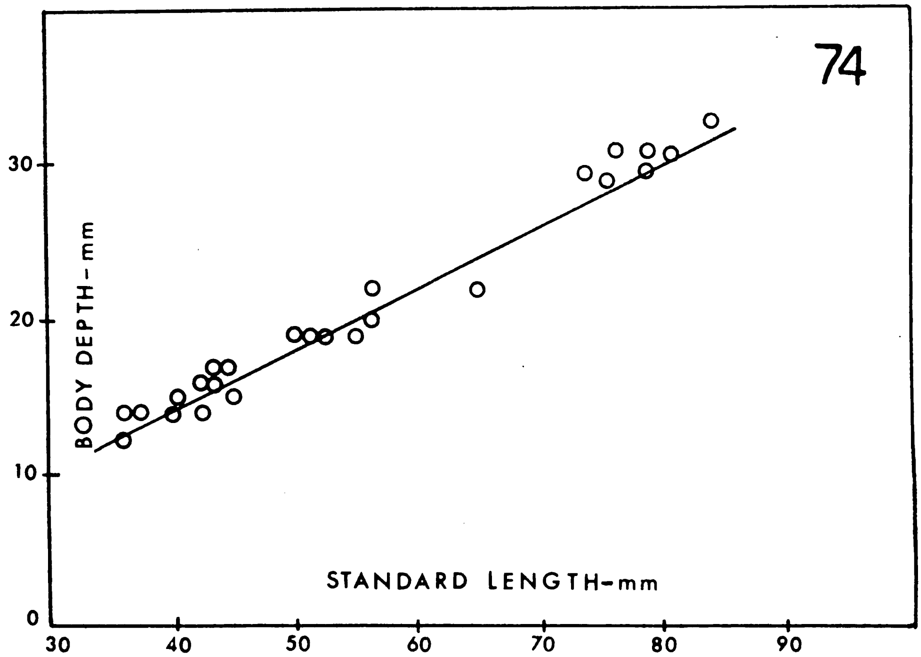
We have already pointed out that *Brycon* with its many cusped teeth is essentially a herbivore. Many other generalized characid genera which have multicuspid teeth feed primarily on plant material, so we may deduce as has been recently suggested by Alexander (1964:174), that this type of feeding was very important to ancestral characids. *Paroligosarcus*, although primarily feeding on insects, is able to eat other types of food. Being very close to *Brycon*, it could be one of the first evolutionary shifts from a primitive characid stock. Why was this shift needed? What would be the advantage of shifting from an essentially herbivorous habit to a more diversified one? I believe the answers to these questions are related to the long-term changes in water levels that have occurred in the Amazonian and Guianean regions in the past.

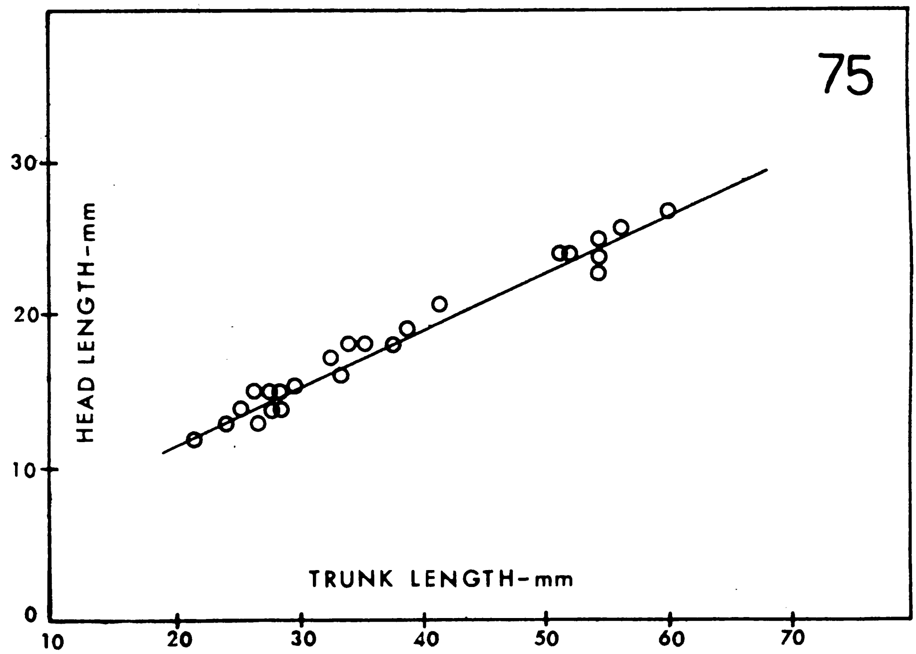
Lowe (1964), in a study of the freshwater fishes of the Rupununi District in [British] Guyana, noticed that during the dry season the fish populations become isolated in small ponds and pools, that food becomes very scarce and that there is an increase of predator pressure.

In the rainy season the fishes become widespread over large areas. These seasonal phenomena are also very characteristic of the Amazon region. The period of time between seasons is, of course, too short to allow the development of population differences, but in situations of prolongated absence of rain, important evolutionary changes would be expected. There are indications that such situations may have occurred in the past, affecting a large part of tropical South America.

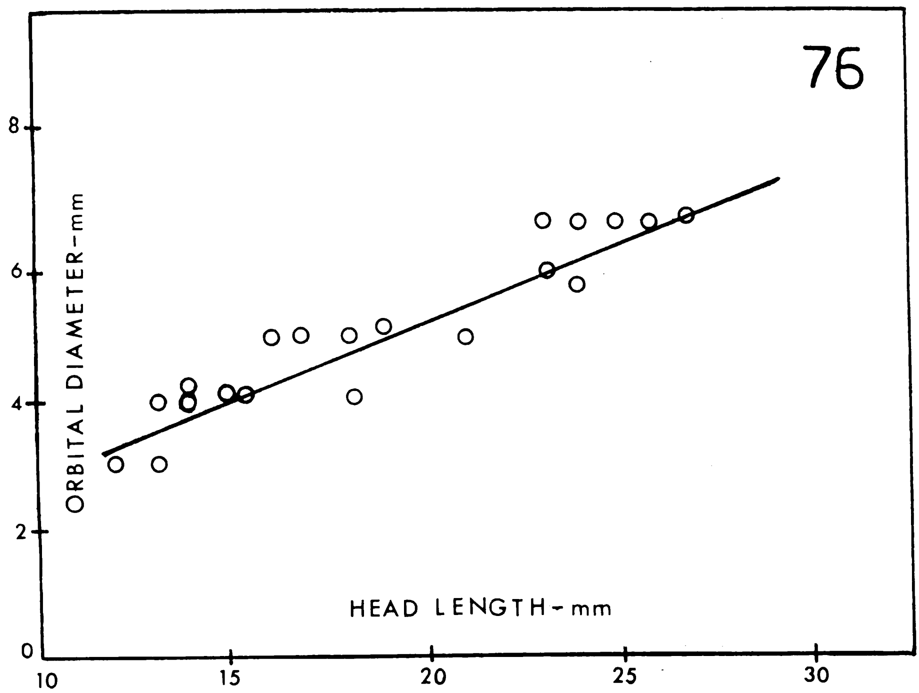
Based on temperature curves (calculated from pollen analysis) for the upper Pleistocene and Holocene and radiocarbon dates, Hammen and Gonzalez (1960) showed that there were periods of glacials and interglacials in equatorial South America, contemporaneous with the same periods in the temperate region of the northern hemisphere. They concluded (p. 314) that the glacials of the tropics were periods of heavy rainfall (pluvials) and the interglacials periods of light rainfall (interpluvials). The resulting changes in water-levels are not yet fully understood and the exact dates of their occurrences have not been precisely determined but a large area of northern South America seems to have been affected. Lowe (1964:135) suggested that alternating wet and dry periods were important factors for fish evolution in the Amazonian and Guianean regions. In dry periods the populations would be isolated and there would be great opportunity for speciation, the new forms becoming widespread during the wet period.

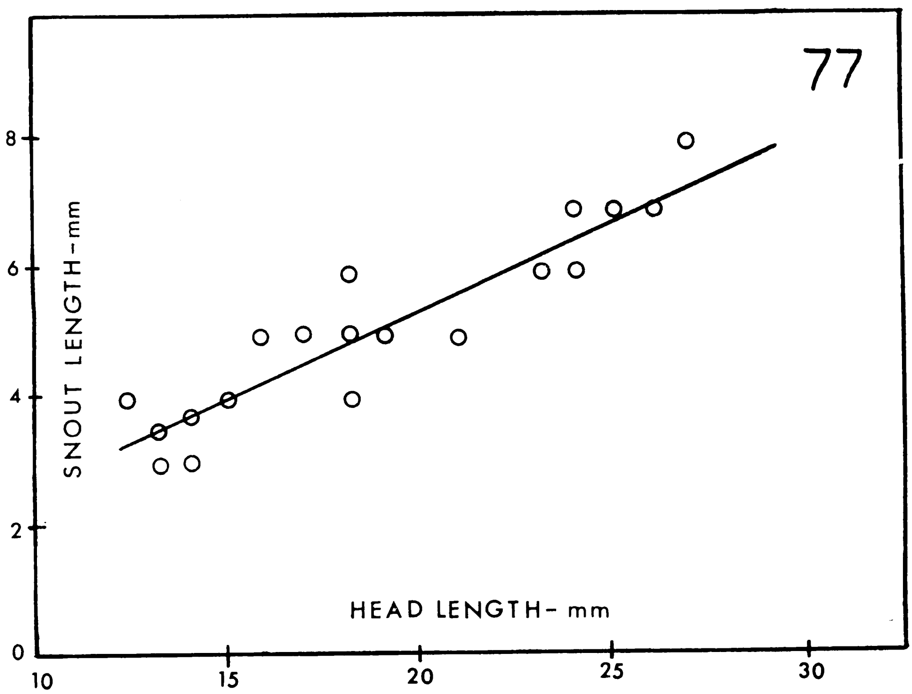
We may assume that in dry periods food would be very scarce and a change toward generalization in feeding would certainly be selectively advantageous. *Paroligosarcus* could have arisen then from a *Brycon*-like ancestor in the Amazon region, developing the first adaptations for predation, which would enable it to have a more diversified diet. The adaptations for predation were still rudimentary but with the origin of *Oligosarcus,* possibly in another dry period, predatory habits were further improved. Better adapted than *Paroligosarcus* and competing with it, *Oligosarcus* seems to have displaced it in large rivers, restricting it to the small streams. With the origin of *Acestrorhynchus* predation reached its peak. Still better adapted than, and directly competing with *Oligosarcus,* it apparently displaced the latter to other streams. Since that time *Acestrorhynchus* has become widespread in the Amazon, flourishing and diversifying in this region and in the Guianas. It is at present represented in these regions by ten species. Three species (and very significantly the most generalized ones) occur farther down the Amazon Basin, and one of them inhabits practically every large river basin in South America east of the Andes. Together with *Oligosarcus* this species is found in at least some places south of the Paraná Basin. This suggests that competition between *Acestrorhynchus* and *Oligosarcus* is apparently still going on and that *Acestrorhynchus* is taking over the few niches still available to *Oligosarcus.*



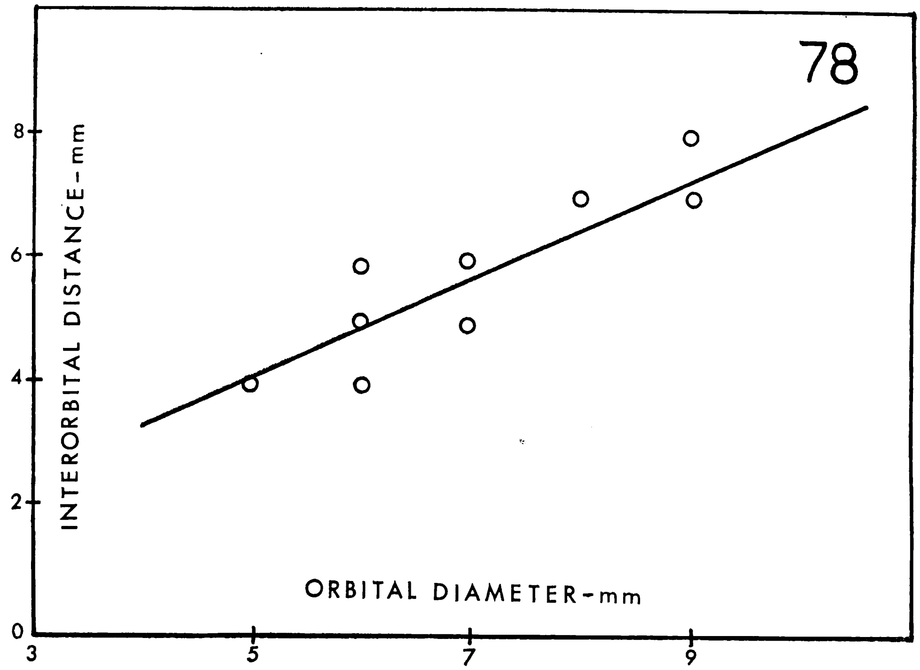


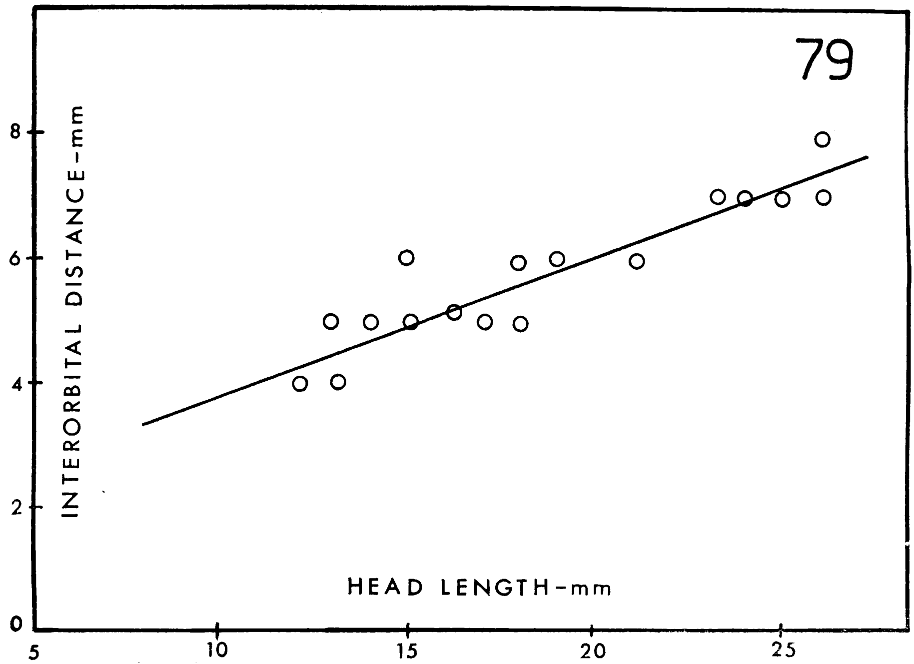
Paroligosarcus pintoi (Campos). Fig. 74: linear regression of body depth on standard length. Fig. 75: linear regression of head length on trunk length.



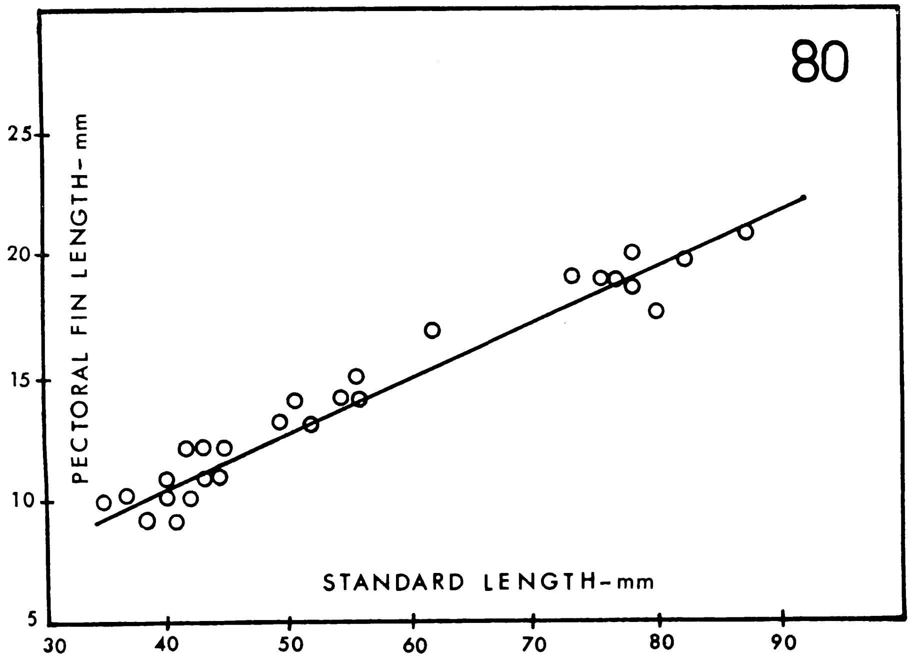


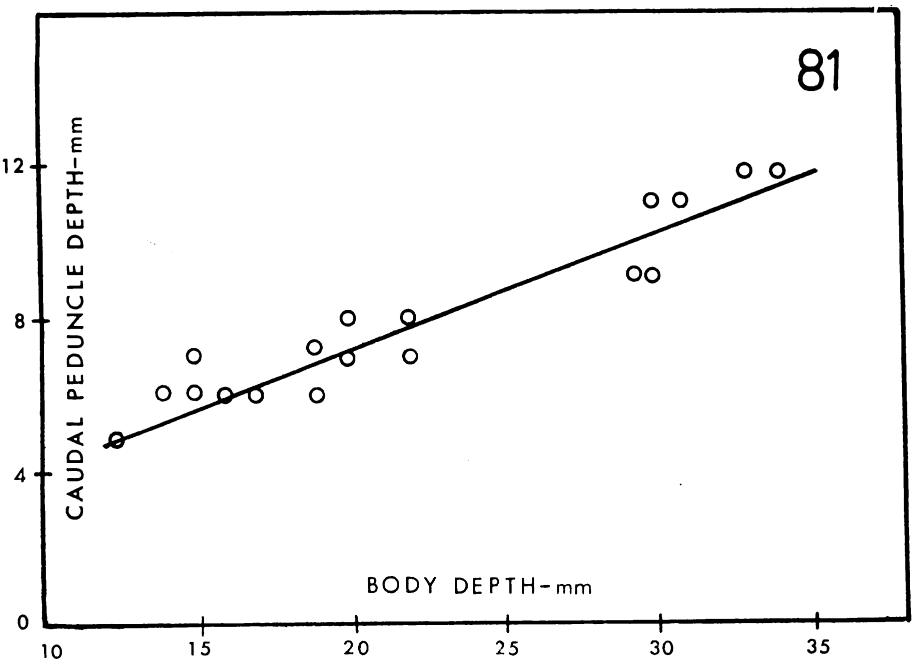
Paroligosarcus pintoi (Campos). Fig. 76: linear regression of orbital diameter on head length. Fig. 77: linear regression of snout length on head length.



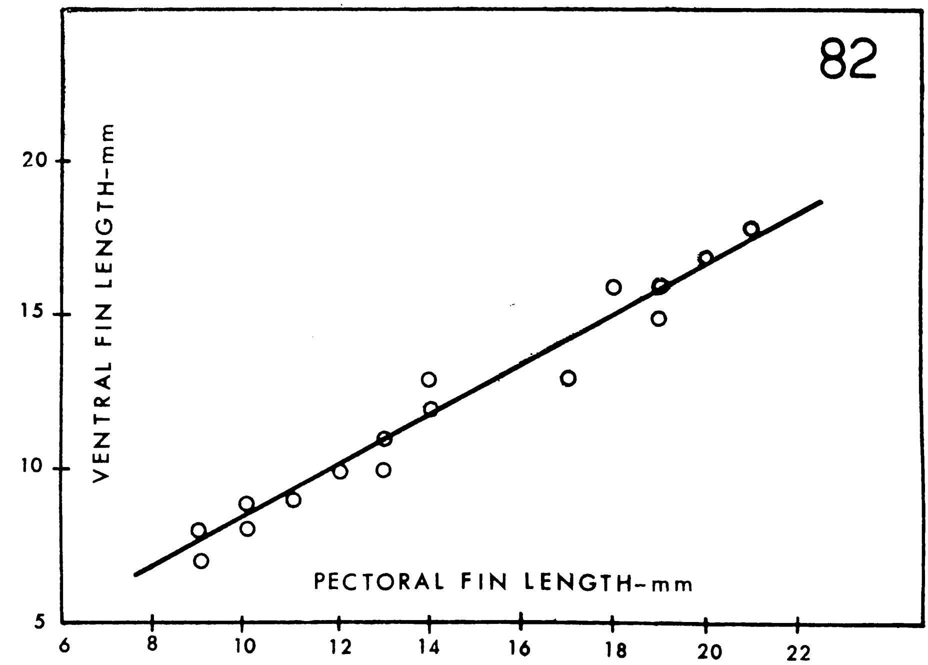


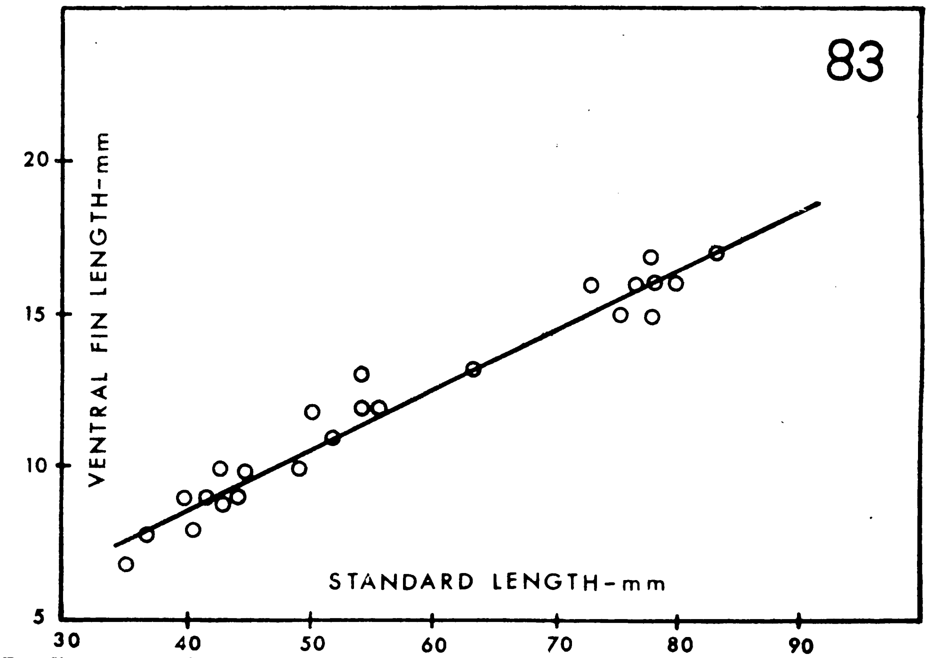
Paroligosarcus pintoi (Campos). Fig. 78: linear regression of orbital diameter on interorbital distance. Fig. 79: linear regression of interorbital distance on head length.



