



Gastrointestinal indices and length weight relationship of Mudskipper (*Apocryptes bato*) from two different habitats along the Bay of Bengal coast

Md. Tuser Mahmud

Roll No: 0123/07

Registration No: 1279

Session: 2023-2024

**A thesis submitted in the partial fulfillment of the requirements for the degree of
Master of Science in Fish Biology and Biotechnology**

Department of Fish Biology and Biotechnology

Faculty of Fisheries

Chattogram Veterinary and Animal Sciences University

Khulshi, Chattogram-4225, Bangladesh

DECEMBER 2024

Authorization

I hereby declare that this thesis is entirely my original work. I grant Chattogram Veterinary and Animal Sciences University (CVASU) the right to share this thesis with individuals or organizations for academic research purposes. Additionally, I authorize CVASU to reproduce this thesis, in full or in part, through photocopying or other means as requested by any individual or organization for academic use. Furthermore, I certify that the electronic version of this thesis provided to the CVASU Library is a true and accurate replica of the printed thesis submitted, within the limits of current technological capabilities.

Md. Tuser Mahmud

December 2024

Gastrointestinal indices and length weight relationship of Mudskipper (*Apocryptes bato*) from two different habitats along the Bay of Bengal coast

Md. Tuser Mahmud

Roll No: 0123/07

Registration No: 1279

Session: 2023-2024

**This is to certify that we have examined the above Master's thesis and have found
that is complete and satisfactory in all respects and that all revisions required by
the thesis examination committee have been made**

.....
Dr. Md. Mahiuddin Zahangir

Supervisor

.....
Dr. Ishrat Zahan Anka

Co-supervisor

.....
Dr. Md. Mahiuddin Zahangir

Chairman of the Examination Committee

Department of Fish Biology and Biotechnology

Faculty of Fisheries

Chattogram Veterinary and Animal Sciences University

Khulshi, Chattogram-4225, Bangladesh

DECEMBER 2024

ACKNOWLEDGEMENT

I am deeply grateful to the Almighty for granting me the strength, perseverance, and patience to successfully pursue and complete my postgraduate studies and thesis for the Master of Science (MS) degree in Fish Biology and Biotechnology.

My sincere appreciation goes to **Dr. Md. Mahiuddin Zahangir**, Associate Professor in the Department of Fish Biology and Biotechnology, CVASU, for his steadfast support, expert guidance, constructive feedback, and constant encouragement, all of which were instrumental in the completion of my work.

I am deeply grateful to **Dr. Ishrat Zahan Anka**, Associate Professor and Head, Department of Aquaculture, Faculty of Fisheries, CVASU, for her invaluable support and guidance.

I am also profoundly thankful to **Shifat Ara Noor and Azmaien Naziat**, Lecturer in the Department of Fish Biology and Biotechnology, CVASU, for their unwavering support, which significantly contributed to my growth as a confident and capable researcher.

I am fortunate to acknowledge the valuable assistance and camaraderie of my fellow researchers, including **Mizanur Rahman, Mahzabin Mariya and Md. Shamim Rahman** whose support and kindness during the research period were greatly appreciated.

Lastly, I am deeply thankful to my parents and friends for their unconditional support, blessings, and sacrifices, which have been my source of strength and motivation throughout this journey.

The Author

Md. Tuser Mahmud

December 2024

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE NO.
	AUTHORIZATION	ii
	SIGNATURE PAGE	iii
	ACKNOWLEDGMENT	iv
	LIST OF PLATES	viii
	LIST OF FIGURES	ix-x
	ABSTRACT	xi
1	INTRODUCTION	1-5
	1.1. Objectives of the study	5
2	REVIEW OF LITERATURE	6-13
	2.1. Mudskipper <i>Apocryptes bato</i>	6-7
	2.2. Length weight relationship	7-8
	2.3. Gastrointestinal indices	8-11
	2.3.1. Visceraosomatic index (VSI)	9
	2.3.2. Hepatosomatic index (HSI)	9-10
	2.3.3. Relative length of gut (RLG)	10
	2.3.4. Intestine somatic index (ISI)	10-11
	2.4. Condition factor (K)	11-12
	2.5. Relative condition factor (Kn):	12-13
3	MATERIALS AND METHODS	14-18
	3.1. Sampling site	14
	3.2. Collection of samples	14
	3.3. Morphometric measurement	15

	3.4. Collection of internal organs	15-16
	3.5. Sex identification	16
	3.6. Calculation the gastrointestinal indices	17-17
	3.6.1. Visceraosomatic index (VSI)	17
	3.6.2. Hepatosomatic index (HSI)	17
	3.6.3. Intestine Somatic index (ISI)	17
	3.6.4. Relative length of gut (RLG)	17-18
	3.6.5. Condition factor (K)	18
	3.6.6. Relative condition factor (Kn)	19
	3.7. Statistical analysis	19
4	RESULTS	20-27
	4.1. Length weight distribution of <i>Apocryptes bato</i>	20
	4.2. Total length and body weight relationship of <i>Apocryptes bato</i>	20-22
	4.3. Standard length-body weight relationship of <i>Apocryptes bato</i>	22-24
	4.4. Gastrointestinal indices Gastrointestinal indices of mudskipper (<i>Apocryptes bato</i>) collected from two different habitats of Bangladesh	24-26
	4.4.1. Viscerosomatic index (VSI)	24
	4.4.2. Hepatosomatic index (HSI)	24-25
	4.4.3. Condition factor (K)	25
	4.4.4. Relative condition factor (Kn)	25- 26
	4.4.5. Relative length of gut (RLG)	26
	4.4.6. Intestine somatic index (ISI)	26-27
5	DISCUSSION	28-32
	5.1. Length weight distribution	28

