

**BIOCHEMICAL AND MICROBIOLOGICAL ANALYSIS OF STREET SEAFOOD AVAILABLE AT COX’S BAZAR SEA BEACH IN BANGLADESH**

**Jebunnahar Ahmed**

Roll No: 0122/10

Registration No: 1132

Session: July-December, 2023

**A thesis submitted in the partial fulfillment of the requirements for the degree of Master of Science in Fishing and Post-Harvest Technology**

**Department of Fishing and Post-Harvest Technology**

**Faculty of Fisheries**

**Chattogram Veterinary and Animal Sciences University**

**Chattogram-4225, Bangladesh**

**DECEMBER 2023**

**AUTHORIZATION**

**Authorization page**

I hereby declare that I am the sole author of the thesis. I also authorize the Chattogram Veterinary and Animal Sciences University (CVASU) to lend this thesis to other institutions or individuals for the purpose of scholarly research. I further authorize the CVASU to reproduce the thesis by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

I, the undersigned, and author of this work, declare that the electronic copyof this thesis provided to the CVASU Library, is an accurate copy of the print thesis submitted, within the limits of the technology available.

**Author**

**December, 2023**

**BIOCHEMICAL AND MICROBIOLOGICAL ANALYSIS OF STREET SEAFOOD AVAILABLE AT COX’S BAZAR SEA BEACH IN BANGLADESH**

**Jebunnahar Ahmed**

Roll No: 0122/10

Registration No: 1132

Session: July-December, 2023

**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**

**-------------------------------------------**

**Co**-**Supervisor**

**-------------------------------------------**

**Supervisor**

**-------------------------------------------**

**Chairman of the Examination Committee**

**Dr. Md. Faisal**

**Associate Professor and Head**

**Department of Fishing and Post-Harvest Technology,**

**Faculty of Fisheries**

**Chattogram Veterinary and Animal Sciences University**

**Khulshi, Chattogram-4225, Bangladesh**

**DECEMBER 2023**

**ACKNOWLEDGEMENTS**

I am incredibly grateful to the Almighty Allah, for providing me with the fortitude, skill, and perseverance that allowed me to continue further education and complete my thesis for the Master of Science (MS) in Fishing and Post-Harvest Technology.

First and foremost, I would like to express my sincere appreciation to Professor Dr. A.S.M. Lutful Ahasan, Vice-Chancellor of Chattogram Veterinary and Animal Sciences University (CVASU), for providing these research facilities and for giving me a remarkable chance.

My deepest gratitude and respects go out to Prof. Dr. M. Nurul Absar Khan, dean of the CVASU Faculty of Fisheries, who established the master's program and supplied state-of-the-art equipment and a lab for any type of study.

It gives me great pleasure to convey my sincere gratitude, respect, appreciation, and deep sense of indebtedness to my esteemed research supervisor and instructor, Nafisa Nawar Tamzi, Assistant Professor, Department of Fishing and Post-Harvest Technology, Faculty of Fisheries, CVASU, for providing me with the opportunity to conduct research and for her invaluable guidance and unwavering support. Her energy, vision, candor, and inspiration really inspired me. It was a real joy and privilege to work and learn under her direction.

I would like to convey my sincere gratitude and admiration to my honourable co-supervisor, Dr. Md. Faisal, Associate Professor and Head of the Department of Fishing and Post-Harvest Technology, Faculty of Fisheries, CVASU for his helpful suggestions, constructive criticism, and kind cooperation in helping to improve the quality of the research work.

I sincerely thankful to the Prof. Dr. Zonaed Siddiki, Co-ordinator, Advanced Studies and Research (CASR), CVASU, for providing funds so that I could finish my research.

Last but not least, I would want to express my heartfelt gratitude and respect to my parents and all family members for their unwavering love, support, inspiration, blessings, and moral guidance during my whole course. Gratitude