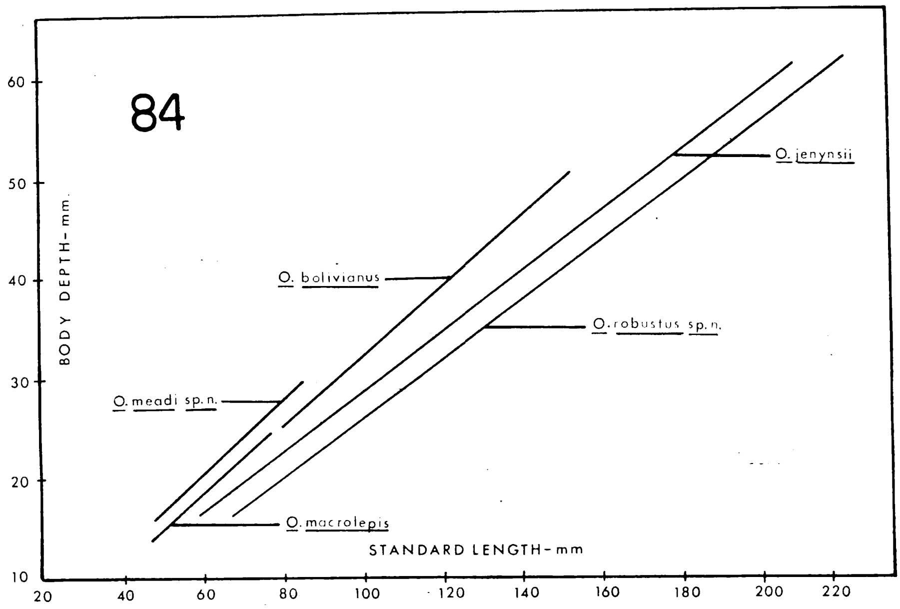


Paroligosarcus pintoi (Campos). Fig. 80: linear regression of pectoral fin length on standard length. Fig. 81: linear regression of caudal peduncle depht on body depth.





Paroligosarcus pintoi (Campos). Fig. 82: linear regression of pectoral fin length on ventral fin length. Fig. 83: linear regression of ventral fin length on standard length.



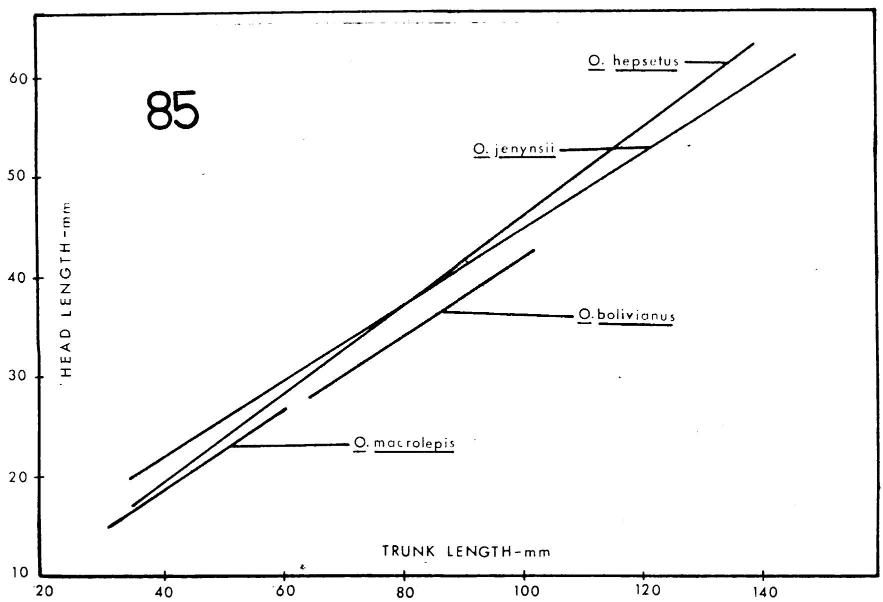
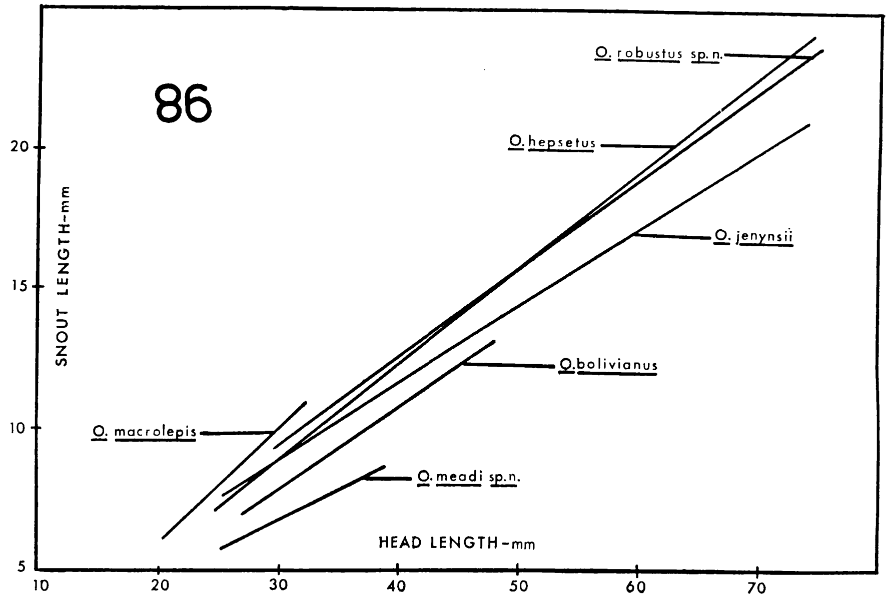


Fig. 84: linear regression of body depth on standard length for all species of *Oligosarcus* except *hepsetus* (Cuvier) which was omitted because it overlaps almost completely that of *jenynsii* (Günther). Fig. 85: linear regression of head length on trunk length for all the species of *Oligosarcus*. The regression of *robustus*, sp. n., and *meadi*, sp. n., overlap almost completely that of *hepsetus* (Cuvier).



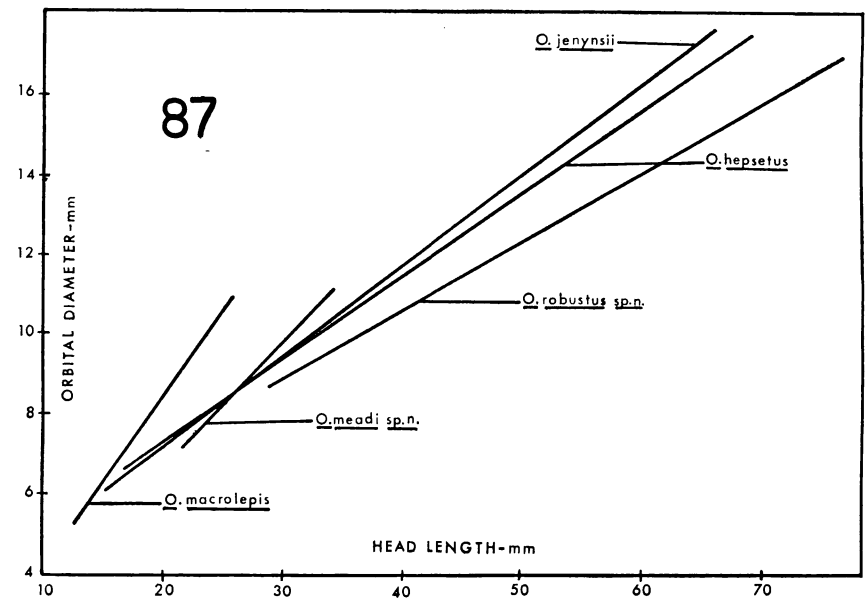
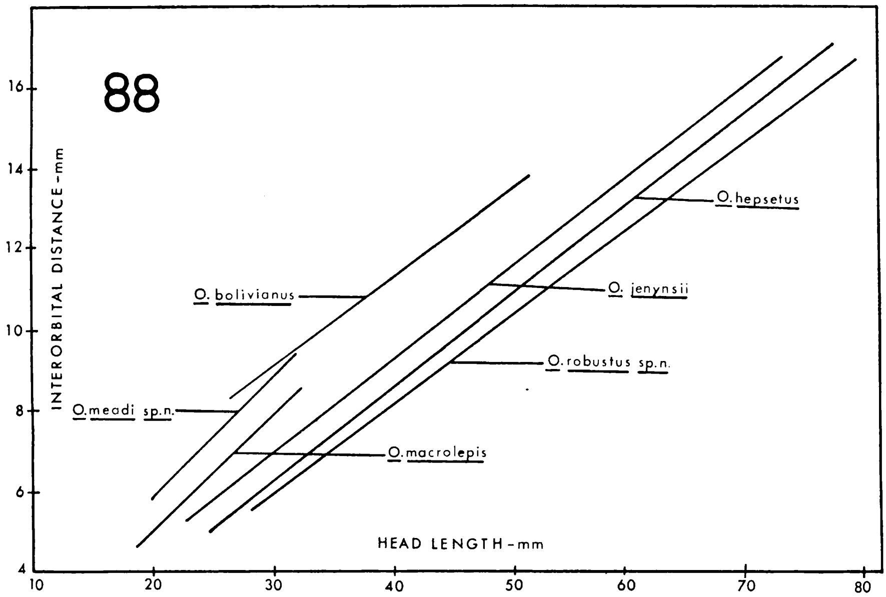


Fig. 86: linear regression of snout length on head length for all species of *Oligosarcus*. Fig. 87: linear regression of orbital diameter on head length for all species of *Oligosarcus;* that of *bolivianus* (Fowler) overlaps that of *hepsetus* (Cuvier).



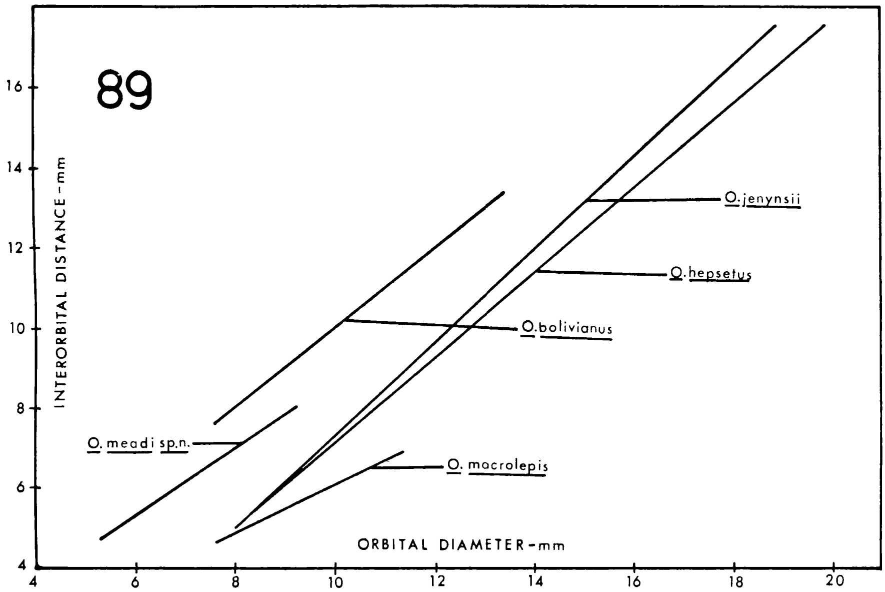
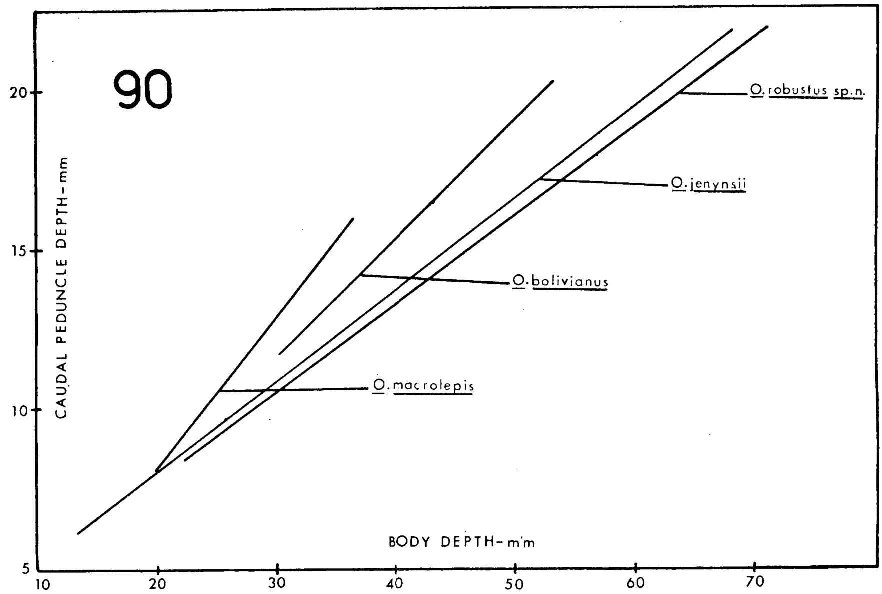


Fig. 88: linear regression of interorbital distance on head length for all species of *Oligosarcus*. Fig. 89: linear regression of interorbital distance on orbital diameter for all species of *Oligosarcus* except *robustus*, sp. n., which was omitted because it overlaps almost completaly that of *jenynsii* (Günther).



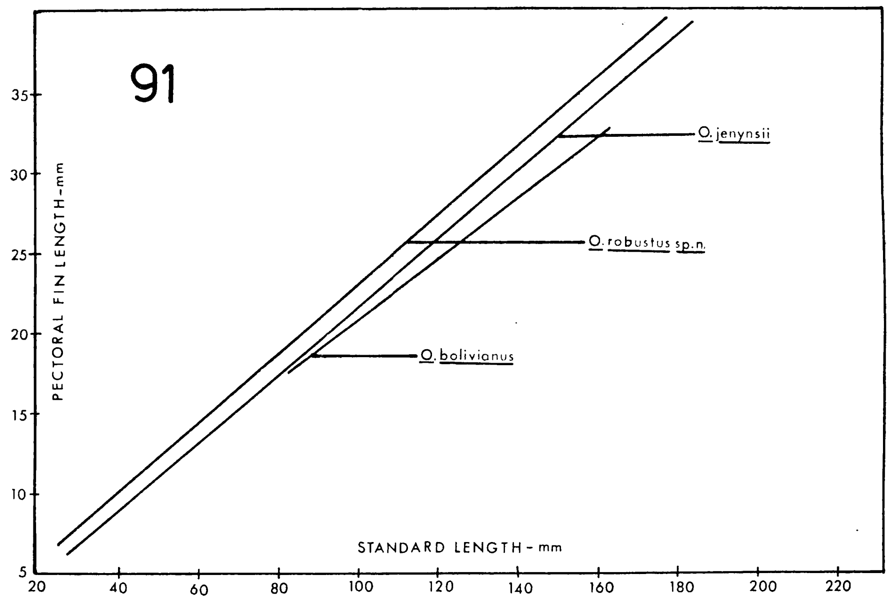
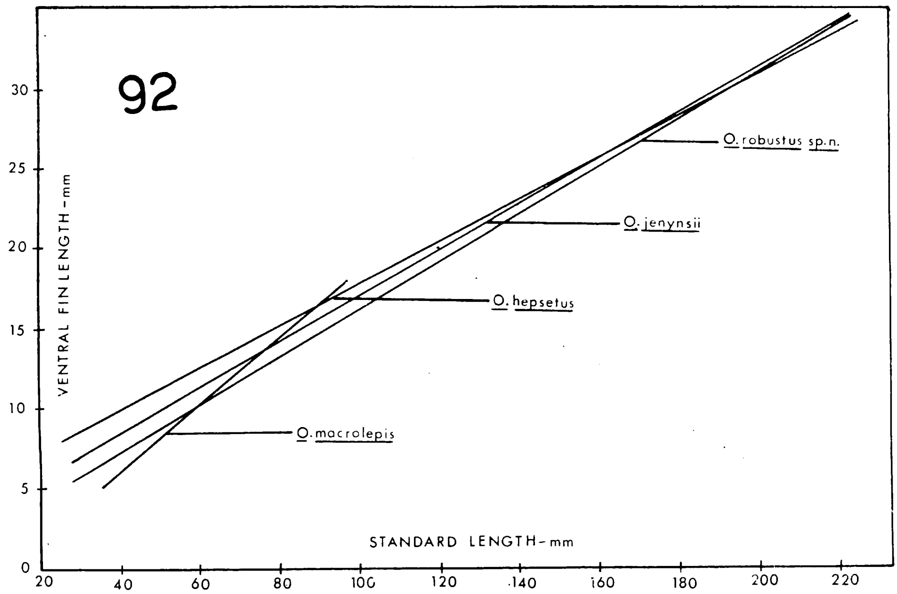


Fig. 90: linear regression of caudal peduncle depth on body depth for all species of *Oligosarcus*. The regressions of *hepsetus* (Cuvier), and *meadi*, sp. n., overlap almost completely those of *jenynsii* (Günther) and *robustus*, sp. n., respectively. Fig. 91: linear regression of pectoral fin length on standard length for all species of *oligosarcus*. Regressions of *macrolepis* (Steindachner), *hepsetus* (Cuvier) and *meadi*, sp. n. omitted because they overlap almost completely those of *robustus*, sp. n., *jenynsii* (Günther) and *bolivianus* (Fowler), respectively.



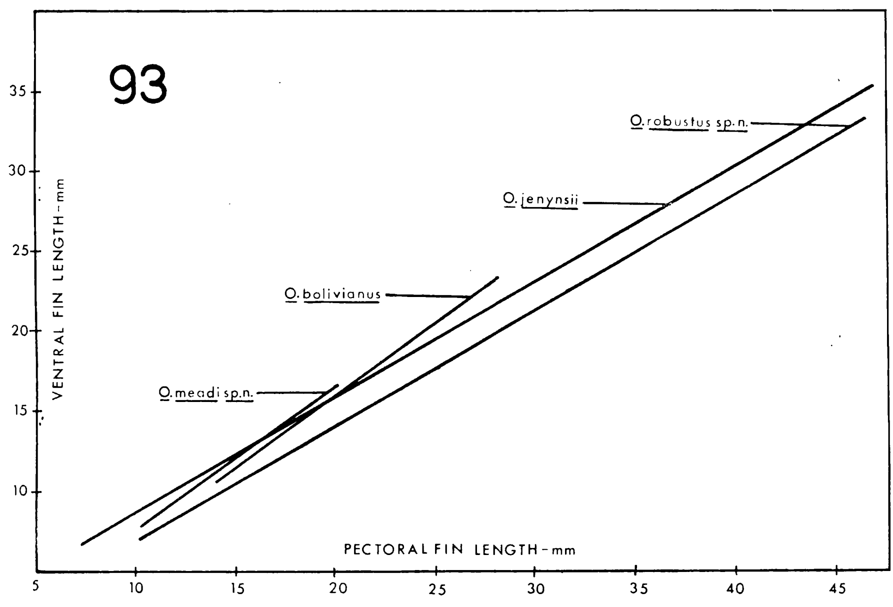
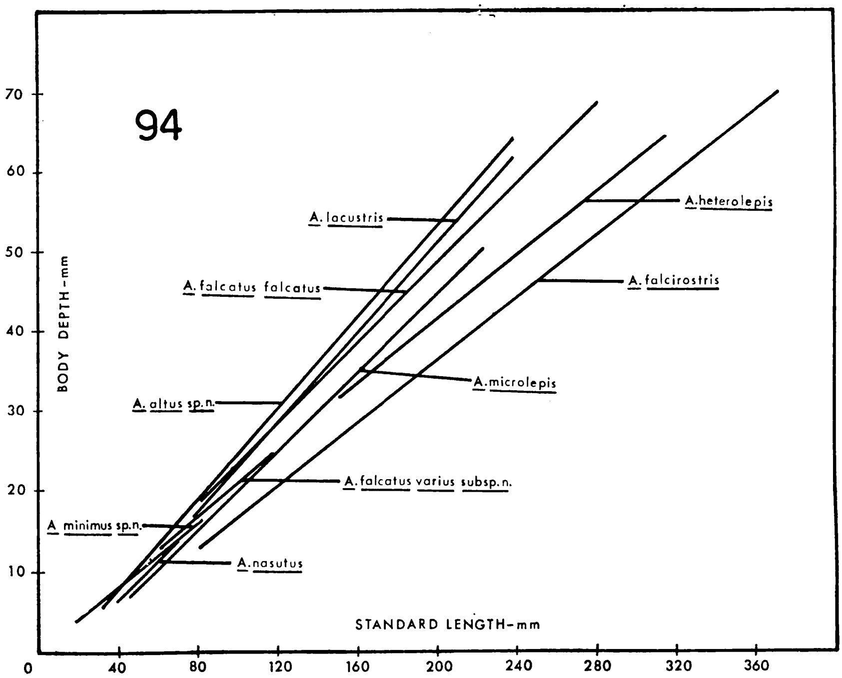
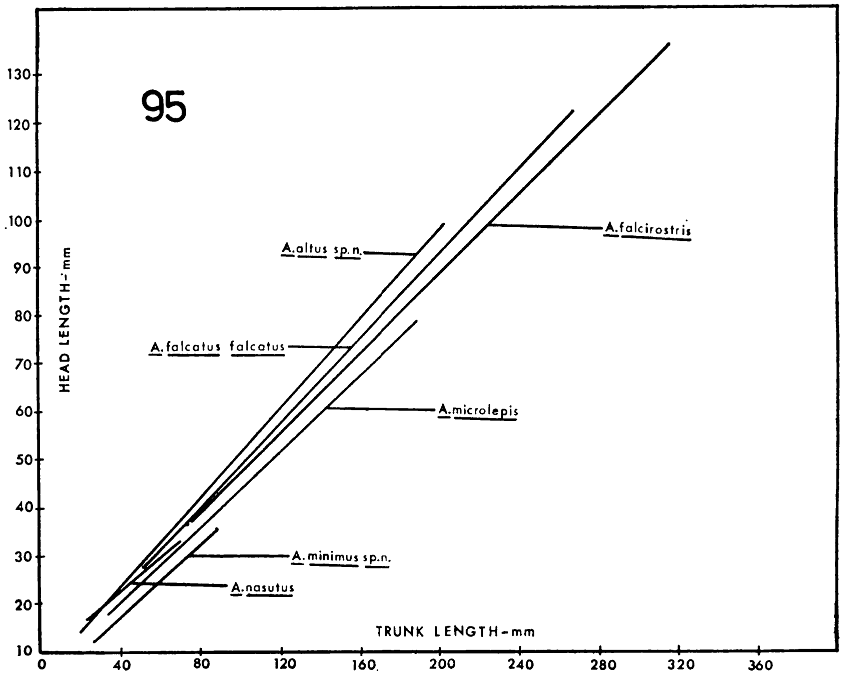
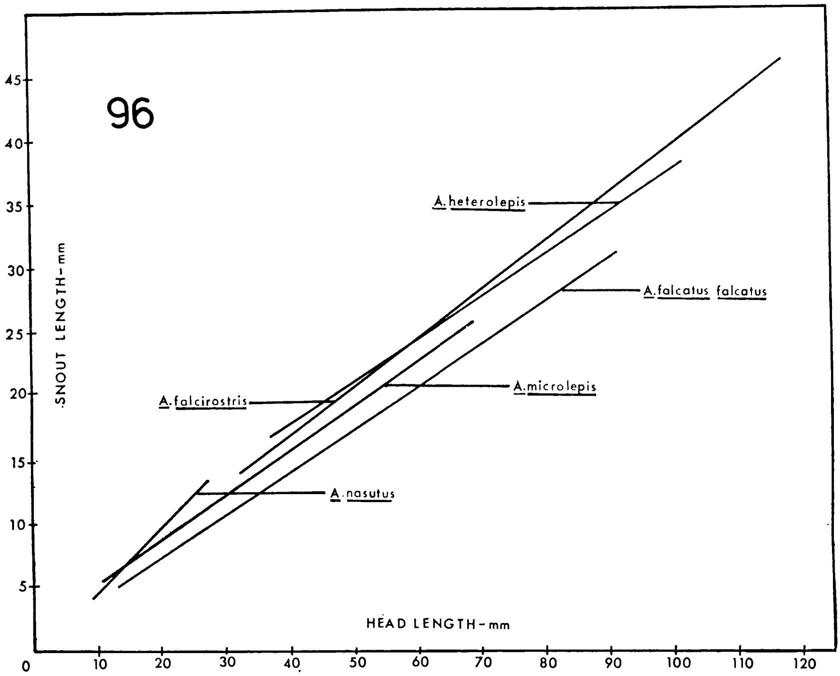


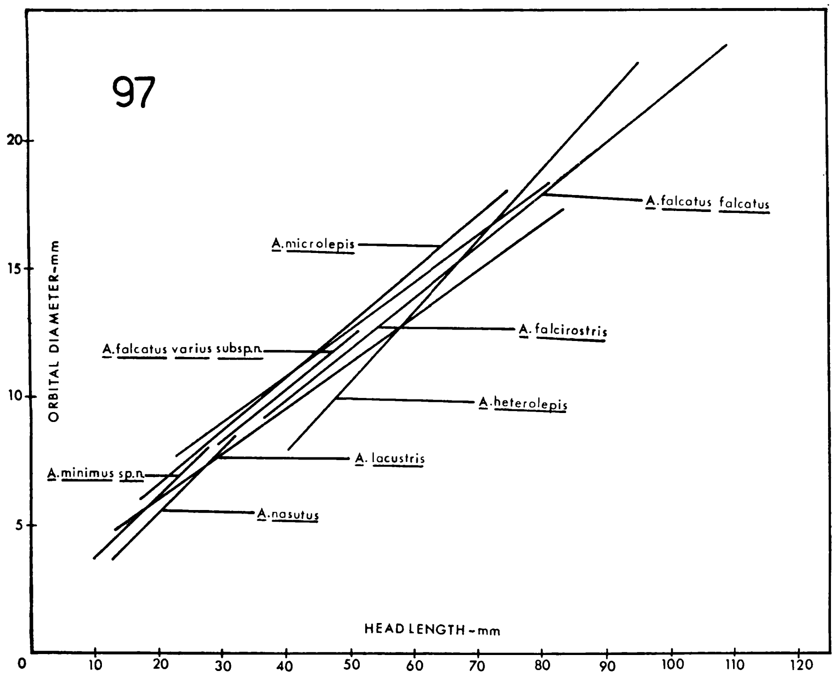
Fig. 92: linear regression of ventral fin length on standard length for all species of *Oligosarcus* except *bolivianus* (Fowler) and *meadi*, sp. n., which were omitted because they overlap almost completely those of *hepsetus* (Cuvier) and *macrolepis* (Steindachner), respectively. Fig. 93: linear regression of ventral fin length on pectoral fin length for all species of *Oligosarcus*. The regression of *hepsetus* (Cuvier) and *macrolepis* (Steindachner) overlap almost completely those of *jenynsii* (Günther) and *robustus*, sp. n., respectively.