	5.2. Length weight relationship	28-29
	5.3. Gastrointestinal indices	29-30
	5.3.1. Viscerasomatic index (VSI)	30
	5.3.2. Hepatosomatic index (HSI)	30
	5.3.3. Relative length of gut (RLG)	31
	5.3.4. Intestine somatic index (ISI)	31
	5.3.5. Condition factor (K) and relative condition factor (Kn)	31-32
6	CONCLUSIONS	33
7	RECOMMENDATIONS AND FUTURE PERSPECTIVES	34
8	REFERENCES	35-43
9	BRIEF BIOGRAPHY	44

LIST OF PLATES

PLATE NO.	TITLE	PAGE NO.
1	Study area map	14
2	Mudskipper (<i>Apocryptes bato</i>)	14
3	Measurement of (A) length and (B) weight of fish	15
4	Collection of organs (A) insert scissors in anus (B) cut the fish open organ (C) collected organ	15
5	Measurement of (A) viscera weight (B) liver weight (C) intestine weight (D) intestine length	16
6	Sex Identification (A) male (B) female	16

LIST OF FIGURES

FIGURE NO	TITLE	PAGE NO
1	Total length and body weight relationship of <i>A. bato</i> from two different regions of Bangladesh. (A) Body weight (BW) and total length (TL) of male collected from Chattogram (B) Body weight (BW) and total length (TL) of male collected from Cox's Bazar (C) Body weight (BW) and total length (TL) of female collected from Chattogram (D) Body weight (BW) and total length (TL) of female collected from Cox's Bazar	21
2	Logarithmic relationship between the total length and weight based on pooled data of <i>A. bato</i> from Chattogram (A) and Cox's Bazar (B).	22
3	Standard length (SL) and body weight (BW) relationship of <i>A. bato</i> collected from two different regions of Bangladesh. (A) Body weight and standard length of male collected from Chattogram (B) Body and Standard length of male collected from Cox's Bazar (C) Body weight and standard length of female collected from Chattogram (D) Body weight and standard length of female collected from Cox's Bazar.	23
4	Logarithmic relationship between the standard length and body weight based on pooled data of <i>A. bato</i> from Chattogram (A) and Cox's Bazar (B)	24
5	Gastrointestinal indices: visceral somatic index (VSI) (A) Hepatosomatic index (HSI) (B) of <i>A. bato</i> collected from the Chattogram (CTG) and Cox's Bazar (COX) region of Bangladesh. Asterisks denotes a significant difference	25

	between fishes from Chattogram and Cox's Bazar region (***, $p < 0.001$, and $n = 100$ from both habitats).	
6	Condition factor (K) and relative condition factor (Kn) of <i>A. bato</i> collected from the (A) Chattogram (CTG) and (B) Cox's Bazar (COX) region of Bangladesh. Here, $n = 100$ from both Chattogram and Cox's Bazar region	26
7	Relative length of gut (RLG) (A) and intestine somatic index (ISI) (B) of <i>A. bato</i> collected from the Chattogram (CTG) and Cox's Bazar (COX) region of Bangladesh. Asterisks denotes a significant difference between fishes from Chattogram and Cox's Bazar region (***, $p < 0.001$, and $n = 50$ from both Chattogram and Cox's Bazar region)	27

ABSTRACT

The length weight relationship (LWR) of fish is a crucial aspect of fisheries biology and management, providing information on the growth patterns, health, and ecology of fish populations. For the investigations, live *Apocryptes bato*, a mudskipper species was collected by hand net from two different coastal habitats Chattogram and Cox's Bazar along the coast of Bay of Bengal. The objectives were to compare digestive efficiency, feeding patterns, and growth characteristics of *A. bato* across these two different habitats. The length weight relationship was calculated using a power function ($W = aL^b$). The length weight relationship of *A. bato* was found to have an exponent "b" value of 2.78 and 1.72 (negative allometric growth) for both habitats for the pooled data, while the female in the Chattogram demonstrates positively allometric growth pattern here "b" value was 3.51. Measured gastrointestinal indices revealed that fish in the Chattogram region had higher visceral somatic index (VSI) and hepatosomatic index (HSI) values than fish in the Cox's Bazar region. However, relative length of gut (RLG) and intestine somatic index (ISI) values is comparably lower in the Chattogram region than the Cox's Bazar. In Chattogram and Cox's Bazar region, condition factor (K) ranged from 0.44 – 0.87 and 0.76 – 1.32 respectively and no statistically significant difference ($p > 0.05$) was observed between the K and relative condition factor (Kn) values of fishes from these two different habitats. Results of the present study also showed significant differences in the gastrointestinal indices between the two habitats indicating the necessity of habitat specific management for *A. bato*. Future conservation and management plans for coastal ecosystems can benefit from these findings, which expand our knowledge of how habitat specific factors affect mudskipper growth and feeding physiology.

Keywords: *Apocryptes bato*, Length weight relationship, Gastrointestinal indices, Habitats, Bay of Bengal