|  |  |  |
| --- | --- | --- |
| **Table of Contents** | | |
| **Chapter** | **Title** | **Page No.** |
|  | **Authorization** | ii |
| **Acknowledgements** | iv |
| **List of Contents** | v-viii |
| **List of Abbreviations** | ix |
| **List of Tables** | x |
| **List of Figures** | xiii-xiv |
| **List of Plates** | xi |
| **List of Flowcharts** | xii |
| **Abstract** | xv |
|  | **Introduction** | 01- 04 |
| 1.1. Background | 01-03 |
| 1.2. Objectives of the Study | 04 |
|  | **Review of Literature** | 05-08 |
| 2.1. Street Vending Seafood | 05 |
| 2.2. Consumer demand for Seafood | 05 |
| 2.3. Health Effects of Seafood Consumption | 05-06 |
| 2.4. Contamination of Seafood | 06 |
| 2.5. Microbiological standards of street foods in Bangladesh | 06-07 |
| 2.6. Microbiology of street seafood | 07 |
| 2.7. Proximate Composition of Seafood | 07-08 |
| 2.8. Socioeconomic status of street food vendors | 08 |
|  | **Materials and Methods** | 09-25 |
| 3.1. Study Area | 09 |
| 3.2. Collection and transportation of sample | 10 |
| 3.3. Socioeconomic data collection of seafood vendors | 10-11 |
| 3.4. Ethical Consideration | 11 |
| 3.5 Sensory attributes of street seafood | 11-12 |
| 3.6. Proximate composition analysis of street seafood  3.6.1. Sample Preparation  3.6.2. Protein determination  3.6.3. Lipid determination  3.6.4. Ash determination  3.6.5. Moisture determination | 12-16 |
| 3.7. Microbiological analysis of Seafood  3.7.1. Total plate count  3.7.1.1. Media Preparation  3.7.1.2. Serial Dilution and Sample Inoculation  3.7.2. *E. coli* Determination  3.7.3. *Vibrio spp*. Identification  3.7.4. *Salmonella, Shigella* Identification | 16-25 |
| 3.8. Statistical Analysis | 25 |
|  | **Results** | 26-45 |
| 4.1. Sensory quality assessment of street seafood  4.1.1. Bombay Duck(*Harpadon nehereus*) products  4.1.2. Crab(*Scylla serrata*)products  4.1.3. Shrimp*(Penaeus monodon)* products | 26-31 |
| 4.2. Proximate composition analysis of street seafood  4.2.1. Bombay Duck *(Harpadon nehereus)* products  4.2.2. Crab (*Scylla serrata*) products  4.2.3. Shrimp*(Penaeus monodon)* products | 32-34 |
| 4.3. Microbiological assessment of Seafood  4.3.1. Total Plate Count  4.3.1.1 Bombay Duck*(Harpadon nehereus)*  products  4.3.1.2 Crab(*Scylla serrata*) products  4.3.1.3 Shrimp*(Penaeus monodon)* products  4.3.2 Presence of Pathogenic Bacteria  4.3.2.1 Kolatoli  4.3.2.2 Sugondha  4.3.2.3 Laboni | 35-36 |
| 4.4 Socioeconomic status of seafood vendor  4.4.1 Age and religion  4.4.2 Marital status and education  4.4.3 Income level  4.4.4 Product preparation  4.4.5 Type of selling infrastructure  4.4.6 Price range  4.4.7 Family size  4.4.8 Raw material quality  4.4.9 Consumer preference | 36-41 |
|  | **Discussion** | 42-46 |
| 5.1 Sensory quality of seafood | 42 |
| 5.2 Proximate composition analysis of street seafood  5.2.1 Bombay Duck *(Harpadon nehereus)* Products  5.2.2 Crab(*Scylla serrata*) Products  5.2.3 Shrimp*(Penaeus monodon)* Products | 42-43 |
| 5.3 Microbiological Assessment of Seafood  5.3.1. Total Plate Count (TPC)  5.3.2. Presence of Pathogenic Bacteria | 43-44 |
| 5.4 Socioeconomic status of seafood vendors  5.4.1Age and religion  5.4.2 Marital status and education  5.4.3 Income level  5.4.4 Product preparation  5.4.5 Type of selling infrastructure  5.4.6 Price range  5.4.7 Family size  5.4.8 Raw material quality  5.4.9 Consumer preference | 44-46 |
|  | **Conclusions** | 47 |
|  | **Recommendations** | 48 |
|  | **References** | 49-53 |
| **Appendix** | 54-65 |
| **Brief Biography** | 66 |

|  |  |
| --- | --- |
| **List of abbreviations** | |
| **Short Form** | **Abbreviation** |
| **%** | Percent |
| **+ve** | Positive |
| **°C** | Degree Celcius |
| **ANOVA** | One-way Analysis of Variance |
| **AOAC** | Association of Official Analytical Chemists |
| **Cm** | Centimeter |
| **CVASU** | Chattogram Veterinary and Animal Sciences University |
| **DOF** | Department of Fisheries |
| **et al.** | And his associates |
| **FGD** | Focus Group Discussion |
| **Gm** | Gram |
| **HSC** | Higher School Certificate |
| **SD** | Standard Deviation |
| **SPSS** | Statistical Package for the Social Sciences |
| **SSC** | Secondary School Certificate |
| **-ve** | Negative |