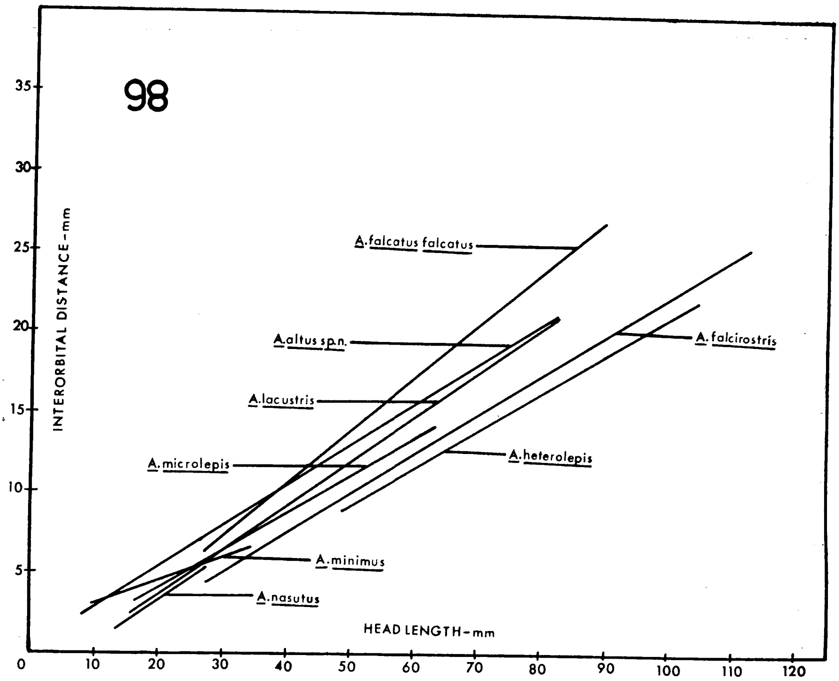


Linear regression for all species of *Acestrorhynchus*. Fig. 94: body depth on standard length. The regression line of *guianensis*, sp. n., nearly coincides with that of *microlepis* (Schomburgk). Fig. 95: head length on trunk length. The regressions of *falcatus varius*, subsp. n., *lacustris* (Reinhardt) and *heterolepis* (Cope) nearly coincide with that of *falcatus falcatus* (Bloch) and the regression of *guianensis*, sp. n., with that of *microlepis* (Schomburgk).





Linear regression for all species of *Acestrorhynchus*. Fig. 96: snout length on head length. The regression lines of *falcatus varius*, subsp. n., overlap that of *falcatus falcatus* (Bloch), and the regression line of *guianensis*, sp. n., that of *microlepis* (Schomburgk). Fig. 97: orbital diameter on head length. Regressions of *guianensis*, sp. n., and *altus*, sp. n., omitted because they nearly coincide with those of *microlepis* (Schomburgk) and *lacustris* (Reinhardt).



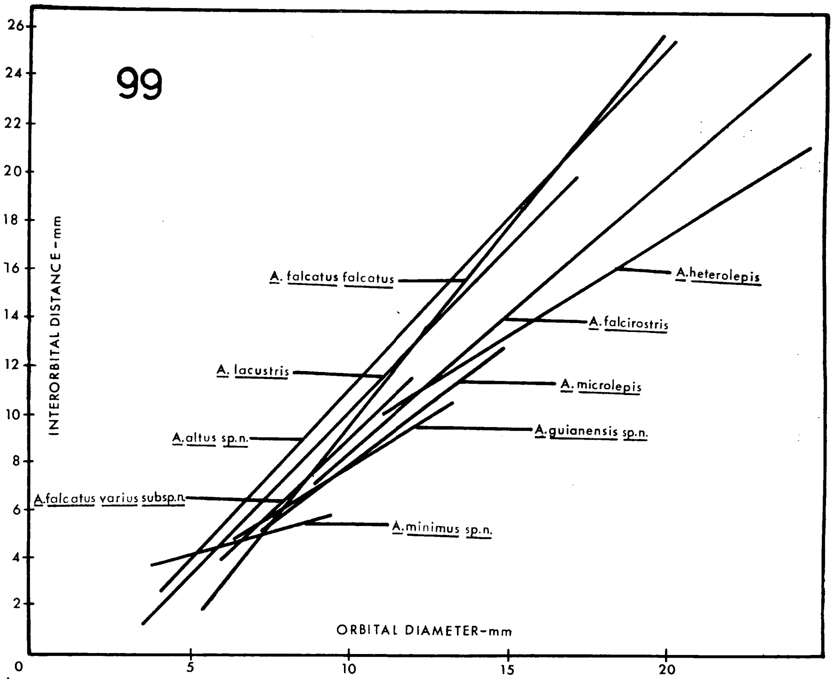
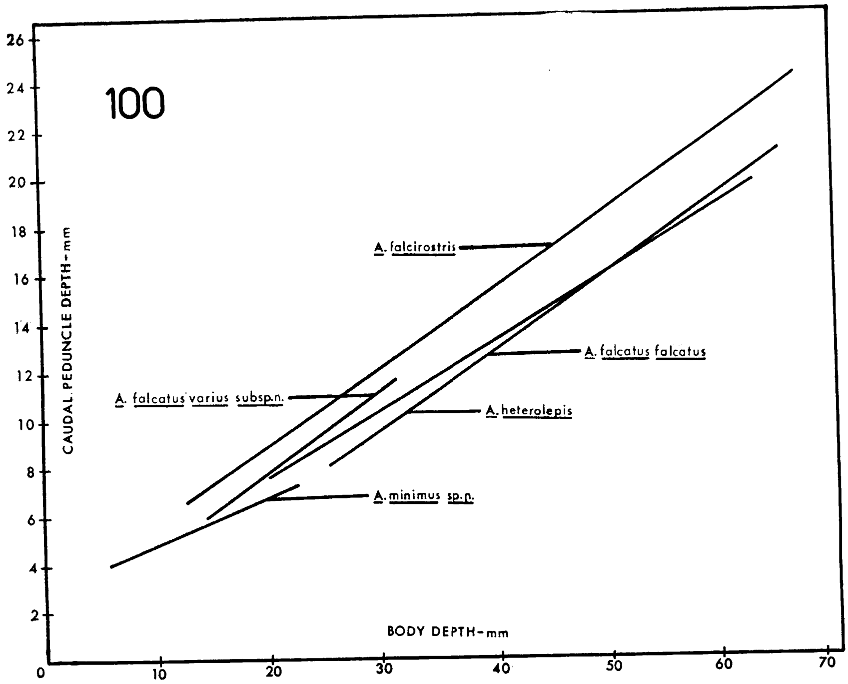


Fig. 98: linear regression of interorbital distance on head length for all species of *Acestrorhynchus*. The regression lines of *falcatus varius*, subsp. n., and *guianensis*, sp. n., nearly coincide with those of *falcatus falcatus* (Bloch) and *macrolepis* (Schomburgk), respectively. Fig. 99: linear regression of interorbital distance on orbital diameter for all species of *Acestrorhynchus*. The regression of *nasutus* Eigenmann overlaps that of *guianensis*, sp. n.



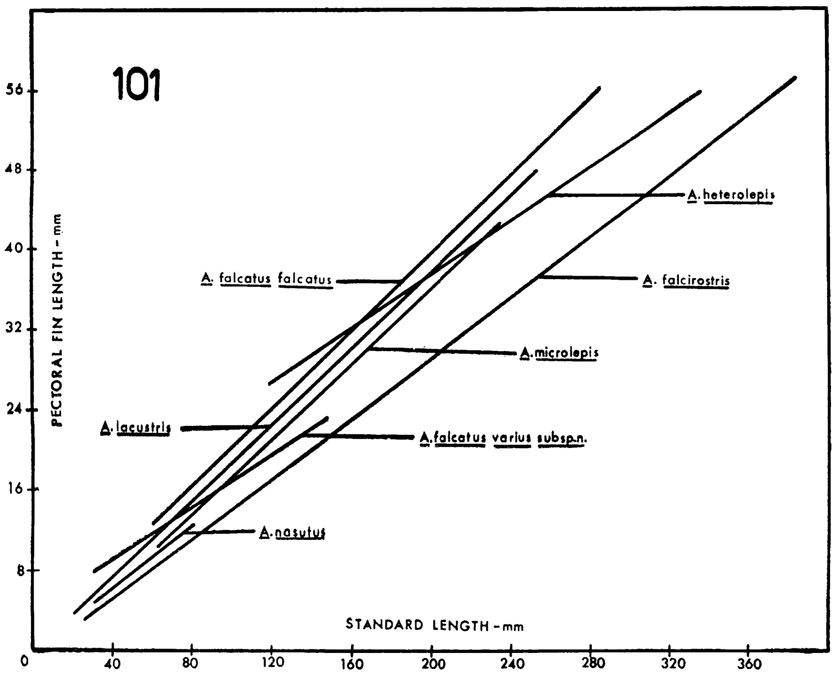
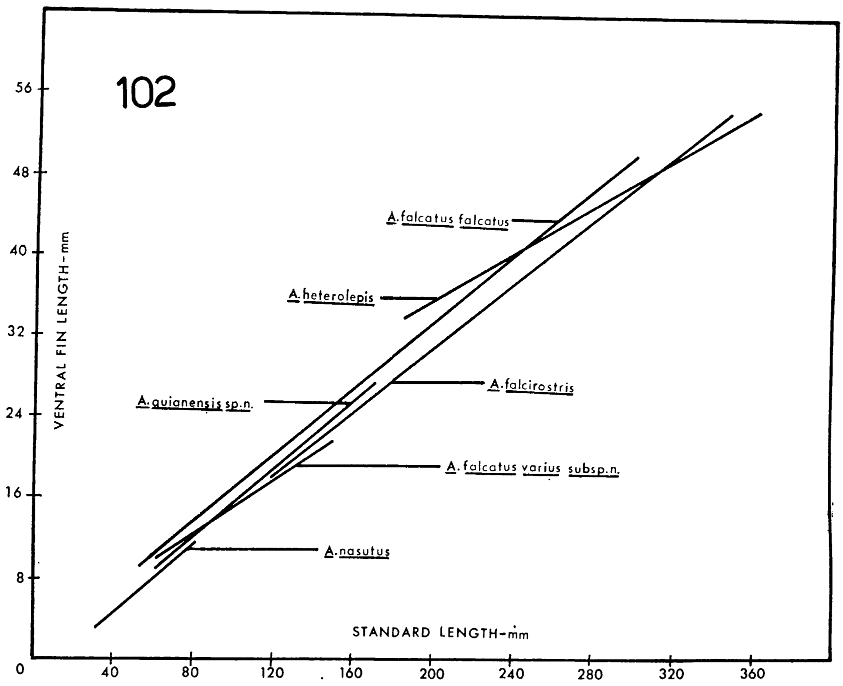
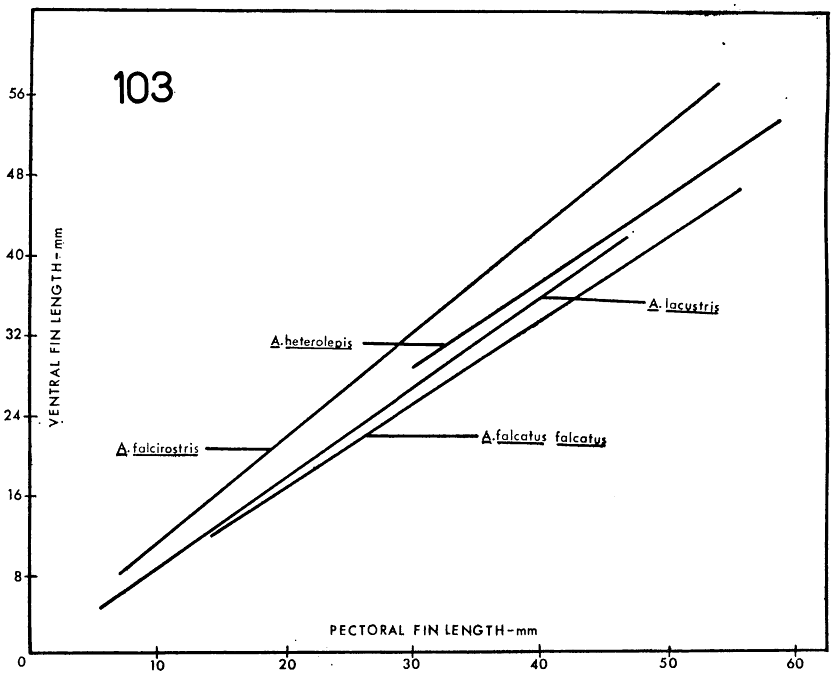


Fig. 100: linear regression of caudal peduncle depth on body depth for all species of *Acestrorhynchus*. The regressions of *lacustris* (Reinhardt), *altus*, sp. n., *microlepis* (Schomburgk) and *guianensis*, sp. n., overlap almost completely that of *falcatus falcatus* (Bloch) and the regression of *nasutus* Eigenmann that of *falcatus varius*, subsp. n. Fig. 101: linear regression of pectoral fin length on standard length for all species of *Ancestrorhynchus*. The regressions of *minimus*, sp. n., *altus*, sp. n., and *guianensis*, sp. n., coincide almost completely with those of *nasutus* Eigenmann, *falcatus falcatus* (Bloch) and *lacustris* (Reinhardt), respectively.





Linear regression for all species of *Acestrorhynchus*. Fig 102: ventral fin length on standard length. The regressions of *lacustris* (Reinhardt) and *altus*, sp. n., nearly coincide with that of *falcatus falcatus* (Bloch) and the regressions of *microlepis* (Schomburgk) and *minimus*, sp. n., with that of *falcirostris* (Cuvier). Fig. 103: ventral fin length on pectoral fin length. The regressions of *falcatus varius*, subsp. n., *nasutus* Eigenmann and *minimus*, sp. n., nearly overlap that of *lacustris* (Reinhardt), and the regression of *altus*, sp. n., *microlepis* (Scomburgk) and *guianensis*, sp. n., that of *falcatus falcatus* (Bloch).

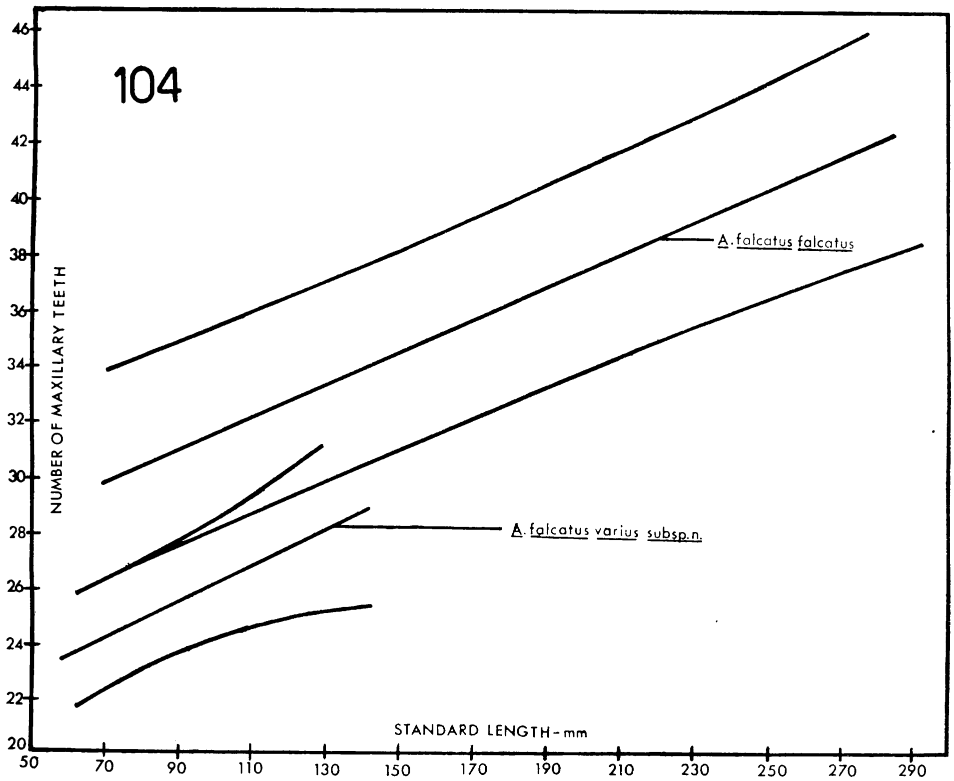


Fig. 104: linear regression of number of maxillary teeth on standard length in *Acestrorhynchus falcatus falcatus* (Bloch) and *falcatus varius*, subsp. n. The curved lines represent the 95% confidence intervals for both subspecies.

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APPENDIX

List of localities and study material. The number of specimes and the range of standard length in mm are in parentheses. The number after each locality indicates its geographical position as it appears in figures 1, 2 and 3.

Paroligosarcus pintoi

DZSP 4659-67 (9, 73-88) — Brazil: SP, Usina do Limoeiro, Rio Pardo — 85
DZSP 4668-70 (3, 40-42) — Brazil: SP, Pirassununga, Lagoa São Vicente — 87
DZSP 4671-78 (8, 42-49) — Brazil: SP, Pereira Barreto, Córrego do Pernilongo — 84
DZSP 4652-58 (7, 41-56) — Brazil: SP, Pirassununga, Rio Mogi-Guaçu — 87
DZSP 3488 (1, 54) — *idem.*
DZSP 3834 (1, 63) — *ibidem.*

Oligosarcus jenynsii

DZSP 4796-99 (4, 77-92) — Brazil: Ba, Belmonte, Rio Jequitinhonha — 69
DZSP 4800 (1, 62) — *idem.*
MCZ 20603 (1, 140) — Brazil: ES, Rio São Mateus — 105
DZSP 3307 (1, 123) — Brazil: ES, Rio São José — 103
DZSP 4070-71 (2, 117-119) — *idem.*
MCZ 20606 (1, 135) — Brazil: Ba, Rio Mucuri — 106
DZSP 4783 (1, 77) — Brazil: ES, Santa Maria da Vitória, Rio Doce — 102
DZSP 4790 (1, 85) — *idem.*
DZSP 1795 (1, 116) — *ibidem.*
DZSP 1686 (1, 105) — Brazil: ES, Rio Doce — 104
DZSP 4772-82 (11, 75-162) — *idem.*
MCZ 20610 (5, 80-97) — *ibidem.*
MCZ 20611 (3, 101-120) — *ibidem.*
DZSP 4765 (1, 145) — Brazil: ES, Cachoeiro do Itapemirim, Rio do Frade e da Freira — 98
DZSP 4785 (1, 67) — Brazil: MG, Rio Doce — (not precisely located)
DZSP 1666 (1, 177) — Brazil: MG, Rio São Francisco — (not precisely located)
DZSP 4695 (1, 140) — Brazil: RS, Pôrto Alegre, Rio Guaíba — 64
DZSP 4921-22 (2, 132-138) — Brazil: RS, Montenegro, Rio Caí — 65
ANSP 1728 (1, 133) — Brazil: RS — 65
ANSP 21917 (1, 105) — Brazil: RS — 65
MCZ 20622 (5, 78-101) — Brazil: RJ, Teresópolis — 93
DZSP 4739 (1, 48) — Brazil: RJ, São João da Barra, Rio Paraíba — 96
DZSP 4742-45 (4, 63-93) — *idem*
DZSP 4746-54 (9, 46-127) — Brazil: RJ, São Fidélis, Rio Paraíba — 95
MCZ 20617-19 (9, 67-144) — Brazil: RJ, Rio Paraíba — 96
MCZ 20613-14 (4, 106-135) — *idem*
MCZ 20601-02 (2, 136-170) — *ibidem*
MCZ 20604 (1, 102) — *ibidem.*
MCZ 20605 (1, 175) — Brazil: RJ, Itabapoana — 97
DZSP 1736 (1, 156) — Brazil: RJ, Lagoa Feia — 94
DZSP 4735-36 (2, 136-147) — *idem.*
DZSP 4740-41 (2, 66-67) — Brazil: RJ, Atafona, Rio Paraíba — 96
DZSP 1479 (1, 123) — Brazil: SP, Taubaté, Rio Paraíba — 89
DZSP 4760 (1, 130) — *idem.*
DZSP 2033 (1, 144) — Brazil: SP, São Luís do Paraitinga, Rio Paraitinga — 90
DZSP 4759 (1, 177) — *idem.*

DZSP 3090 (1, 127) — Brazil: SP, Registro, Rio Ribeira — 70
DZSP 351 (1, 121) — Brazil: SP, Piassaguera, Rio Quilombo — 75
DZSP 1971 (1, 150) — *idem.*
DZSP 4731-33 (2, 81-83) — *ibidem.*
DZSP 4718 (1, 152) — *ibidem.*
DZSP 4720 (1, 140) — *ibidem.*
DZSP 4723-24 (2 , 118-132) — *ibidem.*
DZSP 4726-28 (2, 102-113) — *ibidem.*
DZSP 3775 (1, 143) — Brazil: SP, Iporanga, Rio Ribeira — 71
DZSP 3659 (1, 83) — *idem.*
DZSP 3662 (1, 166) — *ibidem.*
DZSP 1697 (1, 105) — Brazil: SP, Franca, Rio Grande — 86
DZSP 1477 (1, 99) — Brazil: SP, Cubatão — 76
DZSP 4715-17 (2, 74-97) — *idem.*
MCZ 20499 (1, 71) — Uruguay: Maldonado — 63
MCZ 20549 (10, 165-222) — *idem.*
DZSP 4682-84 (3, 105-120) — Uruguay: Florida, Santa Adela, Arroyo Chamizo — 62

Oligosarcus hepsetus

MCZ 839 (6, 139-210) — Argentina: Buenos Aires, Rio de la Plata — 60
MCZ 20548 (4, 165-180) — *idem.*
DZSP 4786-89 (4, 87-89) — Brazil: ES, Santa Maria da Vitória, Rio Doce — 102
DZSP 4791-92 (2, 81-91) — *idem.*
DZSP 1738 (1, 136) — Brazil: RS, Itaqui, Rio Uruguay — 58
DZSP 4686-91 (6, 93-126) — *idem.*
MCZ 20616 (1, 238) — Brazil: RJ, Rio Paraíba — 16
MCZ 20612 (1, 210) — *idem.*
MCZ 20601a (1, 85) — *ibidem.*
MCZ 20602a (1, 122) — *ibidem.*
DZSP 4766-69 (4, 113-142) — Brazil: RJ, Magé, Rio Guapimirim — 92
BM(NH) 89.91 (2, 95-118) — Brazil: SC (not located)
BM(NH) 51.52 (1, 155) — Brazil: SC, Rio Nôvo — 67
BM(NH) 31.39 (6, 162-222) — Brazil: SC, Rio Nôvo — 67
DZSP 4761 (1, 106) — Brazil: SP, Taubaté, Rio Paraíba — 89
DZSP 4757 (1, 135)— Brazil: SP, São Luís do Paraitinga, Rio Paraitinga — 90
DZSP 1734 (1, 132) — *idem.*
DZSP 4737-38 (2, 126-135) — Brazil: SP, Santa Branca, Rio Paraíba — 88
DZSP 4755-56 (2, 66-135) — Brazil: SP, Santa Branca, Ribeirão Gomeatinga — 88
DZSP 4707-08 (2, 98-114) — Brazil: SP, Registro, Rio Ribeira — 70
DZSP 4719 (1, 150) — Brazil: SP, Piassaguera, Rio Quilombo — 75
DZSP 4721-22 (2, 121-133) — *idem.*
DZSP 4725 (1, 117) — *ibidem.*
DZSP 4729-30 (2, 83-105) — *ibidem.*
DZSP 1685 (1, 125) — Brazil: SP, Fazenda Poço Grande, Rio Juquiá — 73
DZSP 4709-10 (2, 43-121) — *idem.*
DZSP 2953 (1, 195) — *ibidem.*
DZSP 3774 (1, 235) — *ibidem.*
DZSP 4705-06 (2, 53-172) — Brazil: SP, Iporanga, Rio Betari — 71
DZSP 4701 (1, 132) — *idem.*
DZSP 1657 (1, 121) — Brazil: SP, Iguape, Rio Ribeira — 72
DZSP 4703-04 (2, 105) — *idem.*
DZSP 4763-64 (2, 97-101) — Brazil: SP, Cachoeira, Rio Paraíba
DZSP 4711-12 (2, 110-120) — Brazil: SP, Juquiá, Rio Juquiá — 73
DZSP 3091-92 (2, 125-170) — *idem.*
DZSP 2954-55 (2, 170-190) — *ibidem.*

Oligosarcus robustus, sp. n.

