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ACESTROCEPHALUS BOEHLKEI, A NEW AND DISJUNCT CYNOPOTAMINE FROM ECUADOREAN AND PERUVIAN AMAZON (OSTEICHTHYES, OSTARIOPHYSI, CHARACIDAE)

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Introduction

In 1971, Tyson Roberts and party collected in the vicinity of Coca, Ecuador a series of 11 specimens of *Acestrocephalus*. During a recent visit to our Museum, Dr. James E. Böhlke brought two specimens for identification which, upon examination, proved to belong to an undescribed species. The remaining specimens of the series were later received from the Museum of Comparative Zoology, Harvard University. Another series from Rio Tulumayo, Peru was sent on loan by Dr. Böhlke and proved to be identical to the material from Ecuador.

This new species provides important data for the understanding of speciation patterns in the Amazon Basin.

I name this species after Dr. James E. Böhlke of the Academy of Natural Sciences of Philadelphia, who made the specimens under his care available for study. For lending the material from the Museum of Comparative Zoology I thank Dr. Robert Schoknecht. Thanks are also due to Dr. Paulo E. Vanzolini, of this Museum, for critically reading the manuscript. For the photographs I thank Mr. Giro Pastore.

Methods and materials

The specimens used in this work are now deposited in the following institutions: Museum of Comparative Zoology, Harvard University (MCZ); Academy of Natural Sciences of Philadelphia (ANSP); National Museum of Natural History, Washington, D.C. (USNM); Museu de Zoologia da Universidade de São Paulo, São Paulo, Brasil (MZUSP).

Measurements, counts and the study of meristic and morphometric variation were made according to Menezes (1969). In the present work, the number of premaxillary teeth refers only to the small conical teeth between the anterior and posterior canines of the external row. Data from other species of the genus, introduced for comparison are from Menezes (1976). Regressions were computed for all measurements involved, but only those showing significant differences among the species are presented.

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Acestrocephalus boehlkei, sp. n.

(Fig. 1)

Fig. 1. *Acestrocephalus boehlkei,* sp.n., 120.0 mm S.L., MZUSP 12994, paratype.

Holotype: MCZ 51473 (135.0 mm S.L.), collected in the Rio Punino, a tributary of the Rio Payamino (Napo River system), above Coca, Ecuador, on 25-27 November 1971, by T. Roberts and Parker.

Paratypes: MCZ 51474 (2, 82.0--107.0 mm); MZUSP 12993-94 (2, 85.0-120.0 mm); USNM 216140 (1, 77.0 mm); all taken with the holotype. ANSP 134501 (2, 33.0-51.0 mm), Rio Napo (tributaries in vicinity of Coca), Ecuador, 30 November 1971, by T. Roberts; MCZ 51475 (1, 31.5 mm), USNM 216141 (1, 38.0 mm) and MZUSP 12995 (1, 41.5 mm), Rio Payamino and tributary 3-4 miles upriver from mouth of Rio Payamino into Rio Coca, Ecuador, 20 November 1971, by T. Roberts, Garcia, Parker and Herrera; ANSP 134500 (5, 54.0-86.0 mm) and MZUSP 12996-98 (3, 57.0-84.0 mm), backwater near Pueblo Nuevo flowing into Rio Tulumayo, and mainstream of Rio Tulumayo, Huánuco, Peru, 27 September 1955, Catherwood Expedition.

Diagnosis

D. ii+9; A. v+32-36; P. i+14-15; V. i+7; 74-78 perforated scales on the lateral line; 13-14 scales above and 12-13 below the lateral line; 32-44 teeth on the maxillary; 9-12 premaxillary teeth; 11-13 teeth in the inner row on the dentary; a dark blotch on the undersurface of the lower jaw, near its tip.

