STRANDED MARINE DEBRIS AND MANAGEMENT ON THE BAZARTETE COASTLINE: RELATING TO THE MANGROVE ECOSYSTEM IN LIQUIÇA MUNICIPALITY OF TIMOR-LESTE

ALZIRA DE JESUS DOS SANTOS

MASTER PROGRAM
COASTAL AND MARINE RESOURCES MANAGEMENT
FACULTY OF FISHERIES AND MARINE SCIENCES
IPB UNIVERSITY
BOGOR
2025

STATEMENT REGARDING THE THESIS AND INFORMATION SOURCES, AND ASSIGNMENT OF COPYRIGHT

I hereby declare that the thesis with the title "Stranded marine debris and management on the Bazartete coastline: relating to the mangrove ecosystem in Liquiça Municipality of Timor-Leste" is my work with direction from my supervisor and has not been submitted in any form to any university. Sources of information originating or quoted from published or unpublished works from other authors have been mentioned in the text and included in the Bibliography at the end of this thesis.

I hereby assign the copyright of my written work to the IPB University.

Bogor, July 2025

Alzira de Jesus dos Santos
C2502231801

SUMMARY

ALZIRA DE JESUS DOS SANTOS: Stranded Marine Debris and Management on the Bazartete Coastline: Relating to the Mangrove Ecosystem in Liquiça Municipality of Timor-Leste. Supervised by ARIO DAMAR, SIGID HARYADI and ABILIO DA FONSECA

Timor-Leste's coastal regions are resource-rich, but marine pollution is becoming more of an issue and unmanaged plastic and other waste from neighbouring cities are leaking into the coastal environment, exposing mangrove trees in Bazartete, Liquiça Municipality. Timor-Leste as a small island developing state (SIDS), faces challenges in managing solid debris, especially plastic waste, which endangers public health and marine biodiversity. Debris, especially large plastic waste, often blocks mangroves, which are vital for fish habitats and shoreline protection. This changes sediment conditions and hinders seedling growth. The buildup of marine debris in Bazartete seems to affect benthic organisms, decrease species diversity, and contaminate the soil and water.

This study aims to analyzes the types, abundance and composition of marine debris in the mangrove ecosystem of Bazartete, Liquiça Municipality, assesses its impacts on macrozoobenthos and mangrove regeneration, evaluates current waste management practices, and proposes strategic recommendations for sustainable marine debris management and ecosystem mitigation in the area. Data collection was conducted in the period between 6 September 2024 to 30 October 2024 by applying survey techniques and direct primary data collection at three stations the research location. The data analyzed quantitative and qualitatively.

This study found that plastic is the dominant type of marine debris across all research stations, with Tibar with the highest levels abundance by weight (86.52 gr/m²), density (1.62 items/m²), and volume (3.00 cm³/m²), while debris composition overall included seven categories: plastic, metal, glass, rubber, fabric, organic, and other inorganic materials, indicating a widespread pollution issue particularly impacting macrozoobenthos (r = -0.3352) and to a lesser extent mangrove seedlings (r = -0.0594). Although community awareness and participation in cleanups are relatively strong, marine debris management in Bazartete remains ineffective due to weak infrastructure, institutional gaps, and lack of integration with mangrove conservation, thereby requiring seven strategic, ecosystem-based interventions to strengthen sustainable coastal management in Liquiça Municipality.

Keywords: Coastal area, Liquiça Municipality, macrozoobenthos, mangrove's seedlings, marine debris

RINGKASAN

ALZIRA DE JESUS DOS SANTOS: Sampah Laut yang Terdampar dan Pengelolaanya di Pesisir Bazartete: Hubungannya dengan Ekosistem Mangrove di Provinsi Liquiça, Timor-Leste. Dibimbing oleh ARIO DAMAR, SIGID HARYADI dan ABILIO DA FONSECA

Wilayah pesisir Timor-Leste memiliki kekayaan sumber daya alam, namun kini menghadapi ancaman serius akitab polusi laut. Di Bazartete, Liquiça, hutan bakau tercemar oleh sampah plastik dan jenis limbah lainnya yang tidak terkelola dan berasal dari pemukiman sekitar. Sebagaimana negara kepulauan kecil yang sedang berkembang (SDIS), Timor-Leste masih menghadapi tantangan besar dalam pengelolaan sampah padat, khususnya sampah plastik, yang berdampak buruk terhadap kesehatan masyarakat dan keanekaragaman hayati laut. Sampah, terutama plastik berukuran besar, sering terperangkap di antara akar bakau, menghalangi pertumbuhan bibit dan menganggu struktur sedimen. Penumpukan sampah laut di kawasan ini diduga menyebabkan penurunan keanekaragaman species, merusak organisme bentik, serta mencemari tanah dan perairan di sekitarnya.

Penelitian ini bertujuan untuk menganalisis jenis, kelimpahan, dan komposisi sampah laut yang terdampar di ekosistem mangrove di Kecamatan Bazartete, Kabupaten Liquiça, menilai dampaknya terhadap komunitas makrozoobentos dan regenerasi mangrove, mengevaluasi praktik pengelolaan sampah yang telah diterapkan, serta merumuskan rekomendasi strategi pengelolaan sampah laut yang berkelanjutan dan upaya mitigasi terhadap ekosistem di wilayah studi..Pengumpulan data dilakukan pada periode 6 September 2024 hingga 30 Oktober 2024 dengan menggunakan teknik survei dan pengumpulan data primer langsung di tiga stasiun lokasi penelitian. Data dianalisis secara kuantitatif dan kualitatif.