ANSP 21918 (1, 140) — Brazil: RS — 64
ANSP 21748 (1, 170) — Brazil: RS — 64

DZSP 4692-93 (2, 233-235) — Brazil: RS, São Leopoldo, Rio dos Sinos — 66
MCZ 20550 (3, 157-215) — Brazil: RS, Pôrto Alegre, Rio Guaíba — 64
MCZ 849 (2, 140-161) — *idem.*
DZSP 4694 (1, 205) — *ibidem.*
DZSP 4696-4700 (5, 78-130) — *ibidem.*
DZSP 4917-20 (4, 85-220) — Brazil: RS, Montenegro, Rio Caí — 65
DZSP 4679-81 (3, 130-208) — Uruguay: Salto, Salto Chico, Rio Uruguay (not located)

Oligosarcus macrolepis

MCZ 20607 (1, 77) — Brazil: Rio Jequitinhonha — (not located)
DZSP 4793-95 (3, 53-63) — Brazil: MG, Itaobim, Rio Jequitinhonha — 68

Oligosarcus meadi, sp. n.

DZSP 4614-15 (3, 76-79) — Brazil: MG, União de Caeté — 100
MCZ 45859 (1, 69) — *idem.*
DZSP 4718-19 (2, 64-65) — *ibidem.*

Oligosarcus bolivianus

ANSP 68831 (1, 147) — Bolivia: Tarija, Monte Bello, Rio Lipeo — 55
ANSP 68815 (4, 83-128) — *idem.*
ANSP 79790 (4, 82-102) — Bolivia: Tarija, Villa Montes — 54

Acestrorhynchus falcatus falcatus

DZSP 4572-91 (20, 108-231) — Brazil: Pa, Utinga — 47
DZSP 4570 (1, 122) — Ecuador: Zaparo, Rio Shiono — 23
DZSP 4571 (1, 156) — Ecuador: Zaparo, Rio Panayacu — 22
MCZ 20580 (4, 112-122) — Brazil: Am. Codajás, Rio Amazonas — 30
MCZ 20553 (1, 92) — Brazil: Am, Manacapuru, Rio Amazonas — 32
MCZ 20569 (2, 142-150) — Brazil: Am, Tabatinga, Rio Amazonas — 26
MCZ 45244-49 (6, 147-276) — Brazil: Pa, Belém, Igarapé Icatu — 47
MCZ 45238-43 (6, 130-195) — Brazil: Pa, Cachoeira do Arari, Ilha de Marajó, Rio Arari — 46
MCZ 45230-37 (8, 83-185) — Brazil: Pa, Boa Vista, Rio Apeú — 48
MCZ 30107 (1, 77) — [British] Guyana, Lama Stop-Off — 4
MCZ 852 (2, 155-180) — Surinam — (not exactly located)
BM(NH) 456 (1, 80) — Surinam — (not exactly located)
BM(NH) 533.6 (2, 166-205) — French Guiana, Approuage River — 19
ANSP 110714 (2, 130-162) — Ecuador: Pastaza, Rio Bufeo — 23
ANSP 110713 (2, 123-147) — Ecuador: Zaparó, Rio Capahuari — 21
ANSP 110710 (4, 141-162) — Ecuador: Zaparo, Rio Shiono — 23
ANSP 110712 (2, 118-123) — Ecuador: Zaparo, Rio Panayacu — 22
FMNH 53487 (1, 107) — [British] Guyana: Wismar, Demerara River — 7
FMNH 53484 (1, 116) — [British] Guyana: Tukeit, Potaro River — 14
FMNH 53488 (1, 151) — [British] Guyana: Potaro Landing, Potaro River — 12
FMNH 53485 (1, 88) — [British] Guyana: Christianburg, Demerara River — 7
FMNH 53489 (1, 81) — [British] Guyana: Packeoo Falls, Rupununi River — 16
FMNH 50113 (8, 98-143) — [British] Guyana: New River — 17
FMNH 53482 (3, 81-90) — [British] Guyana: Maduni Creek, Mahaica River — 4
FMNH 53480 (3, 81-90) — [British] Guyana: Lama Stop-Off, Mahaica River — 4
FMNH 53486 (1, 107) — [British] Guyana: Konawaruk, Essequibo River — 10
FMNH 54923 (1, 82) — [British] Guyana: Hubabu Creek, Demerara River — 5
FMNH 53490 (1, 103) — [British] Guyana: Gluck Island, Essequibo River — 6
FMNH 53483 (1, 116) — [British] Guyana: Amatuk, Potaro River — 13
FMNH 53476 (1, 141) — [British] Guyana: Barima River — 2
IUM 12235 (1, 96) — [British] Guyana: Christianburg, Demerara River — 7
IUM 12236 (1, 98) — [British] Guyana: Packeoo Falls, Rupununi River — 16
IUM 12233 (2, 72-85) — [British] Guyana: Maduni Creek, Mahaica River — 4
IUM 12232 (3, 73-87) — [British] Guyana: Lama Stop-Off, Mahaica River — 4

Acestrorhynchus falcatus varius, subsp. n.

DZSP 4560-67 (8, 60-126) — Brazil: Pa, Cachimbo — 49

Acestrorhynchus britskii, sp. n.

DZSP 4405-06 (2, 157-165) — Brazil: MG, Represa de Três Marias — 107

Acestrorhynchus lacustris

MCZ 20529 (1, 155) — Brazil: Am, Coari, Rio Amazonas — 31
MCZ 20566 (6, 125-190) — Brazil: Am, Rio Javari — 25
MCZ 20515 (1, 117) — Brazil: Am, Parintins, Rio Amazonas — 38
DZSP 4412 (1, 110) — Brazil: Ba, Rio São Francisco — (not precisely located)
DZSP 4550-55 (6, 95-141) — *idem.*
DZSP 5242-43 (2, 121-163) — *ibidem.*
DZSP 1465 (1, 173) — *ibidem.*
DZSP 1480 (1, 137) — *ibidem.*
DZSP 4544 (1, 141) — *ibidem.*
DZSP 4556 (1, 111) — Brazil: MT, Três Lagoas, Rio Sucuriú — 83
FMNH 50665j-m (3, 91-95) — Brazil: MT, Descalvados, Rio Paraguay — 52
DZSP 4546-49 (5, 98-143) — Brazil: MG, Três Marias, Rio São Francisco — 107
DZSP 4407-08 (2, 140-165) — *idem.*
DZSP 5235-39 (5, 103-145) — *ibidem.*
DZSP 4545 (1, 184) — Brazil: MG, Represa de Três Marias — 107
DZSP 4409 (1, 180) — *idem.*
DZSP 5240-41 (2, 144-175) — *ibidem.*
MCZ 20544 (2, 131-170) — Brazil: MG, Rio São Francisco — (not precisely located)
DZSP 1674 (1, 118) — Brazil: MG, Pirapora, Rio São Francisco — 108
DZSP 4542 (1, 107) — *idem.*
BM(NH) 33.34 (1, 203) — Brazil: MG, Lagoa Santa — 101
MCZ 20563 (1, 129) — Brazil: Pa, Óbidos, Rio Amazonas — 40
MCZ 20565 (1, 84) — Brazil: Pa, Santarém, Rio Amazonas — 41
DZSP 3279 (1, 162) — Brazil: Pe, Rio São Francisco — 70 (not precisely located)
DZSP 3320 (1, 143) — *idem.*
DZSP 4543 (1, 121) — *ibidem.*
DZSP 4518-19 (2, 105-135) — Brazil: SP, Olímpia — 80
DZSP 2014 (1, 178) — *idem.*
DZSP 4520-27 (8, 68-139) — Brazil: SP, Piracicaba, Rio Piracicaba — 78
DZSP 368 (1, 152) — *idem.*
DZSP 4528-29 (2, 138-142) — Brazil: SP, Varnhagen — 77
DZSP 2013 (1, 205) — *idem.*
DZSP 4557 (1, 132) — Brazil: SP, Ilha Solteira Rio Paraná — 82
DZSP 4401-02 105-130) — Brazil: SP, Pirassununga, Rio Mogi-Guaçu — 87
DZSP 5228 (1, 165) — *idem.*
DZSP 4532-33 (2, 169-186) — *ibidem.*
DZSP 4534-41 (8, 61-156) — Brazil: SP, Corumbataí, Rio Corumbataí — 79
DZSP 4403-04(2, 73-204) — *idem.*
DZSP 5229-34 (6, 35-175) — *ibidem.*
DZSP 4530-31 (2, 116-139) — Brazil: SP, Alfredo de Castilho, Córrego do Moínho — 81
BM(NH) 28.33 (2, 155-225) — Paraguay: Asunción, Rio Paraguay — 56
ANSP 21532 (2, 168-173) — Peruvian Amazon — (not precisely located)
ANSP 21105-07 (3, 117-150) — *idem.*
ANSP 80148 (2, 145-160) — Peru: Boca Chica, Rio Ucayali — 109

Acestrorhynchus altus, sp. n.

USNM 84153 (1, 163) — Argentina: Chaco, Las Palmas, Rio Quia — 57
MCZ 832 (2, 166-192) — Argentina: Rosário, Rosário, Rio Paraná — 57
MCZ 46005 (1, 160) — Brazil: Am, Rio Javari — 25
MCZ 20515a (1, 100) — Brazil: Am, Parintins, Rio Amazonas — 38

DZSP 2049 (1, 233) — Brazil: MT, São Luís de Cáceres, Rio Paraguay — 51
FMNH 74360 (10, 105-188) — Brazil: MT, Descalvados, Rio Paraguay — 52
BM(NH) 14.85 (1, 75) — Brazil: MT, Carandàsinho, Rio Paraguay — 110
IUM 24161 (1, 144) — Brazil: MT, Corumbá, Rio Paraguay — 53
MCZ 46006 (1, 112) — Brazil: Pa, Óbidos, Rio Amazonas — 40
MCZ 20623 (2, 145-150) — Brazil: Pa, Cachoeira do Arari, Ilha de Marajó, Rio Arari — 46
MCZ 20625 (1, 88) — *idem.*
MCZ 45250-74 (25, 79-135) — *ibidem.*
DZSP 3527 (1, 228) — Brazil: Pa, Ilha de Marajó, Lago Arari — 45
DZSP 4558-59 (2, 127-205) — *idem.*
BM(NH) 28.33a-b (2, 165-175) — Paraguay: Asunción, Rio Paraguay — 56
BM(NH) 25.7 (3, 29-68) — Paraguay: Asunción, Bahia de Asunción — 56

Acestrorhynchus falcirostris

MCZ 20597a (1, 173) — Brazil: Am, Codajás, Rio Amazonas — 30
MCZ 20519 (11, 157-223) — Brazil: Pa, Gurupá, Rio Amazonas — 44
MCZ 20525 (6, 243-303) — *idem.*
MCZ 20503 (3, 135-192) — Brazil: Am, Tefé, Rio Amazonas — 29
MCZ 20510 (3, 335-372) — *idem.*
MCZ 20515a (1, 100) — Brazil: Am, Parintins, Rio Amazonas — 38
MCZ 20541 (1, 209) — Brazil: Pa, Rio Xingu — (not precisely located)
DZSP 3566 (1, 181) — Brazil: Pa, Belém — 47
DZSP 4592-94 (3, 146-202) — *idem.*
DZSP 4599 (1, 186) — Brazil: Pa, Utinga — 47
DZSP 4595-98 (4, 177-256) — Brazil: Pa, Rio Tapajós — 42
MCZ 20547 (2, 187-285) — Brazil: Pa, Santarém, Rio Amazonas — 41
MCZ 20563 (1, 112) — Brazil: Pa, Óbidos, Rio Amazonas — 40
MCZ 45276-78 (3, 111-182) — Brazil: Pa, Cachoeira do Arari, Ilha de Marajó, Rio Arari — 46
DZSP 4600-04 (5, 160-227) — Brazil: Pa, Lago Jacaré, Rio Trombetas — 39
MCZ 45281-85 (5, 111-157) — Brazil: Pa, Boa Vista, Rio Apeú — 48
DZSP 4410-12 (3, 94-130) — Brazil: Pa, Lago Agua Preta — 47
USNM 16778 (1, 230) — Peru: Rio Pacaya — 24
ANSP 95832 (4, 155-215) — Peru: Boca Chica, Rio Ucayali — 109
DZSP 5187 (1, 185) — Venezuela: Guarico, Rio Chimire — 20
DZSP 5185-86 (2, 230-275) — *idem.*
DZSP 5244-45 (4, 208-262) — Venezuela: Guarico, Rio Guariquito — (not precisely located)

Acestrorhynchus microlepis

MCZ 20581 (3, 82-91) — Brazil: Am, Codajás, Rio Amazonas — 30
MCZ 20523 (3, 116-123) — Brazil: Pa, Gurupá, Rio Amazonas — 44
MCZ 20599 (2, 53-54) — Brazil: Am, Jatuarana, Rio Amazonas (not located)
MCZ 20506 (5, 88-123) — Brazil: Am, Tefé, Rio Amazonas — 29
MCZ 20514 (1, 90) — Brazil: Am, Parintins, Rio Amazonas — 38
MCZ 46001 (15, 84-117) — *idem.*
MCZ 20559 (1, 80) — Brazil: Pa, Óbidos, Rio Amazonas — 40
MCZ 20536 (1, 108) — Brazil: Pa, Pôrto de Moz, Rio Amazonas — 43a
MCZ 20540 (1, 117) — *idem.*
BM(NH) 459 (1, 132) — [British] Guyana, Tumatumari, Potaro River — 11
FMNH 53499 (3, 93-126) — *idem.*
FMNH 53492 (1, 115) — [British] Guyana, Potaro Landing, Potaro River -- 12
BM(NH) 21.38 (1, 140) — [British] Guyana, Rockstone, Essequibo River — 6
FMNH 53500 (5, 72-132) — *idem.*
MCZ 30104 (1, 103) — *ibidem.*
MCZ 30106 (1, 105) — *ibidem.*
MCZ 30108 (1,82) — *ibidem*
FMNH 53493 (1, 65) — [British] Guyana, Malali, Demerara River — 8
IUM 12230 (1, 193) — [British] Guyana, Lama Stop-Off, Mahaica River — 4

FMNH 53501a (1, 215) — *idem.*
FMNH 53503 (4, 68-198) — [British] Guyana, Konawaruk, Essequibo River — 10
FMNH 54924 (4, 83-108) — [British] Guyana, Hubabu Creek, Demerara River — 3
FMNH 53496 (1, 95) — [British] Guyana, Georgetown, Demerara River — 3
BM(NH) 457 (1, 113) — [British] Guyana, Crab Falls, Essequibo River — 9
FMNH 7512 (1, 88) — *idem.*
FMNH 53491 (5, 78-152) — *ibidem.*
USNM 16778 (1, 23) — Peru: Loreto, Rio Pacaya — 24
ANSP 68679 (1, 137) — Peru: Loreto, Boca Chica, Rio Ucayali — 109

Acestrorhynchus guianensis, sp. n.

MCZ 20517a-h (9, 90-118) — Brazil: Am, Parintins, Rio Amazonas — 38
MCZ 45275-77 (3, 94-96) — Brazil: Pa, Cachoeira do Arari, Ilha de Marajó, Rio Arari — 46
FMNH 53495 (2, 70-84) — [British] Guyana, Maduni Creek, Mahaica River — 4
FMNH 53501 (1, 160) — [British] Guyana, Lama Stop-Off, Mahaica River — 4
FMNH 54922 (2, 89-96) — [British] Guyana, Hubabu Creek, Demerara River — 5
FMNH 53502 (1, 156) — [British] Guyana, Aruka River — 1
FMNH 53504 (2, 95-100) — [British] Guyana, Botanic Garden, Georgetown — 3
FMNH 74359 (1, 126) — *idem.*
USNM 194148 (1, 114) — Venezuela: Rio La Clarita — (not precisely located)

Acestrorhynchus heterolepis

DZSP 5184 (1, 252) — Venezuela: Guarico, Rio Chimire — 20
MCZ 20529 (1, 205) — Brazil: Rio Içá (not precisely located)
ANSP 21247-48 (2, 162-227) — Peruvian Amazon (not precisely located)
ANSP 95832a (1, 187) — Peru: Loreto, Boca Chica, Rio Ucayali — 109
ANSP 21246 (1, 321) — Peruvian Amazon (not precisely located)

Acestrorhynchus nasutus

BM(NH) 9.17 (5, 52-69) — Brazil: Am, Monte Alegre, Rio Amazonas — 43
FMNH 53475 (1, 66) — [British] Guyana, Rockstone, Essequibo River — 6

Acestrorhynchus minimus, sp. n.

MCZ 20589 (1, 52) — Brazil: Am, Lago Aleixo — 34
MCZ 20554 (1, 50)— Brazil: Am, Rio Içá — (not precisely located)
MCZ 20528 (11, 36-58) — Brazil: Am, Lago Januari, Rio Amazonas — 33
MCZ 20598 (4, 42-65) — Brazil: Am, Jatuarana, Rio Amazonas — (not precisely located)
MCZ 20585 (2, 50-55) — Brazil: Am, Rio Jutaí — 37
MCZ 20532 (15, 40-66) — Brazil: Am, Lago do Máximo — 37
MCZ 20594 (1, 49) — Brazil: Am, Lago Saracá — 35
MCZ 20591 (12, 46-63) — Brazil: Am, Itacoatiara, Rio Amazonas — 36
MCZ 46004 (1, 83) — Brazil: Am, Parintins, Rio Amazonas — 38
MCZ 20560 (3, 48-67) — Brazil: Pa, Óbidos, Rio Amazonas — 40
MCZ 20631 (1, 65) — Brazil: Pa, (not precisely located)
MCZ 20624 (1, 51)— Brazil: Pa, Arari, Ilha de Marajó — 46
DZSP 4608-09 (2, 63-76) — Brazil: Pa, Lago Jocaré, Rio Trombetas — 39

APPENDIX TABLE 1 - Regression data from Paroligosarcus pintoi

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	28	3.80 ± 0.45	0.38 ± 0.011	1 123
BODY DEPTH x STANDARD LENGTH	28	-2.20 ± 0.64	0.42 ± 0.010	1 473
SNOUT LENGTH x HEAD LENGTH	28	0.19 ± 0.46	0.26 ± 0.020	160
ORBITAL DIAMETER x HEAD LENGTH	28	2.28 ± 0.34	0.25 ± 0.018	190
INTERORBITAL DISTANCE x HEAD LENGTH	28	1.63 ± 0.30	0.22 ± 0.018	190
INTERORBITAL DISTANCE x ORBITAL DIAMETER	28	0.28 ± 0.54	0.78 ± 0.070	102
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	28	1.29 ± 0.39	0.29 ± 0.017	288
PECTORAL FIN LENGTH x STANDARD LENGTH	28	1.54 ± 0.51	0.22 ± 0.008	684
VENTRAL FIN LENGTH x STANDARD LENGTH	28	1.05 ± 0.42	0.19 ± 0.007	717
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	28	0.04 ± 0.50	0.83 ± 0.033	622

APPENDIX TABLE 2 - Regression data from Oligosarcus junynsii

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	122	5.06 ± 0.68	0.38 ± 0.0026	2 107
BODY DEPTH x STANDARD LENGTH	120	-1.16 ± 0.72	0.30 ± 0.0062	2 278
SNOUT LENGTH x HEAD LENGTH	122	1.08 ± 0.12	0.27 ± 0.0033	6 741
ORBITAL DIAMETER x HEAD LENGTH	122	2.32 ± 0.87	0.23 ± 0.0078	895
INTERORBITAL DISTANCE x HEAD LENGTH	122	-0.25 ± 0.19	0.23 ± 0.0053	1 929
INTERORBITAL DISTANCE x ORBITAL DIAMETER	122	-4.23 ± 0.33	1.15 ± 0.0315	1 337
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	120	2.33 ± 0.34	0.28 ± 0.0104	740
PECTORAL FIN LENGTH x STANDARD LENGTH	119	1.47 ± 0.12	0.20 ± 0.0030	44 309
VENTRAL FIN LENGTH x STANDARD LENGTH	121	2.72 ± 0.39	0.14 ± 0.0033	1 875
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	119	1.50 ± 3.17	0.71 ± 0.0126	3 218

APPENDIX TABLE 3 - Regression data from Oligosarcus hepsetus

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	78	2.19 ± 0.77	0.44 ± 0.0078	3 066
BODY DEPTH x STANDARD LENGTH	78	-1.32 ± 0.81	0.30 ± 0.0057	2 734
SNOUT LWNGTH x HEAD LENGTH	78	-1.31 ± 0.34	0.34 ± 0.0077	1 984
ORBITAL DIAMETER x HEAD LENGTH	78	2.99 ± 0.17	0.21 ± 0.0084	616
INTERORBITAL DISTANCE x HEAD LENGTH	78	-0.80 ± 0.26	0.23 ± 0.0059	1 548
INTERORBITAL DISTANCE x ORBITAL DIAMETER	78	-2.39 ± 0.65	0.96 ± 0.0525	335
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	76	2.04 ± 0.26	0.28 ± 0.0063	2 028
PECTORAL FIN LENGTH x STANDARD LENGTH	75	3.05 ± 1.18	0.19 ± 0.0082	576
VENTRAL FIN LENGTH x STANDARD LENGTH	75	4.80 ± 0.78	0.13 ± 0.0054	587
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	75	1.97 ± 0.71	0.69 ± 0.0224	958

APPENDIX TABLE 4 - Regression data from Oligosarcus robustus, sp.n.

