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MORPHOLOGICAL CHARACTERISTICS FOR CLASSIFICATION OF GENUS *MACROPODUS* LACÉPÈDE, 1801 IN GIANH RIVER IN THE NORTH CENTRAL PART OF VIETNAM

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Analysis and identification of 57 specimens of genus *Macropodus* Lacépède collected from Gianh River in Quang Binh province in north center region Vietnam. We have classified three species: *Macropodus erythropterus* (Frey. & Her., 2002), *Macropodus opercularis* (Linneaeus, 1758), *Macropodus spechti* (Schreitmüller, 1936) was first discovered in the study area and north center region Vietnam.

Keywords: *Macropodus erythropterus, Macropodus opercularis, Macropodus spechti, Phong Nha – Ke Bang, Classification, Vietnam, Gianh river, Quang Binh.*

CARACTERISTICA MORFOLOGICĂ PENTRU CLASIFICAREA GENULUI *MACROPODUS* LACÉPÈDE, 1801 DIN BAZINUL RÂULUI GIANH, REGIUNEA CENTRALĂ DE NORD A VIETNAMULUI

Au fost analizate şi identificate 57 de exemplare ale genului *Macropodus* Lacépède colectate din bazinul râului Gianh, provincia Quang Binh, regiunea centrală de nord a Vietnamului. Noi am clasificat 3 specii: *Macropodus erythropterus* (Frey. & Her., 2002), *Macropodus opercularis* (Linneaeus, 1758) şi *Macropodus spechti* (Schreitmüller, 1936), descoperite în aria de studiu şi în regiunea centrală de nord a Vietnamului.

Cuvinte-cheie*: Macropodus erythropterus, Macropodus opercularis, Macropodus spechti, Phong Nha – Ke Bang, clasificare, Vietnam, râul Gianh, Quang Binh*.

Introduction

Macropodus is a genus of fairly small gouramies native to freshwater habitats Vietnam, Laos, Cambodia, Malaysia, China, Hong Kong, Taiwan, Japan, South Korea. in eastern Asia. A few species in the genus are regularly seen in the aquarium trade, and *M. opercularis* has been introduced to regions far outside its native range. Medium sized osphronemids with deep, elongated and laterally compressed body. Greatest body depth at anal-fin origin. Caudal peduncle laterally compressed. Snout laterally compressed, moderately long and pointed. Dorsal-fin origin above anal-fin spines 3 – 5. Anal-fin base extending from anus nearly to caudal-fin base. Dorsal fin with 10 – 19 spines and anal fins pointed, reaching beyond caudal-fin base. Pelvic pointed, with 1 spine and 5 soft rays. Fisrt soft pelvic-fin ray filamentous. Body completely covered with ctenoid scales. Lateral line reduced or absent. Bases of unpaired fins covered with scales. Males larger than females, with longer posterior rays in unpaired fins. Males build foam nests.

1. Material and methods

Fish specimens were collected mainly from fishing men in Gianh River in Quang Binh province in north center region Vietnam. Fishing tools are fishnets, rackets, casting – net, multi size fishing – rods and also professional tools of fish men such as: fishing basket, fishing traps, etc. Specimens were fixed either in 10 % formaldehyde and later transferred into 4 % formaldehyde for storage or fixed and stored in 90 % ethanol. All measurements and counts follow Jorg Freyhof and Fabian Herder (2002). Measurements were made point-to-point with dial callipers to the nearest 0.1 mm.

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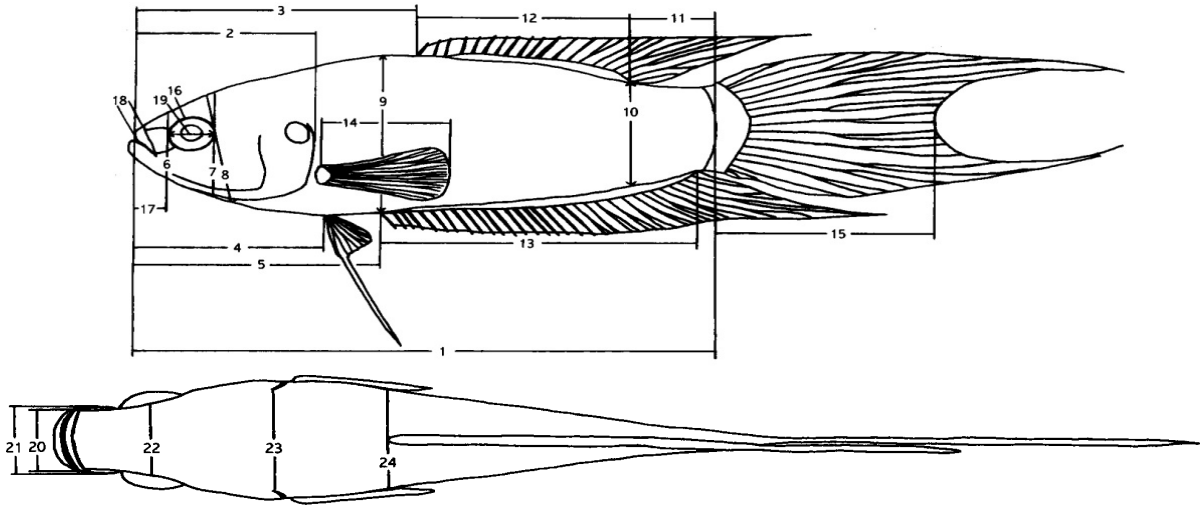