Description

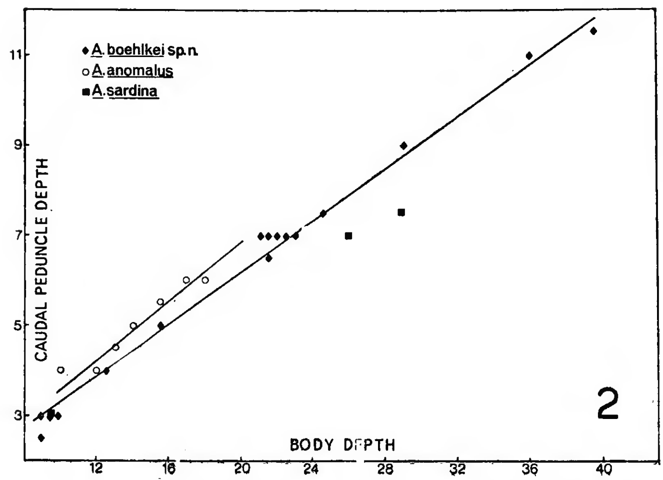
Body relatively small (S.L. 31.5-135.0 mm); dorsal and ventral outlines about equally curved. Snout elongate, slightly shorter than orbital diameter in very small specimens (31.0-41.0 mm), equal to orbital diameter in medium-sized specimens (51.0-85.0 mm), and longer than orbital diameter in large specimens (85.0-135.0 mm). Maxillary with 32-44 teeth, its lower edge slightly convex. Premaxillary with 9-12 teeth between the anterior and posterior canines of the external tooth row. External tooth row of dentary with one anterior canine, followed by one large conical tooth, one canine slightly smaller than the anterior one, one relatively large conical tooth, and a row of small conical teeth, the number of which varies ontogenetically; inner row with 11-13 teeth.

Scales relatively large, 74-78 on the lateral line, 13-14 from the origin of the dorsal fin to the lateral line, 12-13 from the origin of the anal fin to the lateral line; scales along the side of the anal fin base forming a longitudinal row which extends a little beyond the middle of the fin.

Dorsal fin with ii+9 rays, the first branched ray about 3 times as long as the last one; anal fin with v+32-36 rays which progressively decrease in size from the fist to the last ones; origin of the anal fin situated vertically below the base of the fifth or sixth branched ray of the dorsal fin; pectoral fins longer than ventrals, their longest rays reaching beyond the insertion of the latter; there are i+14-15 pectoral fin rays; ventral fins with i+7 rays, their longest rays reaching to the origin of the anus or passing this point in some specimens; upper and lower lobes of the caudal fin about equally developed or lower lobe slightly longer in the largest specimens.

Background color in alcohol light brown, darker above; a dark silvery stripe along the sides of the body, from behind the upper posterior part of the opercle to the caudal base, where it is darker and fused to an oblong dark blotch; a vertically elongated dark blotch on the humeral region; a small dark spot at the origin of the dorsal fin; tip of the lower jaw with a distinct dark blotch which is more conspicuous at the region situated in between the anterior ends of both arms of the lower jaw; upper part of the head dark; scattered dark melanophores on parts of the head. All fins pale with scattered punctuations, especially on the dorsal, anal and caudal fins; the dark pigmentation of the caudal blotch extends to the median caudal fin rays.

The mesurements of the specimens are shown on table 2 and the counts on table 3; the regression data on table 4 and figures 2-4.