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	22	1.84 ± 1.68	0.44 ± 0.0151	843
BODY DEPTH x STANDARD LENGTH	22	-3.57 ± 1.26	0.29 ± 0.0078	1 410
SNOUT LENGTH x HEAD LENGTH	22	0.02 ± 0.58	0.31 ± 0.0116	734
ORBITAL DIAMETER x HEAD LENGTH	22	3.75 ± 0.45	0.17 ± 0.0089	375
INTERORBITAL DISTANCE x HEAD LENGTH	22	-0.55 ± 0.47	0.21 ± 0.0093	534
INTERORBITAL DISTANCE x ORBITAL DIAMETER	22	-4.28 ± 1.15	1.17 ± 0.0931	159
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	22	2.57 ± 0.52	0.27 ± 0.0120	524
PECTORAL FIN LENGTH x STANDARD LENGTH	22	1.75 ± 0.92	0.21 ± 0.0057	1 358
VENTRAL FIN LENGTH x STANDARD LENGTH	22	1.43 ± 0.70	0.15 ± 0.0034	1 181
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	22	0.37 ± 0.74	0.70 ± 0.0200	1 138

APPENDIX TABLE 5 - Regression data from *Oligosarcus macrolepis*

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	4	2.59 ± 1.10	0.40 ± 0.025	262
BODY DEPTH x STANDARD LENGTH	4	-1.80 ± 0.80	0.33 ± 0.012	721
SNOUT LENGTH x HEAD LENGTH	4	-2.54 ± 0.82	0.43 ± 0.040	114
ORBITAL DIAMETER x HEAD LENGTH	4	-0.09 ± 2.14	0.42 ± 0.105	16
INTERORBITAL DISTANCE x HEAD LENGTH	4	-0.72 ± 0.29	0.28 ± 0.014	388
INTERORBITAL DISTANCE x ORBITAL DIAMETER	4	-0.10 ± 1.21	0.60 ± 0.141	18
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	4	-2.00 ± 1.32	0.50 ± 0.027	33
PECTORAL FIN LENGTH x STANDARD LENGTH	4	1.59 ± 2.59	0.21 ± 0.040	27
VENTRAL FIN LENGTH x STANDARD LENGTH	4	0.62 ± 1.11	0.16 ± 0.017	84
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	4	0.28 ± 2.64	0.71 ± 0.175	16

APPENDIX TABLE 6 - Regression data from *Oligosarcus bolivianus*

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	8	4.04 ± 2.98	0.37 ± 0.041	84
BODY DEPTH x STANDARD LENGTH	9	-2.53 ± 1.64	0.34 ± 0.016	460
SNOUT LENGTH x HEAD LENGTH	8	-0.52 ± 0.91	0.29 ± 0.029	97
ORBITAL DIAMETER x HEAD LENGTH	8	3.42 ± 0.76	0.20 ± 0.024	68
INTERORBITAL DISTANCE x HEAD LENGTH	8	2.53 ± 0.43	0.22 ± 0.014	256
INTERORBITAL DISTANCE x ORBITAL DIAMETER	9	-0.30 ± 1.20	1.00 ± 0.124	65
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	9	0.71 ± 1.30	0.36 + 0.039	83
PECTORAL FIN LENGTH x STANDARD LENGTH	5	2.98 ± 2.79	0.18 ± 0.028	39
VENTRAL FIN LENGTH x STANDARD LENGTH	6	3.45 ± 1.55	0.14 ± 0.014	101
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	4	-1.76 ± 1.72	0.90 ± 0.080	127

APPENDIX TABLE 7 - Regression data from Oligarcus meadi, sp.n.

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	8	1.88 ± 1.57	0.44 ± 0.032	181
BODY DEPTH x STANDARD LENGTH	8	-1.81 ± 4.31	0.36 ± 0.060	36
SNOUT LENGTH x HEAD LENGTH	8	0.05 ± 0.84	0.23 ± 0.036	40
ORBITAL DIAMETER x HEAD LENGTH	8	0.72 ± 1.86	0.30 ± 0.087	13
INTERORBITAL DISTANCE x HEAD LENGTH	8	-0.15 ± 4.86	0.30 ± 0.210	2
INTERORBITAL DISTANCE x ORBITAL DIAMETER	8	0.35 ± 1.39	0.83 ± 0.182	21
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	8	2.01 ± 1.60	0.29 ± 0.066	19
PECTORAL FIN LENGTH x STANDARD LENGTH	8	0.75 ± 2.41	0.20 ± 0.034	36
VENTRAL FIN LENGTH x STANDARD LENGTH	8	-1.81 ± 2.70	0.20 ± 0.038	28
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	8	-1.77 ± 2.30	0.94 ± 0.150	39

APPENDIX TABLE 8 - Regression data from Acestrorhynchus falcatus falcatus

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	99	3.87 ± 0.75	0.44 ± 0.0025	2 953
BODY DEPTH x STANDARD LENGTH	99	-1.75 ± 0.97	0.25 ± 0.0022	1 246
SNOUT LENGTH x HEAD LENGTH	99	0.70 ± 0.32	0.33 ± 0.0036	2 105
ORBITAL DIAMETER x HEAD LENGTH	99	3.43 ± 0.24	0.18 ± 0.0054	1 107
INTERORBITAL DISTANCE x HEAD LENGTH	99	-2.78 ± 0.34	0.33 ± 0.0077	1 837
INTERORBITAL DISTANCE x ORBITAL DIAMETER	99	-7.33 ± 0.75	1.67 ± 0.0660	642
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	99	2.04 ± 0.22	0.27 ± 0.0067	1 700
PECTORAL FIN LENGTH x STANDARD LENGTH	99	0.63 ± 0.87	0.19 ± 0.0063	931
VENTRAL FIN LENGTH x STANDARD LENGTH	99	0.46 ± 0.72	0.16 ± 0.0026	969
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	99	0.07 ± 0.22	0.83 ± 0.0098	7 141
NUMBER OF MAXILLARY TEETH x STANDARD LENGTH	79	25.54 ± 0.88	0.06 ± 0.0019	95

APPENDIX TABLE 9 - Regression data from *Acestrorhychus falcatus varius*

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	8	8.27 ± 1.46	0.39 ± 0.0266	220
BODY DEPTH x STANDARD LENGTH	8	0.41 ± 1.37	0.20 ± 0.0160	163
SNOUT LENGTH x HEAD LENGTH	8	-0.07 ± 0.52	0.35 ± 0.0135	414
ORBITAL DIAMETER x HEAD LENGTH	8	2.10 ± 0.87	0.20 ± 0.0290	47
INTERORBITAL DISTANCE x HEAD LENGTH	8	-1.95 ± 0.60	0.28 ± 0.0200	201
INTERORBITAL DISTANCE x ORBITAL DIAMETER	8	-3.62 ± 1.68	1.25 ± 0.2083	36
CUADAL PEDUNCLE DEPTH x BODY DEPTH	8	1.02 ± 0.61	0.33 ± 0.0340	96
PECTORAL FIN LENGTH x STANDARD LENGTH	8	3.75 ± 1.92	0.13 ± 0.0226	33
VENTRAL FIN LENGTH x STANDARD LENGTH	8	1.52 ± 1.28	0.13 ± 0.0151	80
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	8	-1.29 ± 1.39	0.96 ± 0.0946	104
NUMBER OF MAXILLARY TEETH x STANDARD LENGTH	8	19.68 ± 1.38	0.06 ± 0.0162	16

APPENDIX TABLE 10 - Regression data from *Acestrorhynchus lacustris*

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	96	4.90 ± 0.79	0.42 ± 0.0085	2 495
BODY DEPTH x STANDARD LENGTH	92	-4.45 ± 0.94	0.27 ± 0.0069	1 614
SNOUT LENGTH x HEAD LENGTH	96	1.47 ± 0.45	0.32 ± 0.0101	1 050
ORBITAL DIAMETER x HEAD LENGTH	96	2.47 ± 0.33	0.17 ± 0.0067	699
INTERORBITAL DISTANCE x HEAD LENGTH	96	-1.57 ± 0.32	0.27 ± 0.0072	1 433
INTERORBITAL DISTANCE x ORBITAL DIAMETER	96	-3.66 ± 0.63	1.37 ± 0.0607	509
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	92	2.42 ± 0.23	0.26 ± 0.0070	1 425
PECTORAL FIN LENGTH x STANDARD LENGTH	89	0.58 ± 1.11	0.19 ± 0.0082	551
VENTRAL FIN LENGTH x STANDARD LENGTH	89	-2.00 ± 0.96	0.18 ± 0.0071	646
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	89	-0.28 ± 0.72	0.89 ± 0.0281	998

APPENDIX TABLE 11 - Regression data from *Acestrorhynchus altus*, sp.n.

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	54	2.60 ± 0.69	0.47 ± 0.0080	3 384
BODY DEPTH x STANDARD LENGTH	56	-3.65 ± 0.80	0.28 ± 0.0060	2 186
SNOUT LENGTH x HEAD LENGTH	56	0.29 ± 0.45	0.34 ± 0.0103	1 090
ORBITAL DIAMETER x HEAD LENGTH	56	1.69 ± 0.27	0.19 ± 0.0062	989
INTERORBITAL DISTANCE x HEAD LENGTH	56	0.31 ± 0.79	0.25 ± 0.0180	190
INTERORBITAL DISTANCE x ORBITAL DIAMETER	56	-3.61 ± 0.50	1.45 ± 0.0493	876
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	56	1.82 ± 0.27	0.28 ± 0.0079	1 294
PECTORAL FIN LENGTH x STANDARD LENGTH	56	2.65 ± 1.01	0.18 ± 0.0077	540
VENTRAL FIN LENGTH x STANDARD LENGTH	56	0.90 ± 0.95	0.15 ± 0.0072	476
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	56	-0.32 ± 1.04	0.83 ± 0.0396	444

APPENDIX TABLE 12 - Regression data from *Acestrorhynchus falcirostris*

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	80	7.77 ± 0.90	0.40 ± 0.0062	4 245
BODY DEPTH x STANDARD LENGTH	80	-2.71 ± 1.32	0.19 ± 0.0063	959
SNOUT LENGTH x HEAD LENGTH	80	1.42 ± 0.47	0.37 ± 0.0072	2 686
ORBITAL DIAMETER x HEAD LENGTH	80	1.74 ± 0.39	0.20 ± 0.0059	1 132
INTERORBITAL DISTANCE x HEAD LENGTH	80	-2.15 ± 0.42	0.24 ± 0.0063	1 475
INTERORBITAL DISTANCE x ORBITAL DIAMETER	80	-3.25 ± 0.66	1.15 ± 0.0445	669
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	80	2.34 ± 0.34	0.32 ± 0.0090	1 246
PECTORAL FIN LENGTH x STANDARD LENGTH	79	-0.93 ± 0.64	0.15 ± 0.0030	2 432
VENTRAL FIN LENGTH x STANDARD LENGTH	79	-0.81 ± 0.68	0.16 ± 0.0033	2 262
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	79	0.48 ± 0.53	1.05 ± 0.0172	3 710

APPENDIX TABLE 13 - Regression data from Acestrorhynchus microlepis

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	69	4.48 ± 0.75	0.38 ± 0.0103	1 401
BODY DEPTH x STANDARD LENGTH	69	-3.87 ± 0.77	0.24 ± 0.0072	1 101
SNOUT LENGTH x HEAD LENGTH	69	1.71 ± 0.36	0.34 ± 0.0110	961
ORBITAL DIAMETER x HEAD LENGTH	69	2.50 ± 0.32	0.20 ± 0.0097	445
INTERORBITAL DISTANCE x HEAD LENGTH	69	-0.50 ± 0.27	0.23 ± 0.0082	798
INTERORBITAL DISTANCE x ORBITAL DIAMETER	69	-1.37 ± 0.43	0.90 ± 0.0473	68
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	69	1.93 ± 0.22	0.27 ± 0.0102	734
PECTORAL FIN LENGTH x STANDARD LENGTH	69	-2.18 ± 0.63	0.19 ± 0.0059	1 023
VENTRAL FIN LENGTH x STANDARD LENGTH	69	-2.01 ± 0.58	0.16 ± 0.0055	920
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	69	0.08 ± 0.35	0.86 ± 0.0196	2 049

APPENDIX TABLE 14 - Regression data from Acestrorhynchus guianensis, sp.n.

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	23	5.25 ± 1.20	0.38 ± 0.1700	507
BODY DEPTH x STANDARD LENGTH	23	-1.68 ± 1.40	0.22 ± 0.0136	276
SNOUT LENGTH x HEAD LENGTH	23	0.31 ± 0.43	0.37 ± 0.0135	778
ORBITAL DIAMETER x HEAD LENGTH	23	1.56 ± 0.44	0.23 ± 0.0139	286
INTERORBITAL DISTANCE x HEAD LENGTH	23	0.26 ± 0.71	0.21 ± 0.0222	89
INTERORBITAL DISTANCE x ORBITAL DIAMETER	23	-0.70 ± 0.89	0.84 ± 0.0985	73
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	23	1.93 ± 0.48	0.27 ± 0.0222	152
PECTORAL FIN LENGTH x STANDARD LENGTH	23	-0.61 ± 0.84	0.18 ± 0.0081	532
VENTRAL FIN LENGTH x STANDARD LENGTH	23	-1.59 ± 0.85	0.17 ± 0.0026	436
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	23	-1.23 ± 0.46	0.93 ± 0.0244	1 449

APPENDIX TABLE 15 - Regression data from Acestrorhynchus nasutus

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	6	7.84 ± 1.10	0.36 ± 0.0290	155
BODY DEPTH x STANDARD LENGTH	6	-3.49 ± 2.11	0.24 ± 0.0012	47
SNOUT LENGTH x HEAD LENGTH	6	-0.35 ± 2.44	0.49 ± 0.1132	18
ORBITAL DIAMETER x HEAD LENGTH	6	0.51 ± 1.52	0.25 ± 0.0705	13
INTERORBITAL DISTANCE x HEAD LENGTH	6	-2.11 ± 2.26	0.27 ± 0.1050	6
INTERORBITAL DISTANCE x ORBITAL DIAMETER	6	-2.16 ± 1.94	1.00 ± 0.3200	9
CAUDAL PEDUNCLE DEPTH x BODY DEPTH.	6	1.85 ± 1.37	0.28 ± 0.1237	5
PECTORAL FIN LENGTH x STANDARD LENGTH	6	-0.24 ± 2.64	0.16 ± 0.0441	13
VENTRAL FIN LENGTH x STANDARD LENGTH	6	-2.09 ± 1.23	0.17 ± 0.0205	70
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	6	-0.31 ± 1.52	0.91 ± 0.1623	31

APPENDIX TABLE 16 - Regression data from Acestrorhynchus heterolepis

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	6	6.00 ± 5.04	0.43 ± 0.0320	181
BODY DEPTH x STANDARD LENGTH	6	2.10 ± 3.50	0.19 ± 0.0151	170
SNOUT LENGTH x HEAD LENGTH	6	4.85 ± 2.88	0.32 ± 0.0389	69
ORBITAL DIAMETER x HEAD LENGTH	6	-3.02 ± 2.11	0.27 ± 0.0286	89
INTERORBITAL DISTANCE x HEAD LENGTH	6	-2.60 ± 1.22	0.23 ± 0.0166	202
INTERORBITAL DISTANCE x ORBITAL DIAMETER	6	0.52 ± 1.49	0.84 ± 0.0870	93
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	6	-0.04 ± 0.87	0.31 ± 0.0182	298
PECTORAL FIN LENGTH x STANDARD LENGTH	6	10.27 ± 2.35	0.13 ± 0.0248	29
VENTRAL FIN LENGTH x STANDARD LENGTH	6	12.08 ± 3.50	0.20 ± 0.0133	80
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	6	2.54 ± 2.89	0.87 ± 0.0630	189

APPENDIX TABLE 17 - Regression data from Acestrorhynchus minimus, sp.n.

REGRESSION	N	a	b	F
HEAD LENGTH x TRUNK LENGTH	56	2.36 ± 0.99	0.40 ± 0.0268	231
BODY DEPTH x STANDARD LENGTH	56	0.64 ± 0.77	0.19 ± 0.0142	178
SNOUT LENGTH x HEAD LENGTH	56	0.60 ± 0.41	0.34 ± 0.0238	202
ORBITAL DIAMETER x HEAD LENGTH	56	1.01 ± 0.39	0.25 ± 0.0225	127
INTERORBITAL DISTANCE x HEAD LENGTH	56	1.77 ± 0.31	0.14 ± 0.0181	59
INTERORBITAL DISTANCE x ORBITAL DIAMETER	56	2.06 ± 0.37	0.39 ± 0.0676	33
CAUDAL PEDUNCLE DEPTH x BODY DEPTH	56	2.73 ± 0.27	0.20 ± 0.0247	64
PECTORAL FIN LENGTH x STANDARD LENGTH	56	-0.26 ± 0.58	0.17 ± 0.0107	253
VENTRAL FIN LENGTH x STANDARD LENGTH	56	0.15 ± 0.53	0.15 ± 0.0098	232
VENTRAL FIN LENGTH x PECTORAL FIN LENGTH	56	0.94 ± 0.42	0.81 ± 0.0460	300

APPENDIX TABLE 18 - Measurements of Paroligosarcus pintoi (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP 4668	40	26	15	14	3	6	5	7	9	6	10	9	23	19	25	6
DZSP 4669	44	29	17	15	4	6	5	8	9	6	11	9	25	21	29	7
DZSP 4670	42	27	15	15	4	6	5	7	9	6	10	9	24	20	27	7
DZSP 4652	41	28	15	13	3	6	5	7	7	6	9	8	23	20	27	5
DZSP 4653	51	34	19	17	5	7	5	8	10	7	14	12	29	24	33	7
DZSP 4654	56	39	22	19	5	7	6	8	11	7	15	12	32	26	37	9
DZSP 4655	56	38	20	18	6	6	6	9	10	8	14	12	31	27	35	10
DZSP 4656	54	36	19	18	5	7	6	9	11	7	14	13	30	26	35	9
DZSP 4657	52	34	19	18	5	6	5	8	10	6	13	11	30	26	35	7
DZSP 4658	45	30	15	15	4	6	6	7	8	7	12	10	28	22	32	7
DZSP 4659	83	57	33	26	7	9	7	12	15	12	20	17	45	36	49	11
DZSP 4660	80	55	31	25	7	9	7	11	14	11	18	16	41	37	49	11

A - Standard length
B - Trunk length
C - Body depth
D - Head length
E - Snout length
F - Orbital diameter
G - Interorbital distance
H - Maxillary length
I - Fontanel length
J - Caudal peduncle depth
K - Pectoral fin length
L - Ventral fin length
M - Predorsal distance
N - Preventral distance
O - Preanal distance
P - Postorbital Distance

APPENDIX TABLE 18 - (continued)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP 4661	88	61	34	27	8	9	8	13	11	12	21	18	48	43	56	12
DZSP 4662	77	53	29	24	7	9	7	11	14	9	19	16	43	36	48	11
DZSP 4663	78	54	31	24	7	8	7	12	12	11	20	17	43	37	53	10
DZSP 4664	76	52	31	24	6	8	7	12	14	10	19	15	42	37	51	10
DZSP 4665	78	54	31	24	6	8	7	12	14	10	19	16	42	36	49	11
DZSP 4666	78	55	30	23	6	9	7	11	13	11	19	15	44	37	51	11
DZSP 4667	73	50	30	23	6	8	7	11	14	9	19	16	43	35	46	11
DZSP 4671	49	33	19	16	5	7	5	9	10	6	13	10	28	24	31	8
DZSP 4672	43	28	17	15	4	6	5	8	9	6	12	10	26	22	29	6
DZSP 4673	43	29	16	14	4	6	5	7	9	6	11	9	23	20	27	6
DZSP 4674	42	28	16	14	4	6	5	7	9	6	12	9	24	21	27	6
DZSP 4675	40	27	14	13	4	5	4	6	8	6	11	9	24	20	26	6
DZSP 4676	37	24	14	13	4	6	4	6	8	5	10	8	22	18	25	7
DZSP 4678	34	22	12	12	4	5	4	6	8	5	9	7	20	17	23	5
DZSP 3488	54	36	20	18	4	7	5	9	11	7	14	12	30	27	35	7
DZSP 3834	63	42	22	21	5	7	6	10	12	8	17	13	35	28	42	9

APPENDIX TABLE 19 - Measurements of *Oligosarcus jenynsii* (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
ANSP 21917	105	73	34	32	8	11	9	15	15	12	24	19	65	54	78	16
ANSP 21728	133	95	47	38	9	13	10	18	19	16	32	25	76	64	88	19
MCZ 20499	71	47	23	24	7	7	6	11	12	9	16	13	43	37	54	–
MCZ 20549i	165	117	49	48	14	14	12	24	22	17	37	26	94	80	116	–
MCZ 20549h	170	120	55	50	13	15	13	24	25	19	36	30	90	77	104	–
MCZ 20549f	173	121	50	52	15	15	12	24	24	18	38	28	99	84	113	–
MCZ 20549e	175	126	55	49	13	15	13	24	24	19	36	28	–	–	–	–
MCZ 20549d	183	130	54	53	15	15	13	24	24	20	39	29	104	93	130	–
MCZ 20549g	185	133	53	52	14	16	13	26	25	19	36	29	101	94	132	–
MCZ 20549	190	135	–	55	15	15	14	25	26	22	39	26	109	93	125	–
MCZ 20549a	220	149	71	71	20	18	18	33	32	25	49	34	122	113	156	–
MCZ 20549b	222	154	60	68	18	18	17	30	29	21	43	33	124	113	149	–
DZSP 4804	132	93	39	39	10	12	9	18	16	13	28	22	72	63	86	20
DZSP 4803	138	95	42	43	11	13	10	18	15	14	31	25	79	67	95	21
DZSP 4684	105	71	28	34	10	10	7	14	18	10	22	17	60	51	71	17
DZSP 4695	140	100	43	40	11	12	9	19	19	16	32	26	79	68	98	21
DZSP 4723	132	90	39	42	12	12	9	17	19	12	29	22	78	68	89	20
DZSP 4720	140	98	40	42	12	13	9	18	18	13	32	24	80	68	95	19
DZSP 1971	150	102	45	48	14	14	10	20	19	14	34	25	90	72	102	22
DZSP 4718	152	107	43	45	13	13	10	20	19	15	32	25	85	73	97	21
DZSP 1697	105	72	–	33	10	10	7	14	15	11	22	18	60	52	72	15
DZSP 4735	136	94	37	42	12	13	8	19	17	15	30	24	78	63	92	18

