

Papéis Avulsos de Zoologia

THE FOOD OF *BRYCON* AND THREE CLOSELY RELATED GENERA OF THE TRIBE ACESTRORHYNCHINI

NAÉRCIO A. MENEZES

INTRODUCTION

The South American Characidae are a relatively well studied group taxonomically but little work has been done on the food of these fishes. This kind of work, however, is not only needed but also important for further studies of the poorly understood subgroups of this large family.

During the revision of the tribe Acestrorhynchini (in press) I examined the stomach contents of most of the species in the three component genera and of two species of *Brycon*, now regarded as one of the most primitive characid genera. The objective of this paper is to present the data on the food of these species and to briefly compare their diets.

In order to reach accurate conclusions about food preferences in a given species, stomach examinations must be made on specimens taken at different seasons of the year because some species are known to change their preferences due to changes in availability of certain foods. Most of the species upon which this work is based were caught in different months of the year, in different years, and from different localities. Thus, they were represented by good series which contained specimens of all sizes. The results therefore may be regarded as reasonably accurate.

METHODS AND MATERIALS

The stomach was chosen for analysis because, as emphasized by Corbet (1961:5) and Hynes (1950:36), it is easily defined and contains the least digested food. In all cases the stomach was isolated from the rest of the digestive tract, incised, and the contents washed into a Petri dish. The organisms were counted and identified under the stereomicroscope. Only stomach containing recognizable food were considered.

Many methods have been developed for the quantitative analysis of stomach contents (see for instance, Hynes and Corbet, *l. c.*). For the purposes of this study Corbet's Occurrence Method seemed to be the most adequate. However, as many comparisons were involved, the method was modified, the occurrence of food types being expressed not as a percentage of total stomachs containing recognizable food, but as a percentage of the total number of food items found.

The types of food considered are as follows:

Arthropods: refers to all arthropod remains except Insecta and Crustacea.

Insects: include both terrestrial and aquatic adult forms.

Insect larvae: refers to the larvae of all aquatic and terrestrial insects.

Crustaceans: Decapods are the main component.

Oligochaets: includes mainly earthworms.

Plant material: includes fragments of leaves, stems and reproductive organs of both aquatic and terrestrial plants (Phanerogamae), other than the next category.

Fruits: refers to both seeds and intact fruits.

Fishes: includes many teleostean groups. No attempt has been made to identify the specimens.

All the specimens examined belong to the Departamento de Zoologia, Secretaria da Agricultura, São Paulo, Brazil (DZSP) and to the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (MCZ).

Brycon chagrensis (Kner)

PANAMA. Canal Zone (MCZ).

Brycon petrosus Meek & Hildebrand.

PANAMA. Canal Zone (MCZ).

HONDURAS. (MCZ 31692).

Paroligosarcus pintoii Campos & Trewawas

BRAZIL. *São Paulo*: Pirassununga, Lagoa São Vicente (DZSP 4668-70); Pirassununga, Rio Mogi Guaçu (DZSP 3488, 4652-58); Usina do Limoeiro, Represa do Limoeiro (DZSP 4659-67); Pereira Barreto, Córrego do Pernilongo (DZSP 4671-78).

Acestrorhampus jenynsii (Günther)

URUGUAY. *Maldonado*: (MCZ 20549, 20549b, 20549d, 20549g). *Florida*: Estancia Santa Adela, Arroyo Chamizo (DZSP 4682, 4684).

BRAZIL. *São Paulo*: Registro, Rio Ribeira (DZSP 3090); Cubatão (DZSP 4616-17, 1477); São Luís do Paraitinga, Rio Paraitinga (DZSP 2033). *Rio de Janeiro*: Lagoa Feia (DZSP 4736); São Fidélis, Rio Paraíba (DZSP 4746-48, 4750-52, 4754); São João da Barra, Rio Paraíba (DZSP 4739, 4743, 4745); Atafona, Rio Paraíba (DZSP 4741). *Espírito Santo*: Cachoeiro do Itapemirim, Rio do Frade e da Feira (DZSP 4765); Rio São José (DZSP 4686). *Bahia*: Belmonte, Rio Jequitinhonha (DZSP 4797, 2798).

Acestrorhamphus hepsetus (Cuvier)

BRAZIL. *São Paulo*: Iguape, Rio Ribeira (DZSP 4702, 4704); Registro, Rio Ribeira (DZSP 4708); Iporanga, Rio Ribeira (DZSP 4701); Iporanga, Rio Betari (DZSP 4706); Juquiá, Rio Juquiá (DZSP 4709, 3774, 3091); São Luís do Paraitinga, Rio Paraitinga

(DZSP 1734, 4758); Santa Branca, Rio Paraíba (DZSP 4738). *Rio de Janeiro*: Magé, Rio Guapimirim (DZSP 4769).

Acestrorhamphus sp. A.