Fig.1. Measurements taken on *Macropodus* species by Jorg Freyhof and Fabian Herder (2002). 1, standard length (SL), from upper jaw symphysis to caudal margin of hypuralia; 2, head length (HL), from upper jaw symphysis to posterior point of operculum (not including skin flap); 3, predorsal length, from upper jaw symphysis to dorsal-fin origin; 4, prepelvic length, from upper jaw symphysis to pelvic-fin origin; 5, preanal length, from upper jaw symphysis to anal-fin origin; 6, head depth in front of eye; 7, vertical head depth behind eye; 8, head depth at nape, from most cranial visible margin of isthmus along caudal margin of eye to dorsal side of head; 9, body depth at anal-fin origin; 10, body depth at dorsal-fin base end; 11, postdorsal length, distance from end of dorsal-fin base to caudal margin of hypural; 12, length of dorsal-fin base; 13, length of anal-fin base, from anal-fin origin to end of anal-fin base; 14, length of pectoral fin; 15, length of middle caudal-fin rays, from caudal margin of hypural to end of middle caudal-fin ray; 16, frontal thickness, at upper osseous margin of eye, from ventral to dorsal margin of frontal; 17, snout length, from upper jaw symphysis to anterior osseous orbit margin; 18, width of upper lip above premaxillary symphysis; 19, eye diameter, horizontal between osseous margins of orbit; 20, mouth width, maximal transversal extension of mouth; 21, head width at lachrymal, maximal distance between lachrymal bones; 22, interorbital width between bony margins of orbits; 23, head width between dorsal end of opercular openings; 24, body width at dorsal-fin origin; 25, body width at end of dorsal-fin base.

2. Results and discussion

2.1. Macropodus erythropterus Freyhof & Herder, 2002

Diagnosis

Macropodus erythropterus is distinguished from other species of *Macropodus* by the following combination of characters: caudal fin forked; opercular spot pale or missing; spots and bars on dorsal and caudal-fin membranes brown, red in life; soft rays in unpaired fins pale brown; predorsal and subdorsal back reddish and body above anal fin base iridescent blue to green in life; body with 10 - 12 faint and inconspicuous dark bars; top of head and predorsal body without dark spots; posterior tip or margin of scales on body conspicuously darker than scales; distal part of first soft pelvic-fin ray red in life.

Fig.2. *Macropodus erythropterus* Freyhof & Herder, 2002.

Description

See Figures 2 for general appearance and Table 1 for morphometric data of 41 specimens from Gianh River in Quang Binh province in north center region Vietnam. Caudal peduncle 1.3 - 1.7 (mean 1.4) times deeper than long. Eye diameter 0.6 - 1.1 (mean 0.9) times in interorbital space. Scales: 28 - 32 along lateral midline, 17 - 19 around caudal peduncle, 3 - 5 between pelvic-finbase and pectoral-fin base, 4 below eye; 9.5 – 13 transversal scale rows at dorsal fin origin. 14 - 17 gill rakers on ceratobranchial of first arch. Upper jaw with 2 - 5 rows of teeth, lower jaw with 3 - 5 rows of teeth, outer rows of upper and lower jaw with 18 - 26 and 13 - 28 unicuspid teeth, respectively.

Dorsal fin with 12 - 15 (mode 13) spines and 6 - 8 (mode 8) branched or unbranched soft rays. Length of anterior 4 - 6 soft dorsal rays increasing, then decreasing to last ray. Anal fin with 17 - 20 (mode 19) spines and 13 – 17 (mode 15) branched or unbranched soft rays, length of anterior 7 - 11 soft rays increasing, then decreasing to last ray. Soft dorsal rays 3 - 6 and soft anal rays 6-11 pointed. Caudal fin forked, with 5 – 19 branched rays. Pectoral fin with rounded tips and 10 - 12 rays, reaching to vertical of dorsal spines 2 – 6. Pelvic fin with 6 soft rays.