APPENDIX TABLE 19 - (continued)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP 4736	147	103	38	44	14	12	9	19	19	13	33	24	87	71	95	20
DZSP 1736	156	109	44	47	15	13	11	21	20	15	33	26	92	77	105	21
MCZ 20622d	78	54	24	24	7	8	6	11	11	9	17	14	45	40	54	-
MCZ 20622b	80	56	24	24	8	8	6	10	11	8	17	15	45	38	53	-
MCZ 20622	93	65	29	28	9	8	8	13	13	10	19	14	53	44	65	-
MCZ 20622a	95	60	28	30	8	9	7	14	14	10	20	16	54	47	62	-
MCZ 20622c	101	71	29	30	9	10	7	13	12	10	21	17	59	47	67	-
MCZ 20604	101	71	26	30	10	9	7	14	16	10	21	18	60	48	70	-
DSZP 1479	123	83	35	40	12	11	9	17	17	13	25	20	70	64	87	19
DZSP 4760	130	86	35	44	13	11	9	18	19	14	27	23	74	65	88	21
DZSP 4759	117	80	33	37	11	11	7	16	16	13	25	20	66	59	82	17
DZSP 4683	108	74	28	34	10	10	8	15	15	11	24	18	62	55	73	17
DZSP 4682	120	83	33	37	10	10	8	16	20	12	26	19	68	58	81	19
DZSP 3659	83	56	22	27	7	9	6	11	12	9	20	15	47	42	57	10
DZSP 3090	127	88	36	39	12	11	8	17	18	12	29	22	73	61	86	19
DZSP 3775	143	101	42	42	13	13	9	18	19	13	31	25	82	67	93	19
DZSP 3662	166	116	47	50	15	15	11	22	22	15	37	28	94	81	110	23
DZSP 4717	74	48	21	26	7	9	5	12	13	8	18	13	45	39	52	12
DZSP 4731	81	55	21	26	8	9	6	11	12	9	19	15	48	40	58	12
DZSP 4732	83	53	23	27	8	9	6	12	13	9	18	14	49	40	54	12
DZSP 4733	83	54	24	29	9	9	7	13	13	8	19	14	50	40	60	13
DZSP 4716	83	55	23	28	8	10	6	12	13	8	20	17	50	42	57	13
DZSP 4715	97	66	28	31	8	11	6	14	15	9	23	18	56	48	64	14
DZSP 1477	99	67	24	32	9	10	6	14	14	10	24	17	61	50	68	15
DZSP 4728	102	70	26	32	10	9	7	13	14	9	22	16	58	48	66	14
DZSP 4727	108	75	28	33	10	11	7	14	16	12	22	16	60	53	76	16
DZSP 4726	113	76	29	37	12	11	8	16	16	10	24	18	65	53	79	18
DZSP 351	121	81	33	40	11	11	8	16	17	11	27	18	70	58	78	19
DZSP 4724	118	80	33	38	11	11	9	16	16	11	25	19	67	58	78	17
DZSP 2033	144	99	40	45	14	13	9	21	20	14	29	22	86	72	98	23
DZSP 4754	46	29	13	17	5	6	4	7	9	5	12	9	27	23	31	7
DZSP 4739	48	32	15	16	6	6	4	7	10	6	11	9	28	25	32	7
DZSP 4750	58	39	16	19	6	7	5	8	10	7	13	10	34	28	38	9
DZSP 4749	62	41	16	21	6	7	5	9	9	7	13	10	35	30	40	10
DZSP 4743	63	41	19	22	8	7	5	9	12	8	14	11	38	33	44	10
DZSP 4740	66	43	19	23	7	7	5	10	11	7	14	12	40	33	44	11
MCZ 20619b	67	45	21	22	6	7	5	10	11	8	18	13	40	34	47	-
DZSP 4741	67	44	19	23	8	6	5	10	11	8	15	12	40	34	44	-
DZSP 4748	68	45	18	23	7	8	5	10	11	8	14	12	39	33	45	11
DZSP 4747	77	51	21	26	8	8	6	10	12	8	15	11	45	38	50	12
MCZ 20613c	77	53	23	24	8	8	7	11	12	8	17	14	44	37	53	-
DZSP 4752	83	55	24	28	9	8	6	12	13	9	19	14	49	42	57	13
DZSP 4746	84	58	23	26	8	8	6	11	13	9	18	14	48	39	54	12

APPENDIX TABLE 19 - (continued)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP 4753	84	57	24	27	8	9	6	11	13	9	19	15	48	40	55	12
DZSP 4742	86	59	23	27	9	9	6	12	12	9	18	15	48	41	56	12
DZSP 4745	92	64	25	28	9	9	6	12	13	9	21	15	51	45	61	13
DZSP 4744	93	60	23	30	10	10	6	12	13	10	21	16	55	43	61	15
MCZ 20617b	95	67	29	28	10	9	7	12	12	10	22	16	56	46	62	-
MCZ 20619a	97	66	31	31	10	9	7	14	13	10	21	17	59	48	68	-
MCZ 20618b	98	68	30	30	9	9	7	13	12	10	22	17	58	47	68	-
MCZ 20618a	102	71	31	31	9	9	7	13	13	10	22	16	59	48	69	-
MCZ 20618	105	72	33	33	9	10	7	15	14	12	23	19	62	53	74	-
MCZ 20614	106	72	33	34	11	10	8	15	14	11	23	18	65	55	77	-
MCZ 20617a	107	74	31	33	11	9	7	14	14	11	22	16	59	53	74	-
MCZ 20613b	112	78	37	34	9	10	8	15	14	12	24	19	63	54	77	-
MCZ 20613a	115	80	35	35	11	10	8	15	18	12	25	19	67	53	75	-
MCZ 20619	122	85	35	37	12	11	9	16	16	13	26	20	72	58	79	-
DZSP 4751	127	89	36	38	11	12	8	15	17	13	27	21	73	58	80	18
MCZ 20613	135	91	38	44	15	11	9	19	18	13	28	22	82	70	94	-
MCZ 20602	136	93	45	43	14	11	10	19	17	13	28	21	82	67	96	-
MCZ 20617	144	100	42	44	12	11	10	20	18	15	28	21	84	68	97	-
MCZ 20601	170	117	57	53	17	14	12	24	24	18	37	26	107	83	119	-
MCZ 20606	135	94	38	41	14	11	10	18	18	13	27	22	78	64	89	-
DZSP 4765	145	101	40	44	13	13	10	19	19	14	30	23	81	69	95	21
DZSP 4785	67	45	19	22	8	5	5	10	10	8	15	12	40	34	45	11
DZSP 4785	67	45	19	22	8	5	5	10	10	8	15	12	40	34	45	11
DZSP 4782	75	50	21	25	8	9	5	12	12	8	16	14	44	41	53	12
DZSP 4778	79	53	23	26	8	10	6	12	11	8	19	16	47	36	55	12
MCZ 20610c	80	56	19	24	9	8	6	12	12	9	18	13	49	40	56	-
DZSP 4781	82	55	24	27	9	9	6	12	13	10	18	15	48	41	57	12
DZSP 4777	87	58	25	29	9	10	6	13	12	9	20	15	52	44	59	13
MCZ 20610d	89	62	24	27	9	9	6	12	14	9	19	15	53	44	61	-
DZSP 4776	92	70	26	30	9	10	6	13	14	10	21	16	55	45	61	13
MCZ 20610b	95	64	25	28	9	9	6	13	15	10	-	15	55	47	65	-
DZSP 4774	93	64	27	29	9	9	6	13	14	10	21	16	53	45	62	13
DZSP 4765	95	64	27	31	10	10	7	13	14	10	-	-	56	48	67	13
MCZ 20610a	97	70	24	27	9	9	6	12	13	9	19	15	53	44	60	-
DZSP 4773	97	66	27	31	11	10	7	14	14	10	-	17	58	50	68	14
DZSP 4772	98	68	27	30	10	9	6	14	14	10	21	17	57	49	66	13
MCZ 20610	98	68	28	30	11	9	7	14	15	10	21	17	57	49	67	-
MCZ 20611b	101	71	27	30	10	9	7	14	14	10	20	17	59	48	68	-
DZSP 1686	105	74	33	31	8	10	8	13	14	11	22	18	60	51	69	14
MCZ 20611	116	82	32	34	12	11	7	16	17	12	25	20	69	57	80	-
MCZ 20611a	120	84	30	36	13	11	7	16	17	11	23	20	71	59	82	-
DZSP 4780	145	101	41	44	13	15	10	20	20	14	31	27	87	70	95	20
DZSP 4779	162	109	42	53	17	14	12	23	21	10	34	26	91	81	112	24

APPENDIX TABLE 19 - (continued)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP 4783	77	52	22	25	7	9	6	11	12	9	18	16	47	39	51	11
DZSP 4790	85	58	24	27	9	8	7	12	13	8	19	15	50	41	57	12
DZSP 1795	116	76	34	40	12	13	9	17	16	13	25	22	71	61	84	18
DZSP 4770	117	77	32	40	12	12	7	18	16	11	25	20	71	60	82	18
DZSP 4771	119	83	34	36	11	13	8	17	16	12	27	21	68	57	76	17
DZSP 3307	123	85	35	38	12	12	8	17	19	13	28	22	71	60	81	18
MCZ 20603	140	101	39	39	12	12	8	18	19	14	30	22	78	64	89	-
MCZ 20605	175	123	46	52	18	13	11	24	23	16	36	27	100	84	125	-
DZSP 4800	62	41	17	21	6	7	5	9	9	7	14	12	36	31	42	9
DZSP 4799	77	52	22	25	8	8	6	11	12	9	17	14	46	37	50	12
DZSP 4798	80	54	23	26	8	8	6	12	12	9	19	16	46	41	54	12
DZSP 4797	86	58	24	28	8	9	6	12	13	10	19	15	50	43	60	13
DZSP 4796	92	61	28	31	9	9	7	13	13	10	21	17	54	45	63	13
DZSP 2798	102	69	31	33	10	10	7	14	15	11	22	17	55	50	68	16
DZSP 1666	177	119	51	58	18	15	13	25	23	17	36	28	105	89	120	26

APPENDIX TABLE 20 - Measurements of Oligosarcus hepsetus (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MCZ 839e	139	97	43	42	14	12	9	19	20	15	33	25	80	66	94	-
MCZ 839d	163	114	49	49	16	12	11	21	21	17	35	27	92	79	110	-
MCZ 20548	165	116	49	49	16	13	11	22	21	17	38	26	96	82	111	-
MCZ 20548c	170	119	51	51	17	14	11	23	21	17	40	28	99	90	125	-
MCZ 20548a	180	128	53	52	18	14	12	25	23	17	40	31	103	88	129	-
MCZ 20548b	180	125	56	55	19	13	12	24	23	19	43	31	105	89	127	-
MCZ 839	191	132	59	59	20	14	13	28	26	20	43	30	116	95	134	-
MCZ 839c	195	137	58	58	20	15	14	27	25	19	46	33	115	95	128	-
MCZ 839a	203	140	64	63	21	15	14	28	26	20	47	34	120	99	138	-
MCZ 839b	210	144	65	66	24	15	15	29	26	20	47	33	128	105	145	-
DZSP 4691	93	62	25	31	10	8	7	13	13	10	20	17	55	47	67	14
DZSP 4688	93	63	28	30	9	8	7	12	16	9	21	16	56	49	67	14
DZSP 4690	97	67	26	30	10	8	5	13	13	10	-	-	56	47	65	14
DZSP 4689	106	72	30	34	10	8	7	14	15	-	23	19	60	54	77	16
DZSP 4687	110	75	33	35	10	10	7	15	15	11	28	21	64	56	76	17
DZSP 4686	126	86	38	40	12	11	9	16	18	13	27	22	72	61	86	18
DZSP 1738	136	92	39	44	14	11	9	18	17	14	29	23	79	68	97	21
BM(NH) 89.91b	95	65	28	30	9	11	7	13	14	9	23	17	57	45	64	14
BM(NH) 89.91a	118	81	33	37	11	12	8	16	19	12	28	22	66	58	79	17
DZSP 1743	170	117	50	53	16	15	11	23	20	15	35	27	101	84	113	24
DZSP 4758	130	88	35	42	12	13	8	19	16	13	28	23	74	68	94	14
DZSP 1734	132	91	38	41	12	12	8	18	17	13	28	22	74	64	87	18
DZSP 4757	135	92	37	43	13	13	8	18	18	13	29	23	79	65	87	21

APPENDIX TABLE 20 - (continued)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP	4756	65	44	17	21	6	7	5	8	10	7	14	11	36	30	42	10
DZSP	4737	126	85	36	41	12	12	7	17	18	12	27	21	71	61	85	19
DZSP	4738	135	92	39	43	13	12	8	18	18	13	27	21	79	67	92	20
DZSP	4767	113	77	35	36	11	10	7	15	15	12	25	19	62	54	75	17
DZSP	4769	116	80	35	36	11	10	6	15	17	11	25	20	63	56	76	18
DZSP	4768	121	84	37	37	11	11	7	16	17	12	26	21	71	57	80	18
DZSP	4766	142	98	41	44	13	12	9	18	18	13	29	25	78	69	95	21
DZSP	4792	81	54	23	27	9	8	6	11	12	-	-	-	47	42	57	13
DZSP	4789	87	58	26	29	9	8	7	12	13	9	20	14	53	44	62	14
DZSP	4787	90	60	25	30	10	8	7	13	14	10	20	16	53	46	64	15
DZSP	4791	91	61	26	30	9	8	7	13	14	10	21	17	53	45	62	14
DZSP	4788	93	63	25	30	10	8	7	13	14	9	21	16	55	46	65	15
DZSP	4786	94	63	28	31	10	9	7	14	14	10	21	16	56	49	66	16
DZSP	1748	100	68	27	32	11	9	7	14	13	10	22	16	57	51	69	15
DZSP	3092	125	86	36	39	12	12	8	18	20	12	29	22	74	62	84	17
DZSP	1685	125	86	35	39	12	12	8	18	17	12	30	22	72	60	81	18
DZSP	3091	170	117	53	53	16	16	11	22	22	16	38	28	100	85	118	23
DZSP	2954	170	116	47	54	16	15	11	25	20	16	38	28	98	82	112	25
DZSP	2955	190	131	54	59	18	16	12	25	23	18	39	30	111	95	129	30
DZSP	2953	195	131	55	64	20	17	14	29	24	17	44	31	113	105	141	30
DZSP	3774	235	159	69	76	25	18	17	35	28	21	50	39	131	122	164	37
DZSP	4730	83	55	24	28	8	9	6	12	12	9	19	15	47	41	53	12
DZSP	4729	105	70	29	35	11	11	7	15	17	11	23	17	64	55	72	16
DZSP	4725	117	80	31	37	12	12	8	16	16	11	26	20	67	58	79	17
DZSP	4721	121	83	33	38	12	11	8	17	17	11	25	21	72	63	87	18
DZSP	4722	133	92	39	41	12	13	8	19	16	12	29	23	78	65	89	20
DZSP	4719	150	102	40	48	15	13	10	20	19	14	31	23	87	74	104	23
MCZ	20602a	122	82	35	40	13	11	9	18	15	13	28	22	74	63	86	-
MCZ	20601	185	128	56	57	20	14	13	24	22	19	36	28	113	89	134	-
MCZ	20612	210	144	64	66	22	16	16	31	27	20	44	32	122	101	142	-
MCZ	20616	238	158	66	79	28	19	18	35	28	21	48	37	144	119	164	-
DZSP	4763	97	65	28	32	10	10	7	14	15	10	21	17	59	47	66	14
DZSP	4764	101	68	29	33	10	10	6	14	15	11	22	18	60	52	72	15
DZSP	4761	106	71	29	35	11	10	7	15	17	11	-	-	60	54	77	17
DZSP	4762	112	78	34	34	10	11	7	15	17	12	26	19	65	51	74	15
BM(NH)	51.52a	155	107	43	48	14	14	9	20	20	13	31	25	89	76	104	23
BM(NH)	31.39b	162	110	42	52	19	17	12	22	20	15	34	26	93	81	112	24
BM(NH)	31.39e	183	123	48	60	19	16	13	26	21	16	37	27	107	92	127	30
BM(NH)	31.39d	185	128	51	57	17	15	13	25	24	16	38	27	107	87	124	27
BM(NH)	31.39c	192	132	54	60	18	16	13	26	21	17	41	31	108	95	133	29
BM(NH)	31.39a	215	140	61	65	20	17	15	30	22	21	42	33	121	104	144	33
BM(NH)	31.39b	222	151	64	71	23	18	16	30	24	19	48	35	129	112	155	34
DZSP	4703	105	72	28	33	10	10	7	14	15	10	23	17	60	50	70	16

APPENDIX TABLE 20 - (continued)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP	4704	105	73	29	32	10	10	7	14	15	10	24	18	61	51	69	15
DZSP	1657	121	82	31	39	12	11	8	16	18	11	26	19	70	58	79	17
DZSP	4702	132	91	39	44	13	13	9	18	19	13	30	23	78	67	91	20
DZSP	4708	98	67	30	31	9	11	7	13	16	10	24	18	58	49	68	13
DZSP	4707	114	78	34	36	11	10	7	16	17	11	26	21	65	55	75	16
DZSP	4706	53	35	15	18	5	7	4	8	10	6	12	9	32	26	35	9
DZSP	4701	132	92	35	40	13	13	8	17	16	12	27	21	76	63	85	19
DZSP	4705	172	120	53	52	15	15	10	22	22	17	38	28	98	83	116	25
DZSP	4709	43	27	13	16	5	6	3	8	9	5	10	8	27	23	31	7
DZSP	4712	110	76	32	34	11	11	7	16	16	11	26	20	64	51	68	15
DZSP	4711	120	83	34	37	11	11	8	16	16	11	28	21	68	58	78	16
DZSP	4710	121	83	34	38	11	11	8	16	18	11	26	23	71	60	82	18

APPENDIX TABLE 21 - Measurements of Oligosarcus robustus, sp.n. (mm)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MCZ	20550b	157	108	41	49	17	12	10	21	18	14	36	26	93	80	108	-
MCZ	20550	185	128	50	57	18	13	13	25	22	16	42	30	114	95	131	-
MCZ	20550a	215	147	57	58	23	14	15	28	25	18	47	32	125	110	149	-
MCZ	849a	161	112	44	49	16	13	10	22	18	16	37	24	95	81	117	-
MCZ	849	140	98	35	42	13	11	10	18	19	13	34	23	84	69	97	-
ANSP	21918	140	99	40	41	13	11	9	18	16	12	33	22	81	68	98	20
ANSP	21748	170	119	48	51	18	12	11	22	19	14	37	26	98	88	120	22
DZSP	4920	85	57	23	28	9	9	5	12	12	8	18	14	50	44	58	12
DZSP	4919	86	58	22	28	9	9	5	11	13	9	20	14	50	44	58	14
DZSP	4918	182	126	49	56	16	14	11	23	22	17	41	29	103	87	121	28
DZSP	4917	220	149	61	71	21	15	14	29	23	19	49	34	127	116	154	35
DZSP	4692	233	162	65	71	22	17	15	29	17	21	49	35	129	116	158	35
DZSP	4693	235	160	66	75	24	17	24	16	30	25	21	51	38	135	122	37
DZSP	4680	130	88	34	42	13	11	8	17	19	12	27	21	76	66	88	20
DZSP	4681	133	92	33	41	13	11	8	18	21	13	29	21	76	64	90	19
DZSP	4679	208	140	61	68	21	16	14	28	18	47	33	125	107	147	34	23
DZSP	4694	205	141	60	64	20	15	12	27	21	19	45	33	114	107	146	31
DZSP	4696	130	87	36	43	13	12	8	17	17	12	28	19	75	66	89	21
DZSP	4699	94	65	24	29	9	8	6	12	14	9	22	16	54	47	63	14
DZSP	4697	92	63	24	29	9	9	6	12	15	9	22	15	52	45	61	13
DZSP	4698	86	57	20	29	9	8	6	13	13	8	20	15	51	45	61	14
DZSP	4700	78	51	21	27	8	8	5	11	11	8	18	13	46	40	55	12

APPENDIX TABLE 22 - Measurements of Oligosarcus macrolepis (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MCZ 20607	77	53	24	24	8	10	6	11	12	10	18	13	45	37	51	–
DZSP 4795	53	36	16	17	5	7	4	8	8	6	13	9	30	26	34	8
DZSP 4793	62	42	19	20	6	8	5	9	11	7	15	11	37	31	40	9
DZSP 4794	63	43	19	20	6	9	5	9	10	8	14	11	36	30	40	10

APPENDIX TABLE 23 - Measurements of Oligosarcus meadi, sp.n. (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP 4619	64	43	21	21	5	7	6	9	11	8	14	11	35	29	42	11
DZSP 4618	65	44	23	21	5	7	6	8	11	8	14	12	35	31	44	10
DZSP 4617	69	47	23	22	5	8	7	9	11	9	15	12	38	32	45	11
DZSP 4614	76	51	28	25	6	8	7	11	13	10	16	14	43	37	51	13
DZSP 4615	78	53	26	25	6	8	7	11	12	10	16	13	44	38	54	13
DZSP 4616	79	55	27	26	6	9	8	10	13	10	18	15	44	37	52	13
DZSP 4613	64	43	22	21	5	7	6	9	12	9	14	11	35	31	42	10

APPENDIX TABLE 24 - Measurements of Oligosarcus bolivianus (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
ANSP 79790c	82	57	24	25	7	8	8	11	14	10	–	–	46	–	–	12
ANSP 68815a	83	58	26	25	7	9	8	13	13	10	17	–	50	–	58	12
ANSP 68815	86	59	28	27	7	9	9	13	15	10	20	16	50	45	62	12
ANSP 79790b	86	–	27	–	–	–	–	14	14	11	18	15	52	–	–	14
ANSP 79790a	87	62	28	25	7	8	8	–	–	11	–	–	–	–	–	–
ANSP 68815b	100	70	32	30	8	10	9	14	16	13	21	17	56	46	68	14
ANSP 79790	102	69	33	33	8	10	10	17	16	12	–	19	60	52	71	17
ANSP 68815c	128	89	43	39	11	11	11	20	20	15	26	22	75	63	94	18
ANSP 68831	147	105	47	42	12	12	12	22	19	19	–	24	84	70	103	22

APPENDIX TABLE 25 - Measurements of Acestrorhynchus falcatus falcatus (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MCZ 30107	77	21	18	26	9	7	7	11	10	7	16	13	50	41	56	–
MCZ 852	155	105	37	50	17	12	14	23	14	11	31	25	101	82	114	–
MCZ 852a	180	118	41	62	23	14	17	27	17	13	33	26	121	99	139	–
MCZ 20569	150	102	39	48	17	11	15	22	15	12	31	26	100	84	113	–
MCZ 20569a	142	97	36	45	15	10	13	21	15	12	29	24	94	76	104	–
MCZ 20580	122	80	29	42	14	10	10	19	12	10	23	20	82	67	92	–
MCZ 20580b	112	78	23	34	12	9	9	15	11	8	20	18	66	56	79	–

APPENDIX TABLE 25 - (continued)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MCZ	20580a	118	77	26	41	13	10	10	18	12	10	26	22	78	66	89	-
MCZ	20580c	112	78	20	34	11	9	9	15	11	8	20	17	69	56	78	-
MCZ	20553	92	61	21	31	12	8	8	14	11	8	16	15	62	51	69	-
MCZ	45230	185	130	47	55	19	13	16	24	19	15	35	30	116	96	135	-
MCZ	45231	165	115	40	50	18	13	14	23	17	13	32	27	104	87	121	-
MCZ	45232	130	87	30	43	15	10	11	19	14	11	24	19	86	73	99	-
MCZ	45233	106	71	24	35	13	10	9	16	12	8	20	17	70	59	80	-
MCZ	45234	105	70	23	35	12	9	8	16	11	9	20	15	69	58	78	-
MCZ	45235	93	62	22	31	11	9	7	14	11	8	17	14	62	51	69	-
MCZ	45236	86	57	20	29	10	8	7	13	11	7	17	14	57	48	64	-
MCZ	45237	83	54	20	29	11	8	6	13	11	7	16	12	55	47	63	-
MCZ	45238	195	134	51	61	20	14	18	28	19	15	39	33	124	105	146	-
MCZ	45239	180	127	46	53	19	15	16	24	20	15	35	31	116	97	135	-
MCZ	45240	151	104	36	47	16	12	13	21	15	12	34	28	96	83	113	-
MCZ	45241	145	99	36	46	15	12	13	21	17	12	29	25	93	77	108	-
MCZ	45242	142	96	33	46	17	12	12	21	16	11	29	24	91	78	106	-
MCZ	45243	130	88	30	42	15	10	12	20	15	10	26	22	85	71	99	-
MCZ	45244	276	187	68	89	32	19	26	42	25	21	55	45	174	154	202	-
MCZ	45245	221	151	54	70	22	17	21	33	21	18	44	37	138	122	165	-
MCZ	45246	197	136	46	61	20	14	19	27	18	16	38	33	123	104	145	-
MCZ	45247	170	116	43	54	17	13	16	23	17	14	38	32	107	95	129	-
MCZ	45248	164	115	43	49	15	13	15	22	17	14	35	28	102	85	118	-
MCZ	45249	147	99	35	48	16	12	13	21	14	12	31	25	94	78	105	-
BM(NH)	456	80	53	20	27	8	8	7	12	14	8	18	14	53	44	60	12
BM(NH)	31.32a	117	77	27	40	14	10	10	17	14	10	23	20	73	63	88	18
BM(NH)	533.6 a	205	138	48	67	24	15	20	30	18	15	37	32	131	111	149	30
BM(NH)	533.6b	166	113	40	53	19	13	13	24	18	12	30	25	105	89	121	23
IUM	12232	87	58	21	29	10	9	7	13	14	8	19	16	58	47	65	13
IUM	12232a	77	51	18	26	9	8	6	11	12	7	16	14	49	42	56	12
IUM	12232b	73	48	17	25	8	8	6	11	12	6	15	12	50	41	55	11
IUM	12236	88	57	21	31	11	10	8	13	15	7	18	16	59	48	66	13
IUM	12233	85	56	19	29	10	9	7	12	14	7	17	14	55	47	63	13
IUM	12233a	84	55	19	29	10	9	7	12	14	7	17	13	55	46	62	13
IUM	12233b	72	47	17	25	9	8	6	11	12	7	15	12	48	40	54	11
IUM	12235	96	64	22	32	11	9	7	14	14	7	19	17	63	52	70	13
FMNH	53480	90	60	22	30	11	9	7	13	13	8	19	16	58	49	66	14
FMNH	53480b	82	54	20	28	10	8	7	12	13	8	17	14	53	45	62	12
FMNH	53482	87	58	21	29	10	9	7	13	13	8	18	15	57	47	64	13
FMNH	53482a	90	60	20	30	10	9	7	13	14	8	17	14	56	48	65	13
FMNH	53482b	81	54	19	27	10	9	7	12	12	17	16	13	53	44	60	13
FMNH	53510	201	136	55	65	21	16	20	30	22	18	47	37	132	113	157	33
FMNH	53485	88	59	18	29	11	9	7	13	12	7	16	13	57	48	65	12
FMNH	53487	107	73	25	34	13	10	9	17	16	10	21	17	71	58	78	16