BRAZIL. *Rio Grande do Sul*: Montenegro, Rio Caí (DZSP 4819); Ponta Grossa, Rio Guaíba (DZSP 4696-97, 4700).

URUGUAY. Rio Uruguay (DZSP 4679-80).

Acestrorhamphus sp. B

BRAZIL. *Minas Gerais*: União de Caeté (DZSP 4614-16, 4618-19; MCZ 45859).

Acestrorhynchus falcatus (Bloch)

BRAZIL. *Pará*: Ilha de Marajó, Cachoeira do Arari, Rio Arari (MCZ 45238-44); Belém, Igarapé Icatu (MCZ 45244-49); Belém (DZSP 4576-77, 4579, 4583, 4585, 4589-90).

Acestrorhynchus abbreviatus (Cope)

BRAZIL. *São Paulo*: Pirassununga, Rio Mogi-Guaçu (DZSP 4401-02); Corumbataí, Rio Corumbataí (DZSP 4403-04, 4536-37, 5229-34); Piracicaba, Rio Piracicaba (DZSP 4525); Alfredo de Castilho, Córrego do Moinho (DZSP 4530). *Mato Grosso*: Três Lagoas (DZSP 4556); Ilha Solteira, Rio Paraná (DZSP 4557). *Minas Gerais*: Pirapora, Rio São Francisco (DZSP 4542); Três Marias, Rio São Francisco (DZSP 4407-08, 5335-39). *Bahia*: Rio São Francisco (DZSP 4544, 4550).

Acestrorhynchus falcistrostris (Cuvier)

BRAZIL. *Pará*: Ilha de Marajó, Cachoeira do Arari, Rio Arari (MCZ 45276-78); Boa Vista, Rio Apeú (MCZ 45285); Gurupá, Rio Amazonas (MCZ 20519, 20519L); Belém (DZSP 4594); Lago Jacaré, Rio Trombetas (DZSP 4601-02).

VENEZUELA. *Guarico*: Rio Chimire (DZSP 4925).

Acestrorhynchus microlepis (Schomburgk)

BRAZIL. *Pará*: Codajás, Rio Amazonas (MCZ 20581a); Óbidos, Rio Amazonas (MCZ 20559); Pôrto do Moz, Rio Amazonas (MCZ 20540); Lago Jacaré, Rio Trombetas (DZSP 4607). *Amazonas*: Parintins, Rio Amazonas (MCZ 20506); Jatuarana, Rio Amazonas (MCZ 20599).

Acestrorhynchus sp. A

BRAZIL. *Pará*: Ilha de Marajó, Cachoeira do Arari, Rio Arari (MCZ 45252-74); Lago Arari (DZSP 4585). *Mato Grosso*: São Luís de Cáceres, Rio Paraguay (DZSP 2049).

ARGENTINA. *Rosario*: Rio Paraná (MCZ 832).

Acestrorhynchus sp. B

BRAZIL. *Amazonas*: Lago Januari (MCZ 20528); Lago Maximo (MCZ 20532); Lago Aleixo (MCZ 20589); Itacoatiara, Rio Amazonas (MCZ 20591); Jatuarana, Rio Amazonas (MCZ 20598). *Pará*: Ilha de Marajó, Cachoeira do Arari, Rio Arari (MCZ 20624); Lago Jacaré, Rio Trombetas (DZSP 4608-09).

A study of the tribe Acestrorhynchini which includes a taxonomic revision of the species here considered is being published elsewhere (Menezes, 1969).

DISCUSSION

The quantitative data of food types found in the stomach of all species is presented in a table at the end of this paper.

Brycon chagrensis

The food of *B. chagrensis* consists largely of plant material and fruits. Much of the plant material was fragments of leaves and stems, always associated with mud. This suggests that most of the food was taken from the bottom of the stream, perhaps from submerged aquatic plants. The fruits, on the other hand, must have fallen from overhanging trees and probably taken at the surface of the water.

Insects and other arthropods seem to constitute an insignificant part of the diet of this species. Only fragments of members of these two groups were found.

Brycon petrosus

B. petrosus shows feeding habits closely similar to *B. chagrensis*. The former, however, seems to have eaten a larger amount of insects.

Paroligosarcus pintoii

Contrary to the latter, this species seems to restrict its diet almost exclusively to insects, which constitute the largest percentage of food taken. *P. pintoii* apparently eats a large variety of insects. There seems to be no preference for either hard-bodied forms like Coleoptera, Hemiptera and Hymenoptera on one hand, or softbodied forms like Diptera and Insect larvae on the other hand, the two being about equally consumed. Insects must have been captured on the water surface, where they have accidentally fallen. A considerable number of these forms were undamaged. Rests of organisms, however, were found in many stomachs associated with sand and small stones and this is an indication that *P. pintoii* also feeds on dead animals in the sandy bottom.

Plant material and fruits as well as arthropods and crustaceans are represented by small percentages and seem to form an insignificant part of the diet of *P. pintoii*.

