SEX DISCRIMINATION AMONG FOUR MORMYRID SPECIES OF ANAMBRA RIVER SYSTEM NIGERIA

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ABSTRACT

Sex discriminating characters of four mormyrid species caught from Anambra river basin, Nigeria were investigated. Sexual dimorphism occurred in only one transformed character – dorsal fin base length and in four raw morphometric characters namely total length, standard length, dorsal fin base length and anal fin base length. These characters are recommended as key characters in mormyrid taxonomy.

Key Words: Mormyridae, sex dimorphism, Anambra river

INTRODUCTION

Mormyrus rume, Hyperopisus bebe, Campylomormyrus tamandua and *Gnathonemus petersii* are among the mormyrids inhabiting fresh waters of tropical Africa (Lowe-McConnell, 1975). They are very common, of commercial importance and are often seen in piles of smoke-cured fishes (Teugels *et al* 1992). They are used, along with *Clarias* species (Ezenwaji and Inyang, 1998), in preparing local delicacies for marriage and naming ceremonies. Despite their fisheries and importance, very little information exists on their morphometric characters and meristic counts. Venu and Kurup (2003) had noted the importance of morphometric characters for the differentiation of taxonomic units in fishes. Anyanwu and Ugwumba (2003) used morphometric parameters, meristic counts and electrophoresis traces to separate *Pseudotolithus senegalensis* caught from three zones in the Nigerian inshore waters. Morphometric characters and meristic counts have been used to delimit *Clarias* species in Anambra river (Ezenwaji, 1986; Eyo, 1997, 2003 a, b, Eyo and Inyang 2004) and to distinguish between *Heterobranchus bidorsalis* and *Heterobranchus bidorsalis* x *Clarias gariepinus* hybrid (Madu *et al*., 1993)

The present study aims at identifying specific differences in morphometric characters to establish sexual dimorphism in M*. rume, H. bebe, C. tamandua* and *G. petersii.*

MATERIALS AND METHODS

Fish specimens were collected monthly at Otuocha and Ogurugu between October, 2000 and March, 2002 using gill nets, drag nets, surface drift nets and cast nets of various mesh sizes. Baskets, traps and hook and line were also used to catch the fish. Specimens were also bought from the major landing Anambra river port at Otuocha. The multiple sampling methods were employed to eliminate gear selectivity and ensure good representation of all sizes of the Fish. Individuals required for the morphometric studies were iced and transported to the Pure and Applied Project Laboratory, Department of Zoology, University of Nigeria, Nsukka where they were kept under refrigeration until used.

Identification of fish collected was done using the keys of Holden and Reed (1972), Lowe-McConnell (1972), Teugels *et al*. (1992) and Olaosebikan and Raji (1998). The sex of each fish was determined. Prior to the measurement of the morphometric characters, each frozen specimen was allowed to thaw completely after which the weight was taken to the nearest 0.01 gram using a Metler PC 2000 electronic balance. Fish were measured to the nearest 0.01 centimeters using a fish measuring board, Veneir caliper and a pair of dividers. The characters measured were:

- Standard length (SL): The length from the tip of the snout to the anterior base of the caudal fin.

Table 1: Sex dimorphism in raw data among the mormyrid species in Anambra river

	Mormyrus rume				*Hyperopisus bebe*			
Morphometric parameters	Males	Females	T-Value	2-Tail Prob.	Males	Female	T-Value	2-Tail Prob.
Standard length (SL)	37.38±0.55	45.03±0.85	-23.03	0.00*	27.59±0.64	29.55±0.74	-9.98	0.00*
Total length (TL)	40.08±0.77	45.02±0.85	-18.88	0.00*	29.81±0.81	32.55±1.59	-5.05	0.00*
Pectoral fin Height (PFH)	4.14±0.53	4.23±1.21	-0.28	0.79	2.75±.0.41	2.86±0.41	-0.68	0.51
Pectoral fin Base length (PFBL)	1.49±0.31	1.54±0.46	-0.26	0.80	1.01±0.24	0.85±0.28	1.62	0.13
Pelvic fin Height (PeFH)	341±0.37	3.86±1.07	-1.54	0.15	2.20±0.26	247±0.19	-3.06	0.01*
Pelvic fin Base length(PeBL)	161±0.40	1.45±0.52	1.68	0.12	0.71±0.23	0.85±0.28	1.51	0.16
Dorsal fin Base Length (DFBL)	16.28±0.40	17.32±0.44	-6.01	0.00*	2.02±0.19	2.50±0.31	5.72	0.00*
Anal fin Height (AFH)	285±0.21	3.62±0.42	-6.02	0.00*	2.78±0.25	2.58±0.28	2.05	0.06
Anal fin Base length (AFBL)	2.80±0.35	3.25±0.35	-4.70	0.00*	10.91±0.41	12.99±0.65	-8.28	0.00*
Pelvic-Anal fin space (PeAFS)	582±0.74	7.47±0.51	-5.04	0.00*	5.01±0.33	5.04±0.46	-0.17	0.87
Pectoral-Pelvic fin space (PpeFS)	471±0.30	5.35±0.15	-6.32	0.00*	2.60±0.49	3.35±0.28	-4.12	0.00*
	Campylomormyrus tamandua				*Gnathonemus petersii*			
Morphometric parameters	Males	Females	T-Value	2-Tail Prob.	Males	Female	T-Value	2-tail Prob.
Standard length (SL)	27.40±0.36	28.82±0.63	-6.05	0.00*	34.02±1.72	39.55±3.81	-4.44	0.00*
Total length (TL)	28.86±0.52	30.11±1.49	-2.52	0.03*	37.58±0.29	41.44±0.37	-6.79	0.00*
Pectoral fin Height (PFH)	3.95±0.56	4.85±0.56	-5/76	0.00*	4.15±0.47	4.62±0.71	-2.44	0.03*
Pectoral fin Base length (PFBL)	1.27±0.20	1.56±0.27	-3.19	0.01*	1.69±0.34	2.02±0.39	-1.92	0.08
Pelvic fin Height (PeFH)	3.18±0.26	3.42±0.38	-2.11	0.06	2.45±0.54	2.600.64	-1.26	0.23
Pelvic fin Base length (PeBL)	1.10±0.21	1.99±0.37	-9.74	0.00*	1.14±0.39	0.53±0.37	-2.50	0.03*
Dorsal fin Base Length (DFBL)	7.12±0.25	8.85±0.33	-1.86	0.05*	3.15±0.56	4.17±0.73	-4.31	0.00*
Anal fin Height (AFH)	3.12±.0.45	3.45±0.44	-1.87	0.09	3.37±0.36	3.70±0.35	-2.60	0.02*
Anal fin Base length (AFBL)	10.52±0.49	11.02±56	-2.60	0.02*	8.26±0.68	9.36±0.56	-3.99	0.00*
Pelvic-Anal fin space (PeAFS)	4.70±0.29	4.82±0.26	-0.99	0.34	4.32±0.52	4.35±0.53	-0.04	0.97
Pectoral-Pelvic fin space (PpeFS)	2.77±0.31	2.77±0.31	-1.92	0.08	3.16±0.41	2.72±0.30	2.91	0.01*

Key *indicates significant difference @ P = 0.05

Table 2: Sex dimorphism in ratio (percentage standard length) among the mormyrid species in Anambra river

	Mormyrus rume				*Hyperopisus bebe*			
Morphometric parameters	Males	Females	T-Value	2-Tail Prob.	Males	Female	T-Value	2-tail Prob.
Total length (TL)	110.8±2.61	107..23±2.18	4.44	0.00*	108.12±4.72	110.18±5.24	-1.16	0.27
Pectoral fin Height (PFH)	11.08±1.41	11.09±1.17	-0.02	0.99	9.99±0.91	9.85±1.25	0.30	0.77
Pectoral fin Base length (PFBL)	3.99±0.64	3.75±1.25	0.53	0.60	3.68±0.75	7.68±1..29	-10.94	0.00*
Pelvic fin Height (PeFH)	9.12±01.07	10.20±1.02	-2.26	0.04*	7.98±1.05	8.35±0.68	-1.21	0.25
Pelvic fin Base length(PeBL)	4.45±1.15	3.56±1.29	3.32	0.01*	2.58±0.87	2.91±1.02	-0.99	0.34
Dorsal fin Base Length (DFBL)	45.51±1.44	42.32±1.75	1.57	0.02*	7.34±0.77	8.46±0.09	-3.73	0.00*
Anal fin Height (AFH)	7.64±0.56	8.86±1.19	-3.45	0.00*	10.07±0.93	8.72±0.82	3.89	0.00*
Anal fin Base length (AFBL)	7.95±0.88	7.49±0.96	1.63	0.13	39.55±1.35	43.96±2.28	-5.29	0.00*
Pelvic-Anal fin space (PeAFS)	18.26±1.48	15.58±0.50	3.05	0.01*	9.42±1.71	11.37±1.07	-2.88	0.01*
Pectoral-Pelvic fin space (PpeFS)	12.60±0.73	13.04±0.08	-1.92	0.08	9.46±1.74	11.37±1.07	-2.75	0.02*
	Campylomormyrus tamandua				*Gnathonemus petersii*			
Morphometric parameters	Males	Females	T-Value	2-Tail Prob.	Males	Female	T-Value	2-tail Prob.
Total length (TL)	105.32±2.22	105..67±2.67	-0.33	0.75	110.76±6.91	105.53±9.33	1.70	0.12
Pectoral fin Height (PFH)	14.41±1.61	16.41±1.98	-4.21	0.00*	12.36±1.43	11.71±1.70	1.27	0.23
Pectoral fin Base length (PFBL)	4.59±0.48	5.42±0.97	-2.43	0.03*	5.02±1.26	5.14±0.88	-0.25	0.81
Pelvic fin Height (PeFH)	11.51±1.05	11.90±1.59	-0.88	0.42	7.23±1.48	6.62±1.47	1.32	0.21
Pelvic fin Base length(PeBL)	3.98±0.77	6.93±1.33	-8.37	0.00*	3.45±1.04	3.88±0.85	-1.27	0.23
Dorsal fin Base Length (DFBL)	25.99±0.90	27.17±1.41	2.52	0.03*	9.30±1.85	10.48±1.79	-1.87	0.04*
Anal fin Height (AFH)	11.40±1.63	11.96±1.61	-0.36	0.41	9.95±1.22	9.43±1.17	1.08	0.30
Anal fin Base length (AFBL)	38.06±2.43	38.24±1.59	-0.22	0.83	24.37±2.36	23.85±2.53	0.44	0.67
Pelvic-Anal fin space (PeAFS)	10.08±1.15	10.25±1.36	-0.47	0.64	9.32±1.17	6.94±1.16	5.40	0.00*
Pectoral-Pelvic fin space (PpeFS)	10.10±1.13	10.18±1.44	-0.22	0.83	9.32±1.17	6.94±1.16	5.40	0.00*

*Key *Indicate significant difference @ P= 0.05*

- Total length (TL): The length from the tip of the snout to the end of the caudal fin.
- Pectoral fin height (PFH): The length of the tallest pectoral fin ray.
- Pectoral fin base length (FBL): The basal length of the pectoral fin.
- Pelvic fin height (PeFH): The length of the tallest pelvic fin ray.
- Pelvic fin base length (PeFBL): The basal length of the pelvic fin i.e. the distance between the anterior base of the first pelvic fin ray to the posterior base of the last pelvic fin ray.

- Dorsal fin base length (DFBL): The distance between the anterior base of the first dorsal fin ray to the posterior base of the last dorsal fin ray.
- Anal fin height (AFH): The length of the tallest anal fin ray.
- Anal fin base length (AFBL): The basal length of the anal fin i.e. the distance between the first and last anal fin rays.
- Pelvic-anal fin space (Pe-AFS): The ventrobasal distance between the posterior end of the pelvic fin and the anterior end of the anal fin.
- Pectoral – pelvic fin space (Ppe-Fs): The ventrobasal distance between the posterior end of the pectoral fin and the anterior end of the pelvic fin.

RESULTS AND DISCUSSION

Sex differentiating characters in the raw data among males and females of all the mormyrid species (Table 1) were detected in 4 (36:4 %) of the 11 studied characters. These include total length, standard length, dorsal fin base length and anal fin base length. In the transformed data (ratio data), the only sex differentiating character among males and females in all the mormyrid species studied was dorsal fin base length (Table 2) These characters are recommended as key characters in mormyrid taxonomy.

Among *M. rume*, sex discrimination occurred in 7 (63.6 %) raw and 6 (60 %) ratio morphometric characters. Four characters (total length, dorsal fin base length, anal fin height and pelvic – anal – fin space) showed sex discrimination both in the raw and transformed (ratio) data. For *H. bebe*, sex discrimination was recorded in 6(54.6 %) raw and 6 (60 %) ratio characters. Three morphometric characters namely dorsal fin base length, anal fin base length and pectoral-pelvic fin space showed sex discrimination both in the raw and transformed data. Sex discrimination occurred in 7(63:6 %) raw and 4(40 %) morphometric characters in *C. tamandua.* Three characters (pectoral fin base length, pelvic fin base length and dorsal fin base length) showed sex discrimination both in the raw and transformed (ratio) data.

Considering *G. petersii*, sex discrimination was recorded in 3 (27.3 %) ratio and 8(80 %) raw morphometric characters. Two characters namely dorsal fin base length and pectoral-pelvic fin space showed sex discrimination both in the raw and transformed (ratio) data.

Similar work in sexual dimorphism among the teleosts has been reported by Libosvarsky and Bishara (1987). Their report demonstrated sexual differences in three characters in *O. niloticus* and seven characters in *T. zilli*. This finding is also similar to the report of Beacham *et al* (1988) who noted sexual dimorphism in four morphometric characters (head width, caudal peduncle depth, anal fin base length and dorsal fin height) between male and female pink salmon *Onchorhychus gorbuscha* in British Columbia. This report also relates to the findings of Reist *et al* (1995) who demonstrated sexual dimorphism in pelvic and anal fin rays among male and female artic char S*alveinus alpinus* from lake Hazen. Furthermore, the present study is consistent with the report of Nwani (1998) who reported sexual dimorphism in four raw morphometric characters (fork length, anal fin height, pectoral – pelvic fin space and pelvic anal fin space) among *Distichodus* species of Anambra river.

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