APPENDIX TABLE 25 - (continued)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
FMNH	53480a	81	53	20	28	9	8	7	12	12	7	16	13	52	45	61	13
FMNH	54923	82	54	21	28	9	8	7	12	13	7	18	14	53	44	60	13
FMNH	53490	103	69	23	34	12	10	8	15	12	9	20	17	66	55	77	15
FMNH	53486	107	72	25	35	13	10	8	16	13	8	21	18	68	59	80	16
FMNH	53489	81	51	20	30	11	9	7	13	12	7	18	15	59	49	67	13
FMNH	53483	90	61	20	29	11	9	7	13	14	7	16	14	59	48	67	12
FMNH	53484	116	80	26	36	14	11	9	16	14	9	22	19	75	62	85	16
FMNH	53488	151	103	30	48	18	12	12	22	15	12	27	23	94	84	113	22
FMNH	53476	141	95	35	46	16	12	13	20	15	11	28	24	92	76	105	21
FMNH	50113g	98	66	20	32	12	10	8	14	11	8	18	15	62	53	72	14
FMNH	50113e	103	69	22	34	13	10	8	15	12	7	20	17	67	55	75	15
FMNH	50113f	122	83	23	39	14	11	9	18	12	8	21	17	77	64	87	17
FMNH	50113c	123	82	25	41	15	11	9	19	13	10	21	17	81	68	90	19
FMNH	50113d	127	84	27	43	16	11	10	20	14	10	23	20	82	69	92	20
FMNH	50113b	127	84	27	43	15	11	10	19	13	10	24	20	81	68	92	19
FMNH	50113a	134	91	28	43	17	11	10	20	14	11	22	19	84	72	95	20
FMNH	50113	143	95	30	48	18	12	11	22	15	11	25	21	92	76	104	21
ANSP	110713	123	80	30	43	15	12	10	18	14	10	25	21	82	69	94	18
ANSP	110713a	147	98	35	49	18	14	12	22	17	12	29	26	97	84	110	22
ANSP	110710	162	109	39	53	19	14	14	24	17	11	29	25	104	89	121	25
ANSP	110710a	144	96	32	48	17	12	11	21	16	12	27	23	93	80	110	22
ANSP	110710b	160	107	37	53	18	14	13	23	16	13	29	25	102	88	117	24
ANSP	110710c	141	95	33	46	18	12	12	20	15	12	26	21	90	79	104	21
ANSP	110714	130	87	31	43	16	12	10	20	18	11	24	21	87	73	102	19
ANSP	110712	123	82	31	41	15	12	11	18	15	10	25	22	80	67	95	18
ANSP	110712a	118	80	29	38	14	11	9	16	13	10	24	20	76	64	89	17
ANSP	110714a	162	108	37	54	21	13	14	25	17	12	28	24	105	90	119	24
DZSP	4570	156	103	36	53	17	13	14	22	17	14	28	24	99	83	115	-
DZSP	4571	122	82	31	40	14	11	10	18	14	10	25	20	78	65	91	-
DZSP	4572	197	132	49	65	21	16	18	29	17	15	43	36	125	107	141	-
DZSP	4573	210	144	56	66	22	16	20	30	20	17	45	37	136	112	153	-
DZSP	4574	231	154	54	77	25	17	23	33	19	17	47	39	146	130	173	-
DZSP	4575	185	122	47	63	22	14	19	29	22	14	37	31	121	102	141	-
DZSP	4576	175	120	43	55	20	13	17	25	17	13	32	28	112	95	130	-
DZSP	4577	157	105	37	52	18	14	15	23	15	12	32	27	103	86	116	-
DZSP	4578	161	108	40	53	18	14	16	23	19	13	30	34	103	90	124	-
DZSP	4579	155	105	37	50	17	12	15	22	16	12	33	28	100	84	117	-
DZSP	4580	141	93	37	48	17	12	14	21	17	12	31	26	91	79	109	-
DZSP	4581	147	101	35	46	16	12	41	21	15	12	33	26	92	80	107	-
DZSP	4582	135	90	34	45	15	11	13	20	13	12	30	25	88	72	99	-
DZSP	4583	141	94	34	47	16	12	14	20	17	12	30	26	89	78	105	-
DZSP	4584	134	90	33	44	14	11	13	19	14	11	29	24	87	73	99	-
DZSP	4585	128	86	29	42	15	11	12	19	14	11	28	22	82	69	96	-

APPENDIX TABLE 25 - (continued)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP 4586	133	90	32	43	15	12	12	19	14	11	28	24	85	72	97	-
DZSP 4587	135	92	31	43	15	12	11	19	15	11	28	24	85	73	99	-
DZSP 4588	118	78	27	40	14	11	10	18	14	10	25	21	76	65	88	-
DZSP 4589	123	83	28	40	13	11	11	17	13	10	26	22	78	65	89	-
DZSP 4590	118	79	28	39	13	11	11	18	13	9	25	21	75	64	87	-
DZSP 4591	108	73	24	35	12	10	9	15	14	8	23	18	70	58	78	-

APPENDIX TABLE 26 - Measurements of <u>Acestrorhynchus falcatus varius</u> (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP 4567	60	37	12	23	8	7	5	10	10	5	11	9	39	35	46	-
DZSP 4566	70	45	14	25	9	7	5	11	10	6	13	11	46	40	53	-
DZSP 4565	70	45	15	25	9	7	5	11	11	6	12	10	46	41	53	-
DZSP 4564	74	46	17	28	10	8	6	12	12	6	15	13	50	45	59	-
DZSP 4563	84	54	17	30	10	8	6	13	12	7	14	13	54	48	64	-
DZSP 4562	76	48	17	28	10	8	6	12	12	7	13	12	51	44	58	-
DZSP 4561	102	68	22	34	12	8	8	15	13	8	19	16	65	54	75	-
DZSP 4560	126	84	26	42	15	11	10	18	18	10	19	18	83	70	94	-

APPENDIX TABLE 27 - Measurements of <u>Acestrorhynchus lacustris</u> (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MCZ 20565	84	58	19	28	10	7	6	13	9	7	18	15	57	48	65	-
MCZ 20563	129	83	35	43	15	10	10	19	12	11	26	23	87	71	99	-
MCZ 20529	155	103	44	52	16	11	13	24	15	14	33	30	101	79	120	-
MCZ 20515	117	82	27	35	12	9	8	16	11	10	22	20	72	58	80	-
MCZ 20566c	190	130	51	60	20	14	16	28	18	16	42	33	119	99	143	-
MCZ 20566a	178	120	48	58	18	12	14	26	15	16	37	36	115	94	131	-
MCZ 20566b	157	106	43	51	16	13	14	23	14	14	37	32	100	83	119	-
MCZ 20566d	125	84	34	41	13	11	11	16	11	12	29	28	82	66	98	-
MCZ 20544	170	115	47	55	21	12	14	26	16	15	29	33	118	94	132	-
ANSP 21532	168	112	-	56	21	12	14	26	21	-	-	-	107	87	128	28
ANSP 21532a	173	114	45	59	21	12	15	28	22	16	39	31	110	91	129	29
ANSP 21105-7a	117	78	29	39	14	10	11	18	15	11	-	-	77	64	90	19
ANSP 21105-7b	138	94	35	44	16	10	11	20	19	12	-	-	87	72	104	21
ANSP 21105-7c	150	104	42	46	16	12	12	21	19	12	31	29	96	82	112	23
ANSP 80148	160	108	43	52	18	12	13	24	21	15	35	30	100	85	121	26
ANSP 80148a	145	97	40	48	17	11	12	22	20	14	33	28	90	77	109	23
ANSP 21983	152	101	44	51	18	12	12	23	18	13	32	25	97	75	112	26
BM(NH) 33.34	203	137	-	66	24	15	17	32	21	-	35	30	137	114	161	30
BM(NH) 28.33d	155	106	35	49	16	13	13	21	19	12	34	28	98	78	112	24
BM(NH) 28.33a	225	150	62	75	25	16	30	25	22	19	42	36	147	125	170	36
FMNH 50665m	91	60	22	31	11	8	7	14	10	8	17	16	61	51	68	14

APPENDIX TABLE 27 - (continued)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
FMNH	50665l	94	62	23	32	11	9	7	14	12	9	20	17	64	52	71	14
FMNH	50665j	95	63	23	32	12	9	7	14	11	8	19	16	65	55	75	14
DZSP	4401	105	71	22	34	12	8	7	15	12	8	17	15	70	58	79	-
DZSP	4402	130	90	27	40	14	10	10	19	15	11	22	19	84	73	99	-
DZSP	5228	165	113	36	52	19	12	12	24	15	14	25	24	104	94	125	-
DZSP	4403	204	137	52	67	22	13	16	30	21	16	39	39	132	111	150	-
DZSP	5229	175	119	45	56	20	13	13	26	20	15	34	32	114	95	130	-
DZSP	5230	104	68	25	36	13	8	8	15	15	9	19	17	69	58	77	-
DZSP	4404	73	47	26	11	7	6	12	11	7	13	11	50	42	55	55	-
DZSP	5231	75	49	17	26	12	7	6	12	11	7	13	10	51	43	57	-
DZSP	5232	71	45	15	26	11	7	6	11	11	6	12	10	49	41	55	-
DZSP	5233	53	33	12	20	9	5	5	9	7	5	9	8	37	32	40	-
DZSP	5234	35	20	6	15	6	4	4	6	5	4	5	5	25	22	27	-
DZSP	4518	135	93	34	42	15	11	9	19	19	12	23	23	88	77	108	-
DZSP	4536	156	103	38	53	20	11	12	24	22	13	28	24	103	89	119	-
DZSP	4537	135	89	32	46	18	10	10	21	17	11	23	19	88	71	101	-
DZSP	4538	141	95	33	46	15	11	10	20	18	11	27	23	91	76	104	-
DZSP	4539	92	61	20	31	13	8	7	13	14	8	16	14	58	49	66	-
DZSP	4540	81	52	16	29	11	7	6	12	12	7	14	12	53	45	60	-
DZSP	4541	61	38	12	23	9	6	5	10	10	6	11	10	41	35	47	-
DZSP	368	152	103	33	49	19	11	12	23	15	11	26	22	100	83	118	-
DZSP	3478	204	140	52	64	24	12	16	30	21	16	-	-	135	119	163	-
DZSP	2013	205	141	50	64	25	13	16	31	24	14	-	-	136	115	156	-
DZSP	2014	178	119	41	59	22	13	14	27	20	13	30	30	117	101	135	-
DZSP	4556	111	76	22	35	12	9	7	16	14	9	20	19	71	60	82	-
DZSP	4557	132	90	34	42	15	10	9	17	17	11	24	21	88	70	99	-
DZSP	4412	110	77	-	33	13	9	7	15	14	-	20	16	73	60	83	-
DZSP	4542	107	72	25	35	13	8	8	16	13	9	17	15	68	57	78	-
DZSP	4543	121	81	29	40	16	10	9	18	15	10	21	19	80	67	93	-
DZSP	4544	141	94	-	47	18	10	12	20	18	-	25	23	95	80	111	-
DZSP	4545	184	127	41	57	19	13	14	26	18	14	33	30	116	96	136	-
DZSP	4519	105	71	24	34	13	8	7	15	13	10	-	-	72	61	81	-
DZSP	4520	139	96	35	43	15	11	9	19	18	11	26	22	92	75	106	-
DZSP	4521	128	86	31	42	15	10	9	19	15	9	23	20	85	70	99	-
DZSP	4522	127	86	29	41	15	10	9	18	14	10	21	19	82	67	92	-
DZSP	4523	102	68	24	34	13	8	7	15	12	9	20	17	67	55	76	-
DZSP	4524	103	67	24	36	14	9	8	16	12	9	20	17	71	59	84	-
DZSP	4525	100	67	24	33	13	9	8	15	11	9	21	16	66	54	76	-
DZSP	4526	91	59	19	32	11	8	7	14	14	8	16	14	60	49	69	-
DZSP	4527	68	44	16	24	8	7	6	11	11	7	14	11	47	40	54	-
DZSP	4528	142	96	35	46	15	10	11	19	20	11	24	22	95	79	112	-
DZSP	4529	138	95	34	43	14	11	9	19	20	10	23	24	93	74	106	-
DZSP	4530	139	93	33	46	17	10	10	21	17	11	24	21	92	75	104	-

APPENDIX TABLE 27- (continued)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP 4531	116	80	26	36	14	9	8	15	14	9	21	19	75	62	86	-
DZSP 4532	186	128	48	58	21	13	14	28	16	15	31	28	126	106	145	-
DZSP 4533	169	116	43	53	19	11	13	25	18	14	28	25	108	96	126	-
DZSP 4534	134	89	32	45	17	10	10	20	18	10	22	21	89	75	102	-
DZSP 4535	113	75	23	38	15	9	8	17	15	9	20	17	72	61	82	-
DZSP 4546	143	98	38	45	15	11	11	20	15	13	28	23	93	78	109	-
DZSP 4547	139	96	33	43	14	11	10	18	17	11	27	23	90	72	101	-
DZSP 4548	102	67	24	35	13	8	8	16	13	8	17	15	65	57	76	-
DZSP 4549	98	65	22	33	12	8	7	15	13	8	17	14	64	54	74	-
DZSP 4550	141	95	36	46	16	11	12	21	15	11	29	21	95	82	111	-
DZSP 4551	122	80	29	42	16	10	10	19	13	10	24	19	87	71	99	-
DZSP 4552	108	75	26	33	12	9	7	15	13	10	20	18	73	60	83	-
DZSP 4553	106	71	24	35	12	9	10	15	14	8	21	16	73	60	80	-
DZSP 4554	95	63	21	32	11	9	7	14	13	7	19	17	65	54	73	-
DZSP 4555	119	78	26	41	14	10	10	18	15	10	24	21	82	70	95	-
DZSP 1674	118	79	29	39	15	8	8	18	14	10	18	17	79	66	93	-
DZSP 4407	165	113	42	52	18	12	13	25	17	13	34	32	108	91	124	-
DZSP 5235	117	77	30	40	16	9	9	19	13	10	21	17	78	65	88	-
DZSP 5236	103	68	25	35	14	8	7	15	13	9	19	16	68	56	72	-
DZSP 4408	140	97	34	43	16	10	10	19	17	11	24	22	91	76	105	-
DZSP 5237	145	101	33	44	16	11	10	20	17	11	28	23	93	78	106	-
DZSP 5238	135	92	33	43	15	10	9	19	17	11	26	23	88	72	102	-
DZSP 5239	125	85	30	40	14	10	9	17	17	11	24	22	81	67	93	-
DZSP 4409	180	123	44	57	20	13	14	28	23	15	32	30	119	97	132	-
DZSP 5240	175	119	41	56	19	14	14	25	20	14	27	27	114	95	129	-
DZSP 5241	144	98	36	46	15	12	10	20	18	13	28	24	97	79	117	-
DZSP 3320	143	96	34	47	18	10	12	21	19	12	26	24	94	80	110	-
DZSP 3279	162	110	41	52	20	11	11	24	15	12	34	30	106	89	122	-
DZSP 1465	173	117	40	56	22	12	15	28	19	13	30	27	118	98	138	-
DZSP 5242	121	80	29	41	15	10	10	20	15	10	25	18	87	71	100	-
DZSP 1480	137	94	33	43	18	10	12	21	16	11	28	18	93	79	105	-
DZSP 5243	163	111	37	52	20	10	14	25	18	13	-	-	110	92	126	-
MCZ 20544	170	115	47	55	21	12	14	26	16	15	29	-	118	94	132	-
MCZ 20544a	131	93	32	38	15	10	8	17	14	10	23	17	87	73	97	-

APPENDIX TABLE 28 - Measurements of *Acestrorhynchus altus*, *sp.n.* (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
CAS 24161	144	95	37	49	18	11	13	23	20	13	28	23	98	79	105	23
DZSP 4559	127	85	35	42	14	10	11	17	14	12	27	24	82	66	98	-
DZSP 3527	228	151	65	77	27	17	22	36	24	20	47	39	148	129	181	-
DZSP 2049	233	154	60	79	25	17	22	36	22	19	47	40	150	124	180	-
USNM 84153	163	109	40	54	19	13	14	25	18	13	22	25	105	90	125	26

APPENDIX TABLE 28 - (continued)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
USNM 181730	130	89	30	41	15	10	10	19	16	10	24	20	82	67	93	19
USNM 181738	200	135	56	65	21	15	18	28	24	17	39	36	129	109	150	31
BM(NH) 25.7c	29	17	6	12	5	4	3	3	5	2	10	8	21	18	22	5
BM(NH) 25.7b	42	26	9	16	7	5	4	7	8	4	7	6	29	25	32	7
BM(NH) 25.7a	68	44	15	24	9	7	5	10	9	6	12	10	45	37	50	10
BM(NH) 28.33c	165	112	40	53	19	12	14	24	17	14	31	24	108	90	126	25
BM(NH) 28.33b	175	119	43	56	21	13	15	26	23	16	33	31	113	91	128	26
BM(NH) 14.85	75	49	18	26	9	8	6	11	11	7	14	12	52	42	57	11
FMNH 50665k	105	70	25	35	14	10	9	16	14	9	21	17	71	56	78	17
FMNH 50665h	115	76	27	39	13	10	9	16	12	10	23	15	78	61	85	17
FMNH 50665e	120	80	30	40	15	10	10	18	17	10	21	19	79	66	92	19
MCZ 45257	118	78	30	40	13	9	10	17	14	10	24	20	78	63	88	-
MCZ 45258	115	76	30	39	13	9	10	17	13	10	24	20	78	64	88	-
MCZ 45259	130	86	30	44	15	10	11	21	15	11	28	21	85	72	98	-
MCZ 45260	124	82	32	42	15	10	11	19	15	11	26	20	80	67	91	-
MCZ 45261	106	69	28	37	13	9	9	15	13	10	22	20	70	56	79	-
MCZ 45262	110	74	28	36	13	8	9	16	14	10	23	20	73	58	83	-
MCZ 45263	108	73	27	35	12	8	9	15	15	10	23	19	69	58	80	-
MCZ 45264	107	72	27	35	11	8	9	15	12	10	22	17	70	57	79	-
MCZ 45265	118	78	29	40	14	10	10	18	15	10	24	20	77	63	88	-
MCZ 45266	108	72	26	36	12	9	9	16	13	10	23	19	70	58	80	-
MCZ 45267	105	69	26	36	12	8	9	16	13	9	21	19	70	58	80	-
MCZ 45268	100	65	26	35	12	9	7	15	12	10	22	19	65	54	76	-
MCZ 45269	101	68	25	33	12	8	8	15	11	9	21	19	66	52	74	-
MCZ 45270	103	68	25	35	12	9	8	16	13	9	22	18	70	57	79	-
MCZ 45271	98	65	25	33	11	8	8	14	13	9	21	17	63	54	73	-
MCZ 45272	94	61	22	33	10	8	18	14	12	28	21	17	62	57	72	-
FMNH 50665i	124	83	32	41	15	10	10	18	16	11	24	19	83	68	95	19
FMNH 50665d	130	87	34	43	15	11	11	19	18	11	24	20	88	69	100	20
FMNH 50665b	141	93	38	48	17	12	13	22	18	13	30	22	93	76	109	22
FMNH 50665g	141	95	39	46	16	11	12	21	15	11	25	21	94	81	112	22
FMNH 50665c	155	104	43	51	19	13	14	24	17	13	29	22	105	86	120	24
FMNH 50665a	155	103	43	52	19	12	14	25	19	13	31	21	103	88	114	23
FMNH 50665	188	123	49	60	23	14	19	30	21	16	32	28	123	103	143	31
MCZ 832a	166	115	44	50	19	11	13	23	13	14	32	29	109	88	127	-
MCZ 832	192	132	52	58	20	14	16	26	15	16	39	34	123	116	149	-
MCZ 20625	88	58	22	30	10	8	9	14	11	8	20	16	58	48	68	-
MCZ 45250	129	86	32	43	15	10	11	20	15	11	28	20	84	69	95	-
MCZ 45251	131	87	32	44	15	10	12	20	15	11	28	22	85	71	93	-
MCZ 45252	135	92	35	43	14	10	12	20	17	12	30	21	89	72	102	-
MCZ 45253	130	85	35	45	15	10	11	20	17	12	27	19	85	71	97	-
MCZ 45254	132	88	34	44	16	9	11	20	17	12	27	18	87	72	102	-

Note: instead of 50665 a - k, read 74360 a - k.