***2.2. Macropodus opercularis* (Linneaeus, 1758)**

Labrus opercularis Linnaeus, 1758
Chaetodon chinensis Bloch, 1790
Macropodus viridi-auratus Lacépède, 1801
Macropodus venustus Cuvier & Valenciennes, 1831.
Macropodus ctenopsoides Brind, 1915
Macropodus filamentosus Oshima, 1919

Diagnosis

Macropodus opercularis is distinguished from other species of *Macropodus* by the following combination of characters: caudal fin forked; conspicuous dark brown opercular spot with whitish posterior margin (margin red in life); body with 7 - 11 bold, dark bars on pale yellowish background in preserved specimens (blue bars on reddish background in life); dark stripe crossing eye connecting opercular spot with eye; top of head and predorsal body with dark spots; posterior tip or margin of scales on body not darker than scales.

Fig.3. *Macropodus opercularis* (Linneaeus, 1758).

Description

See Figures 3 for general appearance and Table 1 for morphometric data of 6 specimens from Gianh River in Quang Binh province in north center region Vietnam. Caudal peduncle 1.1 - 2.2 (mean 1.7) times deeper than long. Eye diameter 0.8 – 0.9 (mean 0.8) times in interorbital space. Scales: 28 - 30 along lateral midline, 15 - 19 around caudal peduncle, 3 - 5 between pelvic-fin base and pectoral fin base, and 3 - 5 below eye; 11.5 - 12.5 transversal rows of scales at dorsal fin origin. 15 - 21 gill rakers on ceratobranchial of first arch. 2 - 5 rows of teeth on upper jaw; 3 - 4 rows of teeth on lower jaw; outer row of upper jaw with 17 - 31 unicuspid teeth, outer row of lower jaw with 22 - 35 unicuspid teeth.

Dorsal fin with 14 spines and 7 branched or unbranched soft rays, length of anterior 4 - 6 soft rays increasing posteriorly, then decreasing to last ray. Anal fin with 19 spines and 11 - 12 branched or unbranched soft rays,

length of anterior 7 - 11 soft rays increasing posteriorly, then decreasing to last ray. Soft dorsal rays 3 - 6 and soft anal rays 6 - 11 pointed. Caudal-fin forked, with 13 - 16 branched rays. Pectoral fin with rounded tips, with 10 - 12 rays and reaching to vertical of dorsal spines 3 - 5. Pelvic fin with 7 soft rays.

***2.3. Macropodus spechti* Schreitmüller, 1936**

Macropodus opercularis L. var. *spechti* Schreitmillller, 1936

Macropodus opercularis concolor Ahl, 1937

Diagnosis

Macropodus spechti is distinguished from other species of *Macropodus* by the following combination of characters: caudal fin forked; opercular spot pale or missing; body without dark bars or with 4 - 12 faint and inconspicuous dark bars on pale brown to dark greyish background in preserved and live specimens; top of head and predorsal body without dark spots or saddle-like blotches; posterior tip or margin of scales on head and body conspicuously darker than scales; distal part of first soft pelvic-fin ray red in life; spots and bars on dorsal and caudal-fin membranes black; posterior dorsal-fin membranes and caudal-fin membranes blue in life; filamentous caudal-fin rays with white or black posterior extremity.

Fig.4. *Macropodus spechti* Schreitmüller, 1936.

Description

See Figures 4 for general appearance and Table 1 for morphometric data of 10 specimens from Gianh River in Quang Binh province in north center region Vietnam. Caudal peduncle 1.1 - 1.6 (mean 1.4) times deeper than long. Eye diameter 0.8 - 1.1 (mean 1.0) times in interorbital space. Scales: 28 - 31 along lateral midline, 17 – 19 around caudal peduncle, 3 - 5 between pelvic-fin base and pectoral fin base, 4 - 5 below eye; 10.5 - 12.5 transversal rows of scales at dorsal fin origin. 15 - 17 gill rakers on ceratobranchial of first arch. 3 -4 rows of teeth on both upper and lower jaw; outer row of upper jaw containing 10 - 33 unicuspid teeth, and outer row of lower jaw with 23 - 32 unicuspid teeth.

Dorsal fin with 8 spines and 6 - 9 (mode 7) branched or unbranched soft rays; length of anterior 3 - 5 soft rays increasing, then decreasing to last ray. Anal fin with 17 - 21 (mode 19) spines and 11 - 12 branched or unbranched soft rays; length of anterior 7 - 10 soft rays increasing, then decreasing to last ray. Soft dorsal rays 3 - 6 and soft anal rays 6 - 11 pointed. Caudal fin forked, with 7 – 18 branched rays. Pectoral fin with rounded tips and 11 - 12 rays, reaching to vertical of dorsal spines 2 - 6. Pelvic fin with 5 – 6 soft rays.

Conclusion

Analysis and identification of 57 specimens of genus *Macropodus* Lacépède collected from Gianh River in Quang Binh province in north center region Vietnam. We have classified three species: *Macropodus erythropterus* Frey. & Her., 2002, *Macropodus opercularis* (Linneaeus, 1758), *Macropodus spechti* Schreitmüller, 1936. Which has species: *Macropodus erythropterus* Frey. & Her., 2002, *Macropodus spechti* Schreitmüller, 1936 was first discovered in the study area and north center region Vietnam.

Table

Morphometric data of *Macropodus erythropterus*; *Macropodus opercularis* and *Macropodus spechti*

	Macropodus erythropterus (n = 41)				*Macropodus opercularis* (n = 6)				*Macropodus spechti* (n = 10)			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
In percents of SL												
Head length (HL)	34.7	0.9	32.7	36.4	34.8	1.4	32.7	36.3	35.3	1.5	32.6	37.4
Predorsal length	52.0	2.2	46.4	59.8	49.3	1.8	48.0	52.9	52.2	1.1	50.8	53.9
Prepelvic length	36.0	1.9	32.1	41.0	35.8	2.2	32.1	37.9	36.5	1.4	34.5	38.7
Preanal length	48.0	2.2	40.2	52.0	49.0	2.3	46.1	52.6	48.3	1.3	46.6	50.3
Head depth in front of eye	15.8	1.3	13.6	19.0	16.5	0.8	15.6	17.9	16.2	0.8	14.9	17.1
Head depth behind eye	23.5	1.3	20.8	26.2	25.1	1.0	23.4	26.2	24.4	1.0	22.9	25.7
Head depth at nape	28.0	2.0	22.9	33.6	31.4	1.5	29.1	33.4	30.5	1.5	28.2	33.0
Head width at operculum	18.3	0.9	15.5	20.4	18.7	1.4	16.1	20.0	20.0	0.7	19.3	20.9
Body depth at anal-fin origin	37.2	1.5	34.0	40.5	38.7	2.6	36.0	43.0	37.5	1.6	35.1	40.3
Body width at dorsal-fin origin	15.8	0.9	13.9	17.4	16.7	1.7	14.5	19.7	16.8	1.2	14.8	18.2
Body width at end of dorsal-fin base	8.3	0.7	7.2	9.8	7.9	0.7	7.0	8.8	8.3	0.3	7.9	8.8
Body depth at dorsal-fin base end	23.1	1.1	20.3	24.9	24.3	0.7	23.5	25.1	23.6	0.7	22.6	25.0
Postdorsal length	14.6	1.5	10.6	18.6	13.9	0.6	13.0	14.6	14.4	1.0	12.8	15.7
Length of dorsal-fin base	37.4	3.0	29.7	46.8	41.4	1.1	40.2	42.9	36.2	1.2	34.7	37.7
Length of anal-fin base	51.4	2.7	43.1	55.5	53.2	0.9	52.4	54.9	53.2	1.8	50.5	55.8
Length of pectoral fin	25.2	1.7	19.9	29.2	27.3	1.9	24.8	29.8	25.8	1.1	24.2	27.1
Length of pelvic spine	11.4	0.7	9.6	12.7	12.5	2.1	9.7	15.3	12.3	1.7	9.9	15.3
Length of middle caudal-fin ray	29.3	2.7	25.1	35.2	32.6	3.0	29.6	38.1	31.7	1.8	28.3	35.1
In percents of HL												
Eye diameter	24.2	1.6	20.7	27.4	25.8	0.9	25.0	27.4	26.1	1.8	23.6	29.2
Interorbital width	28.3	2.7	25.0	40.9	31.2	2.1	27.9	33.5	27.6	1.6	24.5	29.6
Snout length	30.6	1.8	25.3	34.6	29.5	1.5	28.1	31.9	30.6	1.7	27.9	32.7
Frontal thickness	7.5	1.4	4.5	10.7	10.1	1.7	8.5	13.3	8.2	1.0	6.6	10.0
Upper lip width	26.4	2.4	22.0	34.5	28.1	4.0	24.7	33.1	25.9	1.6	23.0	28.7
Mouth width	23.9	2.5	19.8	30.1	25.9	4.3	20.5	31.7	23.0	1.8	20.3	25.5

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