|  |  |  |
| --- | --- | --- |
| **List of Tables** | | |
| **Sl No** | **Contents** | **Page no** |
|  | Microbiological Quality(CFU per gram) for Standard Plate Count | 07 |
|  | Sensory quality of collected Bombay duck*(Harpadon nehereus)* products from the study areas | 26 |
|  | Sensory quality of Collected Crab *(Scylla serrata)*products from the study areas | 28 |
|  | Sensory quality of collected Shrimp*(Penaeus monodon)* products from the study areas | 29-30 |
|  | Organoleptic characteristics of three products from the three points of Cox’s Bazar, Bangladesh | 31 |
|  | Proximate composition of the three products collected from the study areas by One-way ANOVA | 34 |
|  | Colony forming per mL (CFU/mL) in Total Plate Count | 35 |
|  | Presence of pathogenic bacteria in collected samples | 36 |

|  |  |  |
| --- | --- | --- |
| **List of Plates** | | |
| **Sl No** | **Contents** | **Page no** |
|  | Colour analysis for E.coli determination | 29 |
|  | Colour analysis for *Vibrio spp* determination | 23 |
|  | Colour analysis for *Salmonella* and *Shigella spp* determination | 25 |

|  |  |  |
| --- | --- | --- |
| **List of Flow Chart** | | |
| **Sl No** | **Contents** | **Page no** |
|  | *E.coli* determination | 19 |
|  | *Vibrio cholera* Identification | 21 |
|  | *Vibrio parahaemolyticus* Identification | 22 |
|  | Detection of *Salmonella and Shigella spp* | 24 |

|  |  |  |
| --- | --- | --- |
| **List of Figures** | | |
| **Sl No** | **Contents** | **Page no** |
|  | Map of sampling sites | 09 |
|  | Collection of sample | 10 |
|  | Data Collection | 11 |
|  | Sensory Evaluation | 11 |
|  | Sample Preparation | 12 |
|  | Protein Determination | 13 |
|  | Lipid Determination | 14 |
|  | Determination of Ash | 15 |
|  | Moisture Determination | 16 |
|  | Total Plate Count | 17,18 |
|  | Sample inoculation | 20 |
|  | Mean values of proximate composition of Bombay Duck products collected from the study areas | 32 |
|  | Mean values of proximate composition of Crab products collected from the study areas | 33 |
|  | Mean values of proximate composition of Shrimp products collected from the study areas | 34 |
|  | Status of age and religion of the participants | 37 |
|  | Status of marital status and education of the participants | 37 |
|  | Status of monthly income in the study areas | 38 |
|  | Status of product preparation type in the study areas | 38 |
|  | Status of infrastructure in the study areas | 39 |
|  | Status of price range of different products in the study areas | 39 |
|  | Status of family size of the participants in the study areas | 40 |
|  | Status of raw material quality in the study areas | 41 |
|  | Status of consumer preference of different products | 41 |

**Abstract**

The present study was conducted on the sensory quality, proximate composition, microbial status of Bombay duck, Crab, Shrimp product from Kolatoli, Sugandha, and Laboni areas of Cox’s Bazar and revealing the socioeconomic condition of seafood vendors in Cox’s Bazar. A cross-sectional study with a laboratory component was carried out on sea food sellers, chosen using a methodical random sample process. The primary means of gathering data were structured questionnaire Data was first coded then entered into Microsoft Excel database and later analyzed using SPSS. The results of the study indicated that a wide range of socioeconomic factors had a substantial influence on the livelihood. People, below 30 years (50% from Laboni) were mostly engaged in vending and majority (30-50%) of them received education up to primary level. Overall, it was found that socioeconomic situation of Laboni was better among three. Organoleptic assessment demonstrated that the seafood was suitable for human consumption and showed no significant difference (p>0.05) in texture and hygiene. There was significant variation (p < 0.05) in the color and odor of Loitta products but not among the Crab and Shrimp products. The overall sensory quality was found “Excellent” in Kolatoli among the three study areas. The proximate composition was recorded with no significant variation (p>0.05) among three study areas. Moisture content ranged from 61.61±1.47% to 70.86±1.67, the highest found in Crab products from Sugondha.Protein value varied from 14.04±0.49% to 18.17±1.40%, the highest value of protein in shrimp products of Kolatoli.The highest (13.59±0.02%) lipid content was found in Loitta from Sugondha and lowest (1.80±0.17%) content was found in crab product from Laboni. In terms of Ash, it varied from 1.31± 0.02% (Loitta) to 5.60±0.62% (Crab). Microbiology, All the samples had no significant variation (p>0.05) in Loitta and crab products. The highest bacterial load (5.65×107 CFU/mL)was found from Shrimp of Sugondha and the lowest bacterial load (3.46×107 CFU/mL) was found from loitta of Kolatoli. The pathogenic bacterial species *E. coli* and *Vibrio parahaemolyticus* were found in all products except crab. Nonetheless, the findings of this study can help us to acknowledge the better quality of street seafood. According to the report, hygienic procedures and sanitation facility need to be improved.

**Keywords:** Street seafoods; Sensory quality; Proximate composition; Microbial status.