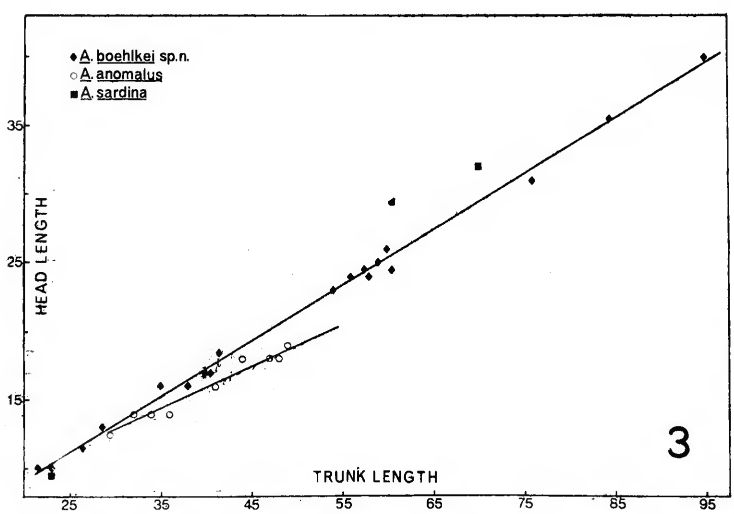


Fig. 2. Regression of caudal peduncle depth on body depth. Fig. 3. Regression of head length on trunk length.

Discussion

The most obvious feature of *A. boehlkei* is the presence of a dark blotch on the tip of the lower jaw. This blotch is not present in the other species of the genus, *A. anomalus* and *A. sardina*. *A. boehlkei* differs also from *A. sardina* in having more anal fin rays, more scales on the lateral line, more teeth on the premaxillary, more teeth

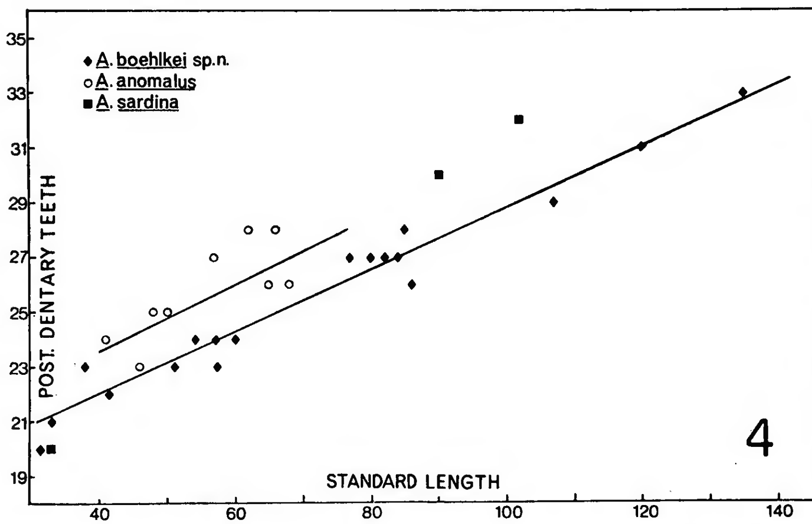


Fig. 4. Regression of number of posterior dentary teeth on standard length.

Table 1 Ranges of meristic characters

	ANAL FIN RAYS	PECTORAL FIN RAYS	LATERAL LINE SCALES	SCALES ABOVE LATERAL LINE	SCALES BELOW LATERAL LINE	MAXILLARY TEETH	PREMAXILLARY TEETH	INNER DENTARY TEETH
boehlkei	32-36	14-15	74-78	13-14	12-13	32-44	9-12	11-13
sardina	29-32	13-14	71-72	12-14	12-13	30-41	7-8	9-10
anomalus	33-35	12-14	73-77	12-13	9-11	34-37	8-11	9-11

in the inner row on the dentary (table 1), a shorter head, a deeper caudal peduncle, and fewer teeth in the posterior row on the dentary at comparable sizes (fig. 4). From *A. anomalus*, which is restricted to the Magdalena Basin, Colombia, it differs significantly in the number of scales below the lateral line, the number of teeth on the inner row on the dentary and in having, on the average, more pectoral fin rays, and more scales on the lateral line and above the lateral line (table 1); in addition, there are morphometric differences, *A. boehlkei* having a longer head, a narrower and consequently less deep caudal peduncle and fewer teeth in the posterior row on the dentary at comparable sizes (figs. 2-4).

Table 2 Measurements

Specimen		A	B	C	D	E	F	G	H	I	J
ANSP	134500	54.0	16.0	38.0	14.5	4.5	4.5	3.5	4.5	28.0	30.0
ANSP	134500A	57.0	17.0	40.0	15.5	5.0	5.0	3.5	5.0	30.5	32.5
ANSP	134500B	57.5	17.0	40.5	15.5	5.0	5.0	3.5	5.0	30.0	33.0
ANSP	134500C	82.0	24.0	58.0	22.5	6.5	7.0	4.5	7.0	43.0	46.0
ANSP	134500D	84.0	25.0	59.0	23.0	6.5	7.5	5.0	7.0	43.0	47.5
ANSP	134501	33.0	10.0	23.0	8.0	3.0	3.0	2.5	3.0	16.0	17.5
ANSP	134501A	51.0	16.0	35.0	12.5	4.0	4.5	3.0	4.0	26.0	28.0
MZUSP	12996	60.0	18.5	41.5	15.5	5.0	5.0	4.0	5.0	31.0	34.5
MZUSP	12997	80.0	24.0	56.0	21.5	6.5	7.0	4.5	7.0	43.0	46.0
MZUSP	12998	86.0	26.0	60.0	24.5	6.5	7.5	5.0	7.5	45.0	50.0
MZUSP	12995	41.5	13.0	28.5	10.0	4.0	3.5	3.0	3.0	21.0	23.0
MZUSP	12993	85.0	24.5	60.5	22.0	7.0	7.0	4.0	7.0	43.0	48.0
MZUSP	12994	120.0	35.5	85.5	36.0	9.0	10.5	6.0	11.0	62.0	68.5
MCZ	51475	31.5	10.0	21.5	8.0	3.0	2.5	2.0	2.5	16.0	17.5
MCZ	51475A	82.0	24.5	57.5	21.5	7.0	7.0	4.5	6.5	42.0	47.0
MCZ	51474	107.0	31.0	76.0	29.0	8.0	9.0	5.0	9.0	54.5	60.0
MCZ	51473	135.0	40.0	95.0	39.5	10.0	11.5	6.5	11.5	70.5	78.0
USNM	216141	38.0	11.5	26.5	8.5	4.0	3.5	2.5	3.0	18.5	20.5
USNM	216140	77.0	23.0	54.0	21.0	6.5	7.0	4.0	7.0	40.0	44.0

A - Standard length
B - Head length
C - Trunk length
D Depth
E Orbital diameter
F - Snout length
G - Interorbital width
H - Caudal ped. depth
I - Predorsal distance
J - Preanal distance

Table 3 - Counts

		A	B	C	D	E	F	G	H	I	J	K	L	M
ANSP	134500	ii+9	v+34	i+15	i+7	i+17+i	74	13	12	5	9	38	24	11
ANSP	134500A	ii+9	v+32	i+15	i+7	i+17+i	75	13	12	5	10	39	24	11
ANSP	134500B	ii+9	v+34	i+15	i+7	i+17+1	76	13	12	5	9	34	23	11
ANSP	134500C	ii+9	v+36	i+15	i+7	i+17+i	74	13	12	5	12	40	27	12
ANSP	134500D	ii+9	v+34	i+14	i+7	i+17+i	76	14	12	5	11	40	27	12
ANSP	134501	ii+9	v+35	i+15	i+7	i+17+i	75	13	12	5	9	35	21	11
ANSP	134501A	ii+9	v+34	i+15	i+7	i+17+i	77	13	12	5	9	32	23	11
MZUSP	12996	ii+9	v+34	i+15	i+7	i+17+i	76	13	12	5	10	37	24	12
MZUSP	12997	ii+9	v+36	i+14	i+7	i+17+i	74	13	12	5	11	42	27	12
MZUSP	12998	ii+9	v+35	i+14	i+7	i+17+i	76	14	12	5	11	38	26	13
MZUSP	12995	ii+9	v+34	i+14	i+7	i+17+i	77	14	12	5	10	39	22	11
MZUSP	12993	ii+9	v+35	i+14	i+7	i+17+i	76	13	12	5	10	39	28	12
MZUSP	12994	ii+9	v+34	i+15	i+7	i+17+i	76	13	12	5	9	42	31	11
MCZ	51475	ii+9	v+34	i+15	i+7	i+17+i	75	13	12	5	11	35	20	13
MCZ	51475A	ii+9	v+33	i+15	i+7	i+17+i	76	13	12	5	9	36	27	13
MCZ	51474	ii+9	v+35	i+15	i+7	i+17+i	78	14	13	5	9	41	29	12
MCZ	51473	ii+9	v+34	i+14	i+7	i+17+i	74	13	12	5	12	44	33	11
USNM	216141	ii+9	v+34	i+14	i+7	i+17+i	76	13	12	5	11	37	23	13
USNM	216140	ii+9	v+32	i+15	i+7	i+17+i	75	14	13	5	9	40	27	13