APPENDIX TABLE 28 - (continued)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MCZ 45255	124	83	28	41	14	9	10	19	14	10	26	19	78	65	91	-
MCZ 45256	123	82	32	41	13	9	11	18	14	11	26	19	81	67	92	-
MCZ 45273	89	59	22	30	11	8	7	14	11	7	19	15	59	48	65	-
MCZ 45274	79	51	18	28	9	7	6	12	10	7	16	13	53	43	59	-
MCZ 20623a	145	97	35	48	16	11	14	23	13	13	28	25	94	80	115	-
MCZ 20623	150	100	39	50	17	11	13	23	16	14	30	24	94	80	114	-
MCZ 46006	112	76	28	36	12	9	9	16	12	10	26	24	76	60	88	-
MCZ 20515a	100	67	25	33	10	8	9	15	12	10	23	19	67	56	74	-
MCZ 46005	140	94	39	46	15	11	14	20	12	13	27	23	91	71	109	-

APPENDIX TABLE 29 - Measurements of A.britskii, sp.n. (mm)

DZSP 4405	165	118	37	47	18	12	9	21	20	12	29	29	106	87	123	-
DZSP 4406	157	116	34	41	17	11	8	20	17	12	27	30	101	84	117	-

APPENDIX TABLE 30 - Measurements of Acestrorhynchus falcirostris (mm)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
USNM 16778	230	156	40	74	30	17	17	32	22	15	33	34	157	119	174	31
ANSP 95832	155	105	29	50	21	12	10	23	17	11	23	23	107	85	121	20
ANSP 95832a	207	142	40	65	27	15	16	29	20	14	29	33	145	111	166	27
ANSP 95832b	214	147	40	67	28	14	15	31	21	15	30	33	145	110	162	27
ANSP 95832c	215	148	43	67	27	15	16	30	20	15	32	34	149	116	172	28
BM(NH) 459	190	129	35	61	24	13	15	26	18	14	28	28	127	101	150	25
CAS(IUM) 12241	191	131	33	60	24	12	13	26	17	12	28	30	130	103	151	24
CAS(IUM) 12237	141	95	22	46	18	12	9	19	14	10	22	23	98	78	112	19
CAS(IUM) 12239b	122	84	20	38	16	10	7	16	12	8	17	18	83	68	95	15
CAS(IUM) 12239a	166	112	30	54	22	12	11	23	15	11	25	27	114	92	132	22
CAS(IUM) 12239	180	121	29	59	24	14	12	26	16	12	27	29	125	101	144	24
CAS(IUM) 12240	207	143	41	64	24	15	14	28	17	15	34	36	142	113	170	27
CAS(IUM) 12238	270	185	48	85	33	19	19	37	20	19	41	43	187	150	220	37
CAS(IUM) 12237a	216	148	41	68	27	16	14	33	19	16	32	34	151	121	180	30
FMNH 53509	190	130	31	60	25	15	13	27	19	13	27	30	130	103	152	25
FMNH 53494	140	96	23	44	18	11	9	18	15	10	20	22	95	76	111	17
FMNH 7513	136	91	22	45	19	11	9	19	17	10	20	22	94	73	106	18
FMNH 53507	288	197	55	91	36	21	19	42	25	19	41	43	195	156	230	39
FMNH 53508	250	172	53	78	29	18	17	34	25	19	40	42	172	136	203	33
FMNH 53506	270	188	47	82	30	20	19	38	21	20	39	42	187	147	219	36
FMNH 53505	112	75	20	37	15	9	7	16	15	8	15	17	79	62	89	15
FMNH 53512	288	200	54	88	35	20	20	29	22	21	40	44	199	157	230	37

APPENDIX TABLE 30 - (continued)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
FMNH	47458	184	125	28	59	21	11	10	22	16	11	29	31	109	88	130	20
MCZ	30105	155	105	27	50	22	11	11	22	14	11	22	24	118	83	122	-
MCZ	45276	111	74	19	37	15	9	7	16	11	8	16	18	77	62	87	-
MCZ	45277	141	95	24	46	18	11	9	21	13	9	21	21	98	77	109	-
MCZ	45278	182	120	30	62	24	13	11	26	16	13	27	25	129	102	148	-
MCZ	45285	111	75	16	36	15	9	7	15	11	8	15	16	77	61	87	-
MCZ	45284	116	78	18	38	16	9	7	16	12	8	16	16	80	62	91	-
MCZ	45283	135	81	22	44	18	11	9	19	13	9	18	20	92	72	105	-
MCZ	45281	153	104	27	49	20	11	10	21	14	10	20	23	104	80	118	-
MCZ	45282	157	106	27	51	21	12	10	23	14	11	22	25	110	86	125	-
MCZ	20519j	176	121	34	55	22	13	11	24	13	12	26	28	126	99	139	-
MCZ	20519i	157	103	33	54	24	13	12	28	13	12	24	27	140	99	148	-
MCZ	20547a	187	129	34	58	24	12	12	27	17	14	28	31	132	104	150	-
MCZ	20519e	193	131	37	62	25	14	13	28	13	13	29	29	137	111	154	-
MCZ	20519h	196	135	35	61	24	14	13	27	12	12	28	31	141	109	158	-
MCZ	20519a	198	135	33	63	24	14	13	27	14	15	26	30	142	110	158	-
MCZ	20519g	203	138	36	65	26	14	13	30	15	13	30	31	146	111	162	-
MCZ	20519c	207	142	39	65	24	14	14	29	14	14	30	34	148	114	168	-
MCZ	20519d	208	140	35	68	27	14	15	32	16	16	32	33	152	121	171	-
MCZ	20519	214	150	38	64	26	14	15	29	15	14	30	31	147	111	163	-
MCZ	20519f	223	153	38	70	28	15	16	33	17	14	31	35	159	120	174	-
MCZ	20519b	223	155	37	68	28	15	16	32	16	16	32	32	166	123	181	-
MCZ	20525	243	169	44	74	28	16	16	34	16	17	37	38	171	132	199	-
MCZ	20525e	263	181	48	82	33	18	19	38	17	18	38	40	183	144	212	-
MCZ	20525d	273	189	52	84	32	17	18	39	17	19	39	45	193	151	221	-
MCZ	20525o	283	199	57	84	33	19	17	41	20	19	43	43	196	158	227	-
MCZ	20547	285	201	55	84	32	19	20	43	19	19	42	45	188	160	225	-
MCZ	20525a	300	206	58	94	37	19	21	46	20	20	46	49	203	161	239	-
MCZ	20525b	303	208	58	95	37	21	22	45	20	20	46	52	213	166	244	-
MCZ	20597a	173	115	33	58	24	13	12	24	14	11	25	26	120	90	135	-
MCZ	20541	209	144	36	65	24	15	13	28	18	13	30	31	144	114	165	-
MCZ	20503b	135	91	23	44	16	10	9	19	13	9	18	21	98	75	107	-
MCZ	20503a	191	132	35	59	24	12	14	26	17	13	-	-	133	103	150	-
MCZ	20503	192	133	34	59	24	14	12	27	15	14	25	27	134	104	155	-
MCZ	20510	335	233	63	102	40	21	22	47	21	22	46	50	232	173	265	-
MCZ	20510a	355	246	67	109	42	24	25	50	24	24	53	55	251	188	277	-
MCZ	20510b	372	259	70	113	46	25	26	52	22	26	55	59	259	196	300	-
DZSP	4592	202	138	35	64	25	15	13	27	16	14	29	29	134	110	156	-
DZSP	4593	190	138	35	62	24	14	13	27	14	12	29	29	130	106	149	-
DZSP	4599	186	125	34	61	23	15	12	27	15	13	29	30	128	102	147	-
DZSP	4410	94	62	14	32	14	8	6	15	12	7	12	13	67	53	75	-
DZSP	4412	130	88	21	42	17	11	8	18	16	9	17	20	90	71	103	-
DZSP	4594	146	98	28	48	20	12	10	22	12	11	25	25	103	84	118	-

APPENDIX TABLE 30 - (continued)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP	3566	181	120	33	60	24	14	11	27	15	4	28	31	128	100	147	-
DZSP	4597	207	139	38	68	27	15	13	28	17	13	30	31	142	104	163	-
DZSP	3423	193	130	37	63	25	14	13	26	17	14	30	30	134	106	155	-
DZSP	4595	256	175	44	81	33	16	16	34	18	17	38	40	177	140	198	-
DZSP	4596	191	128	35	63	25	14	13	26	14	15	28	31	132	108	155	-
DZSP	4598	177	122	32	55	22	14	11	25	15	13	28	29	119	98	141	-
DZSP	3556	295	207	55	88	36	19	19	39	18	20	45	47	194	156	225	-
DZSP	4604	160	107	25	53	21	13	10	22	12	10	22	24	106	85	125	-
DZSP	4603	168	115	28	53	21	13	10	23	13	12	22	23	113	92	128	-
DZSP	4602	182	123	30	59	25	13	11	26	15	12	25	27	127	100	146	-
DZSP	4601	193	131	35	62	25	14	13	26	15	14	28	28	135	105	152	-
DZSP	4600	227	156	42	71	30	15	14	28	18	15	32	34	154	122	176	-
DZSP	5187	185	127	37	58	21	15	10	25	27	14	29	31	127	98	145	24
DZSP	5185	230	157	47	73	27	19	16	33	23	17	37	41	156	127	183	31
DZSP	5186	275	189	55	86	31	21	18	38	28	19	41	43	195	131	217	36
DZSP	5244	208	146	45	62	24	17	13	27	23	15	32	35	144	112	168	27
DZSP	5244a	210	147	47	63	24	17	14	27	22	15	32	36	145	118	174	27
DZSP	5245	234	157	49	77	31	18	17	34	23	18	37	41	166	136	201	32
DZSP	5245a	262	179	55	83	32	18	19	38	29	19	39	43	184	153	217	37

APPENDIX TABLE 31 - Measurements of Acestrorhynchus microlepis (mm)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
BM(NH)	35	115	81	22	34	14	9	7	15	14	9	19	17	75	65	90	13
BM(NH)	38	140	100	33	40	16	11	9	18	15	11	24	23	89	75	101	16
BM(NH)	457	113	79	19	34	14	10	7	15	14	8	17	15	70	59	80	13
BM(NH)	458	132	92	26	40	17	10	8	17	14	10	20	18	83	70	97	16
IUM	12230	193	133	44	60	21	16	14	27	26	14	39	33	126	103	146	27
FMNH	53503	198	138	45	60	23	15	13	25	22	14	34	29	128	106	149	25
FMNH	53503c	68	46	13	22	10	7	5	9	9	5	11	9	45	37	51	9
FMNH	53503b	73	49	14	24	10	8	5	10	11	6	12	10	50	41	54	9
FMNH	53503a	82	55	15	27	12	8	5	11	11	6	13	12	55	46	62	11
FMNH	53491	152	105	34	47	19	13	10	19	18	11	25	2p	99	83	114	19
FMNH	53491c	91	62	19	29	13	8	6	12	12	7	15	13	59	49	67	11
FMNH	53491b	92	62	17	30	13	9	6	12	11	7	15	13	60	51	66	11
FMNH	53491a	110	76	19	34	14	10	7	15	14	7	18	15	70	57	78	14
FMNH	53491d	78	53	15	25	11	8	5	10	9	5	13	10	51	44	58	10
FMNH	7512	88	60	16	28	12	8	5	12	12	7	15	12	57	49	65	12
FMNH	53500	132	93	31	39	16	11	9	16	16	10	22	19	85	71	98	16
FMNH	53500a	111	78	24	33	12	11	8	13	15	9	21	17	73	60	81	14
FMNH	53500d	66	44	13	22	10	7	5	9	8	5	11	10	44	37	51	9
FMNH	53500c	72	48	14	24	11	7	5	10	9	6	12	10	48	40	55	9
FMNH	53500b	75	51	15	24	10	8	5	10	11	7	13	12	50	42	57	9

APPENDIX TABLE 31 - (continued)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
FMNH	53499	126	78	29	38	14	11	8	16	16	9	22	19	81	69	94	16
FMNH	53499b	93	64	18	29	12	8	6	13	13	6	15	13	61	51	71	11
FMNH	53499a	110	76	21	34	14	10	6	16	14	7	18	15	71	60	83	13
FMNH	53492	115	78	21	37	16	9	7	15	15	8	18	15	75	63	88	13
FMNH	54924a	100	68	20	32	13	9	7	14	13	7	16	14	66	54	75	13
FMNH	54924	108	74	22	34	15	9	6	15	13	8	17	16	71	59	80	13
FMNH	54924c	83	58	16	25	11	8	5	11	10	7	13	12	54	45	62	11
FMNH	54924b	84	57	17	27	11	8	5	11	10	6	13	12	56	47	64	11
FMNH	53496	95	66	21	29	11	9	6	12	12	7	19	15	60	49	70	11
FMNH	53493	65	43	13	22	9	7	4	9	9	5	10	9	44	36	48	9
FMNH	53501a	215	151	47	64	23	16	15	27	25	16	40	36	135	116	162	28
MCZ	30108	82	53	15	29	12	8	6	12	11	7	14	11	58	49	64	-
MCZ	30104	103	70	20	33	14	8	7	15	12	8	17	15	68	56	75	-
MCZ	30106	105	71	20	34	14	9	7	15	12	8	18	15	69	57	79	-
MCZ	20559	80	55	16	25	9	8	6	12	12	5	14	12	51	44	59	-
MCZ	20536	108	74	23	34	13	10	8	15	12	9	19	17	71	60	81	-
MCZ	20523b	116	83	20	33	12	9	7	13	12	8	20	14	74	63	82	-
MCZ	20540	117	82	25	35	13	10	7	16	9	8	20	18	74	62	88	-
MCZ	20523	120	88	22	32	13	10	7	15	13	9	18	15	76	62	87	-
MCZ	20523a	123	87	24	36	14	11	8	15	13	10	18	17	82	68	92	-
MCZ	20514	90	60	18	30	12	8	6	13	11	7	14	12	58	47	65	-
MCZ	20581a	91	62	18	29	12	8	6	12	10	6	14	13	62	51	69	-
MCZ	46001a	90	62	19	28	10	8	6	11	10	7	19	15	60	47	68	-
MCZ	20581b	85	58	16	27	10	7	6	12	10	7	13	12	58	49	66	-
MCZ	46001b	117	81	24	36	14	11	8	16	14	9	21	20	7	64	90	-
MCZ	46001c	112	80	22	32	12	9	7	14	11	8	20	17	69	55	77	-
MCZ	46001d	113	78	23	35	13	11	8	15	12	9	20	18	76	64	88	-
MCZ	46001e	93	63	20	30	12	9	6	13	11	7	16	15	62	50	71	-
MCZ	46001f	100	68	22	32	12	9	8	14	12	8	19	16	68	55	77	-
MCZ	46001g	93	63	20	30	12	9	7	13	12	7	18	14	62	51	73	-
MCZ	46001h	84	58	17	26	10	8	6	11	10	7	15	13	55	47	63	-
MCZ	46001i	93	64	21	29	12	8	7	13	11	7	17	15	62	50	70	-
MCZ	46001j	94	64	19	30	11	9	7	14	11	7	16	15	62	51	73	-
MCZ	46001k	105	72	22	33	13	9	8	15	12	8	19	17	70	58	81	-
MCZ	46001l	96	65	20	31	11	8	7	12	12	8	18	15	63	52	73	-
MCZ	46001m	91	62	20	29	12	8	6	13	11	8	16	13	60	51	70	-
MCZ	46001n	91	63	18	28	11	8	7	11	12	7	15	13	60	48	70	-
MCZ	46001o	86	58	18	28	11	8	6	12	10	7	16	13	58	48	67	-
MCZ	46001p	108	75	23	33	13	10	7	14	11	8	20	18	69	60	81	-
MCZ	20581	82	56	15	26	10	7	6	11	9	6	13	10	54	44	62	-
MCZ	20599a	53	35	9	18	8	5	4	8	5	5	7	7	32	27	35	-
MCZ	20599	54	36	9	18	8	5	4	7	5	4	6	6	36	31	41	-
MCZ	20506d	88	61	20	27	10	7	6	11	10	7	15	13	57	48	63	-

APPENDIX TABLE 31 - (continued)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MCZ	20506c	88	63	17	25	9	7	6	11	10	7	14	12	57	47	67	-
MCZ	20506b	92	64	19	28	11	8	6	13	11	7	16	14	60	51	68	-
MCZ	20506	95	65	19	30	11	9	6	13	11	7	16	15	62	51	70	-
MCZ	20506a	123	87	24	36	14	10	8	15	12	9	19	17	80	67	91	-
ANSP	68679	137	96	35	41	15	11	10	18	18	11	26	23	88	70	102	17

APPENDIX TABLE 32 - Measurements of *Acestrorhynchus guianensis*, sp.n. (mm)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
USNM	194148	114	77	23	37	15	11	8	17	11	9	20	17	75	62	83	13
FMNH	53502	156	108	32	48	19	13	10	21	19	10	27	24	99	85	116	19
FMNH	53501	160	113	37	47	17	12	10	21	20	12	31	26	101	84	120	20
FMNH	53495a	70	47	14	23	9	7	5	9	10	5	12	11	46	38	52	10
FMNH	53595	84	57	16	27	11	8	6	12	12	6	15	13	55	47	64	11
FMNH	53490	66	43	13	23	10	7	5	10	10	6	11	9	45	36	51	8
FMNH	53504b	95	65	21	30	11	9	6	12	12	7	19	16	61	50	70	13
FMNH	53504a	100	63	22	32	12	10	7	14	13	8	19	17	64	53	74	13
FMNH	74359	126	87	27	39	16	11	8	17	16	10	23	22	80	67	94	16
FMNH	54922a	80	54	18	26	10	8	6	11	11	6	15	12	52	43	60	10
FMNH	54922	96	65	22	31	12	9	7	14	14	8	18	15	63	53	72	13
MCZ	45277	94	65	20	29	11	8	5	12	11	7	16	14	59	50	67	-
MCZ	45276	95	66	21	29	11	8	5	13	12	8	17	14	61	51	71	-
MCZ	45275	96	66	21	30	12	8	6	12	11	8	17	15	62	53	72	-
MCZ	20517a	118	82	23	36	14	10	9	16	13	9	21	20	76	64	92	-
MCZ	20517b	95	67	p9	28	11	8	7	13	11	7	17	14	62	50	74	-
MCZ	20517c	90	62	19	28	11	8	6	12	11	7	16	14	59	50	70	-
MCZ	20517d	105	72	21	33	13	9	8	15	12	8	19	17	69	57	80	-
MCZ	20517e	100	70	20	30	12	9	7	14	10	8	18	15	65	54	76	-
MCZ	20517f	95	64	20	31	12	9	7	13	12	7	18	15	64	53	74	-
MCZ	20517g	95	65	19	30	11	8	7	13	12	7	18	15	62	52	73	-
MCZ	20517h	89	61	17	28	11	8	6	11	11	7	16	13	58	49	68	-
MCZ	20517	99	67	21	32	11	9	8	13	12	8	19	17	67	53	75	-

APPENDIX TABLE 33 - Measurements of *Acestrorhynchus heterolepis* (mm)

DZSP	5184	252	171	55	81	29	20	17	37	31	17	46	42	159	141	195	36
MCZ	20529	205	136	43	69	27	14	13	31	20	14	37	35	137	114	158	-
ANSP	21247	162	111	33	51	21	11	10	22	20	10	-	-	109	86	124	-
ANSP	95832a	187	127	39	60	25	14	11	25	21	12	-	-	128	102	149	25
ANSP	21248	227	155	46	72	30	16	15	33	28	15	-	-	152	122	173	30
ANSP	21246	321	221	64	100	38	24	21	48	39	20	53	49	205	175	245	43

APPENDIX TABLE 34 - Measurements of Acestrorhynchus nasutus (mm)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
FMNH	53475	66	43	13	23	11	6	4	9	9	5	10	9	44	37	49	8
BM(NH)	9.17e	52	33	9	19	9	5	3	8	7	4	8	7	36	30	39	7
BM(NH)	9.17c	55	34	10	21	9	6	3	8	7	5	8	7	38	32	41	7
BM(NH)	9.17b	57	36	11	21	10	6	4	9	7	5	10	8	40	33	43	7
BM(NH)	9.17d	58	38	10	20	10	6	4	9	7	5	9	8	39	33	42	7
BM(NH)	9.17a	69	44	13	25	12	7	5	11	8	6	11	10	47	41	52	8

APPENDIX TABLE 35 - Measurements of Acestrorhynchus minimus, sp.n. (mm)

Specimen		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
DZSP	4609	76	50	16	26	9	8	5	12	9	6	12	11.	48	41	56	-
DZSP	4608	63	42	12	21	8	6	5	10	8	5	10	9	39	34	47	-
MCZ	20528	52	35	11	17	7	5	4	8	6	5	8	8	34	30	38	-
MCZ	20528a	56	38	12	18	7	6	4	9	7	5	10	9	36	30	42	-
MCZ	20528b	58	39	12	19	7	6	4	9	8	5	10	9	37	32	43	-
MCZ	20528d	52	34	11	18	7	5	4	8	7	5	9	8	34	28	39	-
MCZ	20528e	50	33	11	17	6	5	4	8	7	5	8	7	33	29	38	-
MCZ	20528f	52	35	11	17	6	5	4	8	7	5	8	7	35	29	40	-
MCZ	20528g	43	29	9	14	5	5	4	6	6	4	7	6	28	24	30	-
MCZ	20528h	51	34	11	17	6	5	4	8	7	5	9	8	34	28	37	-
MCZ	20528i	48	32	11	16	6	5	4	7	7	5	8	8	31	27	35	-
MCZ	20528j	36	23	8	13	5	4	4	5	6	4	6	5	25	21	26	-
MCZ	20528k	46	31	10	16	6	5	4	7	6	5	8	7	31	26	34	-
MCZ	20560	67	45	14	22	7	6	5	10	8	6	12	11	45	38	51	-
MCZ	20560a	52	35	10	17	6	5	4	9	7	5	9	9	35	28	39	-
MCZ	20560b	48	32	9	16	6	5	4	7	6	5	9	7	32	27	37	-
MCZ	20624	51	34	10	17	6	6	4	8	-	5	8	8	34	28	38	-
MCZ	20631	65	44	15	21	9	6	4	9	8	5	11	10	43	36	43	-
MCZ	20532	60	40	11	20	7	6	5	10	7	5	10	9	39	33	45	-
MCZ	20532a	61	41	11	20	8	6	5	10	8	5	10	10	40	33	45	-
MCZ	20532b	66	45	13	21	8	7	5	10	7	6	11	10	43	36	49	-
MCZ	20532c	57	39	10	18	7	5	4	8	7	5	9	8	37	31	44	-
MCZ	20532d	51	34	10	17	6	6	4	8	7	5	8	8	35	28	39	-
MCZ	20532e	51	34	11	17	6	6	4	8	7	5	10	9	35	27	39	-
MCZ	20532f	59	42	10	17	6	5	4	8	7	5	9	8	35	30	40	-
MCZ	20532g	54	37	10	17	6	5	4	8	7	4	8	8	35	29	40	-
MCZ	20532h	55	42	13	17	6	5	4	8	7	5	10	9	36	29	40	-
MCZ	20532i	50	34	10	16	6	5	4	8	6	5	8	8	33	28	37	-
MCZ	20532j	49	35	9	14	6	5	4	7	6	4	7	7	29	25	33	-
MCZ	20532k	42	28	8	14	5	5	4	7	6	4	7	7	28	23	31	-
MCZ	20532l	45	30	8	15	6	4	4	7	5	4	7	6	30	25	35	-
MCZ	20532m	45	30	8	15	6	4	4	7	5	4	7	6	30	25	35	-

APPENDIX TABLE 35' - (continued)

Specimen	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MCZ 20532n	40	27	8	13	5	4	3	6	6	4	6	5	27	22	29	–
MCZ 20554	50	34	11	16	6	6	4	7	5	4	8	8	32	27	37	–
MCZ 20585	55	38	10	17	6	5	4	8	8	5	9	8	33	29	40	–
MCZ 20585a	50	34	10	16	6	5	5	8	8	5	9	8	32	26	37	–
MCZ 20589	52	35	12	17	6	6	4	8	7	5	10	9	35	30	42	–
MCZ 20591	56	38	12	18	7	6	4	9	7	5	10	9	36	30	41	–
MCZ 20591a	57	39	12	18	6	5	4	9	6	5	10	10	37	32	42	–
MCZ 20591b	57	39	12	18	6	6	4	9	8	5	10	9	36	31	42	–
MCZ 20528c	57	39	11	18	7	6	4	9	7	5	9	9	37	32	42	–
MCZ 20591d	63	43	13	20	7	6	5	9	8	5	9	9	42	35	47	–
MCZ 20591e	52	36	11	16	7	5	5	9	7	5	8	8	35	30	40	–
MCZ 20591f	46	31	10	15	6	5	4	8	6	5	8	7	30	26	34	–
MCZ 20591g	54	37	11	17	6	6	4	8	7	5	8	8	35	30	41	–
MCZ 20591h	55	38	11	17	7	6	4	8	7	5	9	8	36	29	39	–
MCZ 20591i	48	33	9	15	6	5	4	8	6	5	8	7	30	25	35	–
MCZ 20591j	47	32	10	15	6	5	4	7	7	5	8	8	30	25	35	–
MCZ 20591k	52	35	11	17	6	5	4	8	7	5	9	8	34	28	38	–
MCZ 20591l	46	31	10	15	5	5	4	7	7	5	9	8	30	26	34	–
MCZ 20594	49	34	10	15	6	5	4	7	9	5	8	8	31	26	34	–
MCZ 20598	65	45	13	20	8	6	5	8	10	5	11	10	41	34	47	–
MCZ 20598a	57	39	10	18	7	5	4	9	8	5	10	8	36	31	41	–
MCZ 20598b	53	37	9	16	6	5	4	8	7	5	8	8	34	26	41	–
MCZ 20598c	42	38	9	14	6	5	4	7	6	4	7	6	28	23	31	–
MCZ 46004	83	57	16	26	10	8	6	11	9	6	15	12	54	47	63	–