Acestrorhamphus jenynsii

A. jenynsii has a varied diet but prefers fishes, which are represented by the largest percentage. Besides fishes, the other important foods are insects and insect larvae, the remaining types being roughly equally less eaten. Most of the fishes and insects were found whole in the stomach, clearly suggesting that *A. jenynsii* does not take pieces out of its prey but rather swallows the organism intact.

Acestrorhamphus hepsetus

This species essentially shows the same food preferences exhibited by *A. jenynsii*. It seems, however, to have been feeding less frequently on insects and more on fruits.

***Acestrorhamphus* sp. A**

This species has fishes as the main component of its diet and in this respect it is closely similar to the last two mentioned species. Apparently it is more specialized, because, besides fishes, only crustaceans and plant material were found in its stomach. These two food items, represented in the table by small percentages, apparently are not significant components in its diet.

***Acestrorhamphus* sp. B**

The food of this species consists very largely of insect larvae. Fishes, however, seem to represent an important part of its diet with a small percentage of plant material. As to food preferences, this species is more closely related to the last three than to *Paroligosarcus pintoii* which has no fishes at all in its diet.

All the species of the genus *Acestrorhynchus*, as the table suggests, are highly specialized feeders, having almost exclusively fishes in their diets. *A. falcatus* and *Acestrorhynchus* sp. A were found to have been feeding also on crustaceans (exclusively shrimps) but these are secondary foods. The stomach of all species contained in a great number of cases, almost intact fishes, strongly suggesting that they primarily swallow their prey whole.

CONCLUSIONS

Based on the above data, we can make some generalizations about food preferences on the four genera involved in this study.

The primitive genus *Brycon* is essentially herbivorous. Although our conclusion is based on the analysis of two species taken at the same locality and season, other data from the literature (e.g. Lowe, 1964:128) seem to indicate that all species in this genus show a strong preference for plant material. Many Brazilian fishermen know that it is worthless to try to catch *Brycon* using animal baits. They use instead, a special preparation of "mandioca" (*Cassava* sp.) which is put in the water to attract the fishes.

The monotypic genus *Paroligosarcus* is omnivorous with a strong preference for insects.

All the species of the genus *Acestrorhamphus* have a varied diet but fishes form always a very important part of this diet. The genus may also be regarded as omnivorous with a strong preference for fishes.

Acestrohynchus is carnivorous, all predatory species in this genus feeding almost exclusively on fishes.

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Table of occurrence of food types. For each species, the absolute number of food items are recorded in the first column and the percentages in the second

FOOD	<i>Brycon chagrensis</i>	<i>Brycon petrosus</i>	<i>Parotilgoscarcus pintoi</i>	<i>Acestrorhamphus jenynsii</i>	<i>Acestrorhamphus hepsetus</i>	<i>Acestrorhamphus sp. A</i>	
ARTHROPODA	1	0	1	2	1	0	
INSECTS	5.0	0	2.6	4.6	7.1	0	
Coleoptera	1	3	10	4	1	0	
Diptera	0	10.7	26.3	9.3	7.1	0	
Hemiptera	0	1	7	1	0	0	
Orthoptera	0	0	2	1	0	0	
Hymenoptera	0	0	0	1	0	0	
INSECT LARVAE	0	0	5	3	0	0	
CRUSTACEA	0	0	8	6	1	0	
OLIGOCHAETA	0	0	1	2	1	1	
PLANT MATERIAL	15	60.7	2	0	1	16.6	
FRUITS	3	7	2	4	1	1	
FISHES	0	25.0	2	2	2	0	
TOTAL	20	99.9	38	17	6	4	
	100.0	28	99.6	99.8	99.5	99.8	
FOOD	<i>Acestrorhamphus sp. B</i>	<i>Acestrorhamphus falcatus</i>	<i>Acestrorhamphus abbreviatus</i>	<i>Acestrorhamphus falcatostris</i>	<i>Acestrorhamphus microlepis</i>	<i>Acestrorhamphus sp. A</i>	<i>Acestrorhamphus sp. B</i>
ARTHROPODA	0	0	0	0	0	0	0
INSECTS	0	0	0	0	0	0	0
Coleoptera	1	0	0	0	0	0	0
Diptera	0	0	0	0	0	0	0
Hemiptera	0	0	0	0	0	0	0
Orthoptera	0	0	0	0	0	0	0
Hymenoptera	0	0	0	0	0	0	0
INSECT LARVAE	5	45.4	0	0	0	0	0
CRUSTACEA	0	1	0	0	0	0	0
OLIGOCHAETA	0	0	0	0	0	6	31.5
PLANT MATERIAL	2	18.2	0	0	0	0	0
FRUITS	0	0	0	0	0	0	0
FISHES	3	27.3	14	10	12	13	15
TOTAL	11	100.0	31	100.0	100.0	68.4	100.0
	11	15	31	10	12	19	15
	100.0	99.9	100.0	100.0	100.0	99.9	100.0