A - Dorsal fin
B - Anal fin
C - Pectoral fin
D - Ventral fin
E - Principal caudal rays
F - Lateral line scales
G - Scales above lat. line
H - Scales below lat. line
I Gill rakers
J - Premaxillary teeth
K - Maxillary teeth
L - Posterior dentary teeth
M - Inner teeth on the dentary

In Ecuador, the specimens of *A. boehlkei* were collected in the rivers Punino, Payamino, and some tributaries of the Rio Napo, involving an area of approximately 20 square kilometers. The Peruvian specimens are from a smaller area, having been collected only in the Rio Tulumayo. The distance between the two areas is about 1,200 kilometers; however, no morphological differences were found between the two samples. This apparent lack of geographical differentiation is especially significant from the evolutionary point of view. It is expected that the species will eventually be found in other rivers, but always in the upper courses, not in the main courses, for these have been well collected, and the fishes are medium-size carnivores.

Table 4 – Regression data

REGRESSION	N	b	a	r^2
Head length x trunk length	19	0.40 ± 0.006	1.04 ± 0.33	0.99
Body depth x standard length	19	0.30 ± 0.006	-2.66 ± 0.53	0.99
Snout length x head length	19	0.29 ± 0.006	1.04 ± 0.33	0.99
Orbital diameter x head length	19	0.23 ± 0.008	0.92 ± 0.19	0.97
Interorbital distance x head length	19	0.14 ± 0.008	1.05 ± 0.20	0.93
Posterior dentary teeth x standard length	19	0.11 ± 0.005	17.33 ± 0.42	0.96
Predorsal distance x standard length	19	0.52 ± 0.004	-0.61 ± 0.37	0.99
Preanal distance x standard length	19	0.50 ± 0.004	-1.17 ± 0.37	0.99
Caudal peduncle depth x body depth	19	0.29 ± 0.006	0.46 ± 0.12	0.99

N - Number of specimens

b - Regression coefficient ± its standard deviation

a - Regression constant ± its standard deviation

r^2 - Coefficient of determination

The most economical hypothesis to explain this discontinuous distribution within the same river basin is exclusion by competition. This hypothesis has already been used to explain the distribution of *A. sardina,* which has been collected so far in the headwaters of two Amazonian tributaries. Probably the competitor responsible for this double exclusion is *Galeocharax,* the most recent and specialized member of the same group, which is found in the main course of large rivers.

The lack of differentiation of *A. boehlkei* indicates that the confinement to headwaters is a recent phenomenon or, in other words, that the expansion of *Galeocharax* is recent, probably Quaternary. Although the evolution of the Amazonian hydrology during the Quaternary is unknown, it seems reasonable to assume that, in general, the dramatic climatic variations which occurred during that period have had profound effects on the aquatic fauna. The most recent drastic paleoclimatic event is the dry period which occurred between 4,000-2,200 years ago (Journaux, 1975:32), after which *Galeocharax* would have invaded the Amazon Basin. This dry and cooler period (V of Fairbridge, 1976) is the minimal date for the last evolutionary cycle within the Cynopotaminae.

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