Penelitian ini menemukan bahwa limbah plastik merupakan jenis sampah laut yang paling dominan di semua stasiun penelitian, dengan Tibar mencatat akumulasi tertinggi berdasarkan berat (86,52 gr/m^2), kepadatan (1,62 item/m^2), dan volume (3,00 cm^3/m^2). Komposisi sampah laut secara keseluruhan mencakup tujuh kategori—plastik, logam, kaca, karet, kain, organik, dan anorganik lainnya—yang menunjukkan tingkat pencemaran yang meluas dan berdampak negatif terutama terhadap komunitas makrozoobentos ($r = -0,3352$) serta sedikit memengaruhi regenerasi semai mangrove ($r = -0,0594$). Meskipun kesadaran masyarakat dan partisipasi dalam kegiatan pembersihan cukup tinggi, pengelolaan sampah laut di Bazartete masih belum efektif akibat lemahnya infrastruktur, kurangnya koordinasi kelembagaan, serta tidak terintegrasinya konservasi mangrove dengan sistem pengelolaan limbah. Oleh karena itu, penelitian ini merekomendasikan tujuh strategi berbasis ekosistem dan pemberdayaan masyarakat untuk memperkuat tata kelola pesisir yang berkelanjutan di Kabupaten Liquiça.

Kata kunci: Wilayah pesisir, Provinsi Liquiça, makrozoobentos, anak anakan mangrove, sampah laut

STRANDED MARINE DEBRIS AND MANAGEMENT ON THE BAZARTETE COASTLINE: RELATING TO THE MANGROVE ECOSYSTEM IN LIQUIÇA MUNICIPALITY OF TIMOR-LESTE

ALZIRA DE JESUS DOS SANTOS

Thesis
as one of the requirements to obtain
a Master of Science Degree
in the Coastal and Marine Resources Management Study Program

MASTER PROGRAM
COASTAL AND MARINE RESOURCES MANAGEMENT
FACULTY OF FISHERIES AND MARINE SCIENCES
IPB UNIVERSITY
BOGOR
2025

Thesis Examiner Team:
1. Dr. Ir. Gatot Yulianto, M.Si.
2. Dr. Ir. Zairion, M.Sc.

Thesis Title : Stranded Marine Debris and Management on the Bazartete Coastline: Relating to the Mangrove Ecosystem in Liquiça Municipality of Timor-Leste

Name : Alzira de Jesus dos Santos

NIM : C2502231801

Approved by

Supervisor 1:
Prof. Dr. Ir. Ario Damar, M.Si.

Digitally signed by:
Ario Damar
Date: 10 Jul 2025 15.54.37 WIB
Verify at disign.ipb.ac.id

Supervisor 2:
Dr. Ir. Sigid Hariyadi, M.Sc.

digitally signed
disign.ipb.ac.id

Supervisor 3:
Abilio da Fonseca, Ph.D.

Acknowledged by

Head of the Study Program
Coastal and Marine Resources Management:

Dr. Ir. Zairion, M. Sc
NIP. 19640703 199103 1003

digitally signed
disign.ipb.ac.id

Dean of Faculty of Fisheries and Marine Sciences

Prof. Dr. Ir. Fredinan Yulianda, M.Sc
NIP. 19630731 198803 1002

digitally signed
disign.ipb.ac.id

Exam Date: June 18, 2025

Graduation Date:

PREFACE

I would like to express my deepest gratitude to God Almighty. Praise and thanks are devoted to the Lord Jesus Christ for His abundant wisdom, grace, and blessings, which have enabled the completion of this scientific work. This research was carried out from September to October 2024 under the title: *"Stranded marine debris and management on the bazartete coastline: relating to the mangrove ecosystem in Liquiça Municipality of Timor-Leste".* The study was conducted as part of the requirements for the Master of Science Program in Coastal and Marine Resources Management at IPB University.

This research was motivated by a growing concern for the impacts of marine debris on the fragile mangrove ecosystems along the Bazartete coastline. Recognizing the importance of mangrove in supporting biodiversity, protecting coastal areas, and sustaining livelihoods, this study seeks to assess the extent of stranded debris and explore appropriate management strategies that can support environmental conservation efforts in the region.

My wishes to extend my gratitude to the Archipelagic Island States (AIS) forum, supported by UNDP and IPB University Indonesia, for their support and opportunity. Deep appreciation is also given to Universidade Nacional Timor Lorosa'e (UNTL), particularly Department of Fisheries and Marine Science, for providing essential research equipment and academic input, along with the generous assistance from the staff of the Marine Science Program (MSP) who kindly facilitated additional equipment during fieldwork.

I would like to express sincere and heartfelt appreciation to all those who have contributed to the successful completion of this research. Special thanks go to my supervisors, Prof. Dr. Ir. Ario Damar, M.Si., Dr. Ir. Sigid Hariyadi, M. Sc, and Abilio da Fonseca, Ph. D for their invaluable guidance, feedback, and support throughout the research process. I also appreciate to the external examiner Dr. Gatot Yulianto and Dr. Zairion (Associate Professor), and it is also Professor Dr. Luky Adrianto, Professor Dr. Hefni Effendy, Dr. Fery Kurniawan, Dr. Sebastian C.A Fers, and all lecturer in IPB University.

To my friends who stood by my side during the research, offering encouragement, assistance, and companionship and especially to my family for their endless patience, moral support, and love, words cannot fully express the depth of gratitude. I hope that this scientific work will not only benefit those who engage with it academically but also contribute meaningfully to efforts in marine conservation and environmental management in Timor-Leste and beyond.

Bogor, July 2025

Alzira de Jesus dos Santos

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES