



AGUHON

A Philippine Maritime History Journal

Volume 3, Issue Number 1





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AGUHON
A PHILIPPINE MARITIME HISTORY
AND HERITAGE JOURNAL

THEMATIC ARTICLES
FROM THE MUSEO MARITIMO
INTERNSHIP PROGRAM

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About the Journal

A. Objective of the Academic Journal

In line with the vision of the Asian Institute of Maritime Studies (AIMS) to become the “Home of Maritime, Engineering, and Heritage Knowledge Exchange” in the country, AIMS Museo Maritimo has established *Aguhon: A Philippine Maritime History and Heritage Journal*. *Aguhon* is a non-refereed journal that aims to provide a platform for research related to maritime history and heritage.

As a developing field within historical studies, maritime history remains a growing area of interest. *Aguhon* seeks to contribute to the ongoing discourse and body of literature on the subject. As a non-refereed journal, it prioritizes creating a space for initial discussions and assembling foundational works that may later evolve into peer-reviewed and specialized academic research.

This pioneering initiative reflects AIMS Museo Maritimo’s broader commitment to building a comprehensive repository of maritime knowledge—one that can support the nation-building efforts of a maritime Philippines.

Most importantly, *Aguhon* is a thematic journal whose content provides the contextual foundation for the exhibitions curated by AIMS Museo Maritimo.

B. Background of the Academic Journal

Aguhon is a Tagalog translation of a compass. Since the locus of (AIMS) Museo Maritimo is maritime heritage and history, the adoption of a compass to signify the academic journal complements the identity and story of the museum. A compass is a necessary instrument for navigation. It guided sailors through centuries. In conjunction to the purpose of a compass, the journal also intends to support and navigate maritime related studies in the Philippines.

Editor

The editor's responsibilities include both copy-editing and proofreading. In addition to these tasks, the editor oversees and manages the overall operations of the academic journal. The editor is also responsible for ensuring that the journal's thematic content aligns with the exhibitions of AIMS Museo Maritimo, with the journal serving as a contextual foundation for these exhibitions.

Head Editor: Mr. Daryl Lorence P. Abarca

Editor: Ms. Nina Ricci D. Racela

A Letter from the Editor

Dear Reader,

It is with great pride and honor that we present the third volume of *Aguhon: A Philippine Maritime History and Heritage Journal*. In exploring the multifaceted identity of the Philippines, scholars have adopted various interpretative frameworks—from class struggle and historical materialism to ecclesiastical influence and cultural hybridity. Yet, no single perspective fully encapsulates the richness of the Filipino experience.

At Museo Maritimo, our perspective is rooted in the maritime legacy of the archipelago. We view the Philippines as a nation shaped by the sea—its people, culture, economy, and identity deeply intertwined with its maritime environment. This volume of *Aguhon* continues our commitment to exploring this perspective by presenting scholarly and interdisciplinary articles that examine the Philippines as a maritime nation-state.

Volume III takes a unique curatorial turn by featuring special articles centered on the history and significance of individual maritime objects. These items, each strategically displayed on specific decks of the Lighthouse building, complement the broader narrative introduced in Volume I and the items explored in Volume II. Through these artifacts, we gain a deeper understanding of the different layers of the Philippine maritime story—each object offering insight into why the Philippines

must be viewed as a maritime nation-state, not merely by geography, but by history, culture, and lived experience.

We extend our heartfelt gratitude to our authors, whose dedication and scholarly rigor made this volume possible. Their research has enriched the journal with diverse perspectives and thematic depth. More importantly, their work helps establish *Aguhon* as a vital platform for interdisciplinary discourse on Philippine maritime history and heritage.

We are also profoundly thankful to our readers—your time, attention, and engagement with our work are the highest forms of recognition. Your continued support drives us to delve deeper and work harder in preserving and sharing the maritime story of our nation.

This endeavor would not have been possible without the unwavering support of our Vice President for Student Services and Development, Dr. Lamberto G. Mindanao, whose guidance and encouragement have been instrumental in the journal's development. We also extend our sincere thanks to Mr. Juan Martin R. Guasch, whose direction and diligence were crucial to the journal's design and production.

Finally, we acknowledge the enduring support of the VPSS Office and the Polytechnic University of the Philippines Department of History. On behalf of the entire editorial team, we thank you for joining us in this voyage through the maritime heritage of the Philippines. We hope that *Aguhon* continues to

inspire, educate, and provoke thoughtful reflection on what it truly means to be a maritime nation.

Sincerely,

Mr. Daryl Lorence P. Abarca

Editor

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Contents

Bahay Kubo and Sea Spices: The Maritime and Culinary Legacy of Pre-Colonial Philippines <i>Jonalyn S. Arnaiz</i>	1
The Maritime Legacy of Manila Hemp: Spanish Arrival and the Global Introduction of Manila Hemp in Rope Production <i>Jericho Babista</i>	28
Signals Across the Seas: Maritime Smoke Signals and the Scattered Societies of the Philippines <i>Angelo Miguel A. Nuestro</i>	66
Enhancing Maritime Safety in the Philippines: The Evolution and Impact of Barometric Technology on Typhoon Forecasting and Navigational Resilience <i>Jevic L. Moreno</i>	81
Enhancing Maritime Safety and Efficiency: The Role of GPS (Global Positioning System) in Philippine Fishing Vessel Operations <i>Vielka Lanz Iryl R. Quinante</i>	105

Preface

The Philippines is a nation of profound ethnic, cultural, and historical complexity. Situated at the crossroads of the Asia-Pacific, it has, for thousands of years, been a meeting point of civilizations. Its people — shaped by successive waves of migration, trade, and colonization — embody a synthesis of major cultural traditions: Austronesian seafaring roots, Indo-Malay influences, Sino trade networks, Islamic scholarship, Hispanic colonial legacies, and Anglo-American modernity. These cultural currents, flowing through centuries, have forged the Filipino identity — unique, resilient, and ever-evolving.

In this third volume of *Aguhon*, we delve deeper into this maritime foundation by exploring the curated collections of the AIMS Museo Maritimo. Each artifact featured in this issue is not merely a display piece but a vital part of a larger story — each item curated within a specific deck of the Lighthouse building to illuminate a segment of the Museum’s overarching narrative. These objects serve as historical anchors, revealing how the sea has long connected, sustained, and defined the Filipino people.

At the heart of this volume is a central question: *Why is the Philippines a maritime nation-state?* Through scholarly reflections and interpretive essays, we examine how the country’s archipelagic nature, surrounded by vast seas and traversed by ancient trade routes, shaped the trajectory of its history. From early Austronesian navigators to the galleon

trade, from Muslim sultanates to modern port cities, the Philippine story is inescapably maritime.

We invite readers to journey with us through these collections — not just to observe history, but to engage with it. By understanding the waves of migration and cultural exchange that converged across these islands, we gain insight into the making of a nation that is both pluralistic and unified by the sea.

Together, let us rediscover how the Philippines' archipelagic geography, maritime heritage, and enduring relationship with the sea continue to shape its people, culture, and place in the world.

Bahay Kubo and Sea Spices: The Maritime and Culinary Legacy of Pre-Colonial Philippines

Jonalyn S. Arnaiz

Abstract

Pre-colonial Philippines became a region with a vibrant and complex maritime culture that played a pivotal role in shaping its history. The archipelago's rich maritime history can be traced back through various historical records and studies, reflecting a deep connection among its people and the sea. Maritime trade was a cornerstone of pre-colonial Philippine society. Historic resources consisting of the look at through Bobby Orillaneda on maritime exchange during the 15th century highlight how early Filipinos engaged in significant change networks with neighboring regions, which includes China, Malaysia, and Indonesia.¹

This study delves into the captivating global of pre-colonial Philippines, in which maritime trade routes and folk traditions just like the folk song "Bahay Kubo" reveal the profound effect of spices on the Philippines' history and way of life. The observation uncovers how those humble elements were as soon as the lifeblood of thriving trade networks, shaping not only the Filipino food plan however additionally the social and financial landscapes of the time but, this rich heritage is

¹ Bobby Orillaneda, "Maritime Trade in the Philippines during the 15th Century CE" (PDF, Academia.edu), accessed August 14, 2024.

vulnerable to being forgotten, as the significance of those spices fades from public memory through exploring the intersections of maritime trade, cuisine, and cultural expressions, this work targets to rekindle appreciation for the Philippines' vibrant beyond and its pivotal role within the worldwide spice trade.

Key Words: Bahay Kubo, Filipino Cuisine, Maritime Trade, Pre-colonial Philippines, Spices

Introduction

The pre-colonial Philippines boasted a rich maritime heritage that played a vital role in shaping its historical and cultural landscape. Located strategically in Southeast Asia, the archipelago was a hub of massive maritime trade networks, connecting it to distant areas like China, Malaysia, and Indonesia.² This vibrant alternate community not only facilitated the trade of products but additionally fostered cultural

interactions that enriched nearby traditions, with spices emerging as a key commodity in this global exchange.³ Spices had been critical not only to the trade but also to Filipino delicacies, infusing neighborhood dishes with flavors and contributing to the cultural tapestry of the time.⁴ The concept of the "Bahay Kubo," or nipa hut, stands as a symbol of the pre-colonial Filipino way of lifestyles, embodying sustainable living and communal values deeply linked to the environment

² Emma Helen Blair and James Robertson, eds., *The Philippine Islands, 1493-1898*, vol. 44 (1700-1736) (Google Books, 2014)

³ Xu, Guanmian. 2021. "Pepper to Sea Cucumbers: Chinese Gustatory Revolution in Global

History, 900-1840." Academia.edu. 2021.

⁴ Fernandez, Doreen. 1987. *Historias, Crónicas, Vocabularios: Some Spanish Sources for Research in Philippine Food*. *Philippine Studies* 35, no. 3 (1987): 279–95.

and maritime practices.⁵ This folk tradition, highlighted in songs and cultural expressions, reflects the wider importance of maritime trade and cultural practices. This study will examine the historical and cultural effect of spices in pre-colonial Philippines through the lens of maritime exchange and cultural expressions such as the folk song "Bahay Kubo," revealing how these factors interwoven with spices contributed to the archipelago's rich history and global trade networks.

Philippines in the Global Spice Trade

The pre-colonial Philippines was uniquely positioned in Southeast Asia, serving as an essential nexus inside the regional and global spice change. Its strategic location alongside prominent maritime routes made it an critical hub for the exchange of spices such as ginger, turmeric, and pepper. Those spices, incredibly valued for their culinary and medicinal properties, have been crucial to trade networks that spanned from Asia to Europe and beyond. Ancient sources underscore the Philippines' function as a central player on this global trade, with its herbal

⁵ "Bahay Kubo: Mga Aral Doon ay Sari-Sari." *Abante News*. December 26, 2020.

harbors and navigable waterways facilitating the movement of spices between main generating areas and worldwide markets.⁶ ⁷ The archipelago's role allowed it to serve not only as a trading post but also as a key transshipment point in which spices were redistributed to diverse parts of the world.

The significance of the Philippines in the spice trade is further illustrated by its interactions with neighboring regions. Historical records indicate that Filipino traders

engaged significantly with merchants from China, Malaysia, and Indonesia, developing a vibrant trade of goods and cultural practices.⁸ This engagement became not limited to the trade of spices alone but extended to other goods and cultural artifacts, enriching the local traditions and fostering a multicultural environment inside the archipelago. The worldwide call for spices and the Philippines' strategic role contributed to its prominence in maritime trade routes, underscoring its historical importance in global trade networks.⁹

⁶ Blair and Robertson, *The Philippine Islands*, vol. 44.

⁷ Orillaneda, "Maritime Trade in the Philippines."

⁸ Lockard, Craig A. "Pepper to Sea Cucumbers: Chinese Gustatory Revolution in Global History, 900-

1840." PDF, Academia.edu. Accessed August 14, 2024.

⁹ Jone S. Baravilala, "Spices of the Pacific Region with Special Reference to Vanilla and Ginger Production: Challenges and the Way Forward," (PDF,

Impact on Filipino Cuisine and Culture

The impact of the spice trade on nearby communities in pre-colonial Philippines became profound and multifaceted. The widespread trade networks established with neighboring regions which include China, India, and the Arab international not only facilitated the flow of spices but moreover contributed substantially to the financial improvement of nearby communities.^{10 11} The influx of wealth generated from the spice trade precipitated the boom of local markets,

which in turn supported diverse economic activities and livelihoods. The trade facilitated the rise of local industries focused around the production and processing of spices, leading to increased financial opportunities and social mobility for many Filipinos. Furthermore, the spice exchange prompted social structures and cultural practices within the archipelago. The introduction of spices into local delicacies brought about great adjustments in dietary practices, as spices have become crucial to Filipino culinary traditions.

ResearchGate, accessed August 16, 2024).

¹⁰ Fernandez, "Historias, Crónicas, Vocabularios," 279-295.

¹¹ Anupam K.R. Sachan, Sunil Kumar, Kiran Kumari, and Deepti Singh, "Medicinal Uses of Spices

Used in Our Traditional Culture: Worldwide," *Journal of Medicinal Plants Studies** 6, no. 3 (2018): 116-122, ISSN (E): 2320-3862, ISSN (P): 2394-0530, accessed August 16, 2024.

This incorporation of spices not only enriched the local food lifestyle however additionally contemplated broader economic and cultural modifications resulting from increased trade interactions.¹²

The spice trade played an essential function in shaping the economic and cultural material of pre-colonial Philippines. The archipelago's strategic location enabled it to become a considerable player in local and international spice trade networks, with profound implications for nearby

communities. The economic benefits of the trade contributed to the development of neighborhood markets and industries, at the same time as the cultural exchanges facilitated through the trade enriched Filipino traditions and practices. Through its function inside the spice trade, the pre-colonial Philippines confirmed its significance in international trade and its potential to influence cultural and economic tendencies across the area and beyond.¹³

Spices have had a profound impact on Filipino cuisine,

¹² Md. A. J. Khan, et al., "Sauces, Spices, and Condiments: Definitions, Potential Benefits, Consumption Patterns, and Global Markets," (PDF, ResearchGate, accessed August 16, 2024).

¹³ M. L. Stewart, "Social and Cultural Influences on Food Choices: A Review," (PDF, ResearchGate, accessed August 16, 2024).

shaping each traditional dish and everyday cooking practices. essential spices such as ginger, turmeric, and pepper were crucial to Filipino cooking for centuries, contributing to the unique flavors of numerous traditional dishes. For instance, the use of turmeric and ginger in dishes like tinola (a chicken stew) and sinigang (a sour soup) is a testament to the deep integration of these spices into Filipino culinary practices.¹⁴ Those spices are not only valued for their flavors but also for his or her health advantages, reflecting a long-status tradition of the use of spices for medicinal purposes. The combination of spices into

Filipino delicacies is likewise evident in the culinary practices of diverse regions. The bicol express, a spicy dish from the Bicol region, prominently features chili peppers, showcasing how local delicacies have advanced around the use of specific spices.¹⁵ Traditional Filipino food practice regularly entails complex spice blends that enhance both the flavor and dietary value of dishes, underscoring the role of spices inside the culinary historical past. further to their culinary applications, spices preserve medicinal and ceremonial significance in Filipino culture. For example, turmeric has been utilized in traditional

¹⁴ Khan et al., "Sauces, Spices, and Condiments."

¹⁵ "Bahay Kubo: Mga Aral doon ay Sari-Sari."

remedies to treat various illnesses, from digestive issues to inflammatory conditions.¹⁶ Similarly, spices are employed in ceremonial practices, in which they play a function in rituals and offerings, highlighting their cultural significance beyond the kitchen.¹⁷

The influence of spices extends beyond culinary practices into numerous aspects of Filipino customs and daily existence. Traditional cooking methods and the

preparation of staple dishes often involve precise spices and techniques which can be passed down through generations, keeping culinary traditions and cultural identity.¹⁸ The meticulous preparation of traditional Filipino dishes, which includes lechon (roast pig), often involves marinating the meat with a mix of spices, reflecting the deep cultural appreciation for spices in communal and festive gatherings.¹⁹ Furthermore, the cultural significance of spices is reflected in Filipino customs

¹⁶ Sachan et al., "Medicinal Uses of Spices Used in Our Traditional Culture," 116-122.

¹⁷ Ajaikumar B. Kunnumakkara, Cemile Koca, Sanjit Dey, Prashasnika Gehlot, Supachi Yodkeeree, Divya Danda, Bokyung Sung, and Bharat B. Aggarwal, "Traditional Uses of Spices: An

Overview," (PDF, ResearchGate, accessed August 16, 2024).

¹⁸ Fernandez, Doreen. 1987. *Historias, Crónicas, Vocabularios: Some Spanish Sources for Research in Philippine Food*. *Philippine Studies* 35, no. 3 (1987): 279–95.

¹⁹ Stewart, "Social and Cultural Influences on Food Choices."

associated with food and hospitality. The use of spices in festive dishes and daily food highlights their role in maintaining social bonds and cultural practices. As an example, the preparation of sawsawan (dipping sauces) often incorporates various spices, which might be integral to traditional eating experiences and social gatherings.²⁰ The emphasis on spices in Filipino cuisine not only enriches the sensory experience of meals but also reinforces cultural

continuity and network identity.

The role of spices in Filipino culture is likewise reflected in contemporary discussions about gastronomy and cultural heritage. Studies on the conservation and safeguarding of culinary traditions underscores the significance of spices in maintaining and promoting traditional food practices as intangible cultural heritage.²¹ Those insights highlight how spices keep influencing Filipino culinary

²⁰ Karen Grace V. Aster, Jaime Ramir B. Castillo, Shekaina R. Cheng, John Paulo L. Trillana, Ysabella Marie B. Varlez, and Jame Monren Tapalla Mercado, "Sawsawan: Explicating the Culinary Heritage Significance of Philippine Condiments Using Bibliometrics (1972 - 2018)*", University of Santo Tomas, April 25, 2023.

²¹ Makhabbat Ramazanova, Raquel Santos Cardoso, and Isabel Freitas, "The Role of Social Media in the Conservation and Safeguard of Gastronomy as Intangible Cultural Heritage," in Sustainable Tourism, Culture and Heritage Promotion* (March 2024).

identity and make contributions to the broader cultural landscape. Spices have a profound cultural impact in the Philippines, shaping traditional cuisine, medicinal practices, and daily customs. Their integration into Filipino food reflects a deep-seated appreciation for their flavor, health benefits, and cultural significance. This enduring impact underscores the importance of spices in preserving and promoting Filipino culinary history and cultural identity.²²

Cultural Significance of "Bahay Kubo"

"Bahay Kubo," a traditional Filipino folk song, provides a vivid portrayal of rural Filipino lifestyles and agricultural practices. The song, which describes a simple rural house surrounded by using diverse vegetable crops, is deeply ingrained in Filipino cultural consciousness and reflects the values and way of life of pre-colonial and early colonial Filipino communities.²³ The folk song celebrates the simplicity and self-sufficiency of rural life,

²² Mary Rose Gemma S. Rodriguez and John Erwin Prado Pedroso, "Exploring Culinary Heritage: Insights from Local Gatekeepers in the Province of Antique, Philippines," March 2024.

²³ Stephen Acabado, "[OPINION] The Bahay Kubo and the Making of the Filipino," Rappler, June 26, 2020, 4:25 PM PHT.

highlighting the connection among the humans and their environment. This folk song serves as an important cultural artifact that encapsulates the essence of Filipino agrarian society and its reverence for nature and agricultural abundance. The song "Bahay Kubo" mentions numerous vegetables, which include ginger (luya) and radish (labanos), that are necessary to Filipino cuisine. Ginger, widely used in Filipino dishes which includes tinola (a chicken stew) and sinigang (a sour soup), is known for its fragrant and flavorful features.²⁴ Its use in cooking no longer most correctly compliments the taste of

dishes but moreover presents health benefits, along with helping digestion and reducing inflammation.

Radish, another vegetable featured in the song, is usually used in Filipino dishes like kangkong (water spinach stew) and sinigang. Its crisp texture and mild flavor make it a versatile ingredient in diverse culinary preparations.²⁵ The inclusion of these veggies in "Bahay Kubo" underscores their significance in everyday Filipino cooking and highlights their function in traditional recipes which have been passed down thru generations. The vegetables mentioned in "Bahay Kubo" are frequently

²⁴ Khan et al., "Sauces, Spices, and Condiments."

²⁵ Kunnumakkara et al., "Traditional Uses of Spices."

used alongside spices to create flavorful and aromatic dishes. For instance, ginger is a key ingredient in many traditional Filipino recipes, in which it enhances different spices and herbs to enhance the overall flavor profile.²⁶ The folk song's reference to those veggies displays their integral role in traditional Filipino cuisine, wherein spices and herbs are used to expand complex and unique flavors in dishes.

"Bahay Kubo" portrays a vision of agricultural self-sufficiency and simplicity, emphasizing the significance of homegrown produce in rural Filipino life. The song's depiction of a

house surrounded by numerous crops illustrates the traditional Filipino practice of subsistence farming, wherein families develop their personal food to maintain themselves.²⁷ This illustration highlights the value of agricultural knowledge and practices that have been widespread to Filipino culture for hundreds of years. The song additionally displays the broader cultural values of self-reliance and harmony with nature. Through showcasing a lifestyle centered on agriculture and domestic gardening, "Bahay Kubo" underscores the deep connection between Filipinos and their land, celebrating the sustainable

²⁶ "Bahay Kubo: Mga Aral Doon ay Sari-Sari."

²⁷ Rodriguez and Pedroso, "Exploring Culinary Heritage."

practices which have long been a cornerstone of Filipino rural life.²⁸ "Bahay Kubo" is more than just a folk song; it is a reflection of Filipino agricultural practices, culinary traditions, and cultural values. The song's portrayal of vegetables and flora highlights their significance in Filipino cuisine and their function in promoting self-sufficiency and sustainability. Through its depiction of rural life, "Bahay Kubo" captures the essence of Filipino culture and the iconic importance of agriculture in shaping national identity.²⁹ Coastal

and island communities in the Philippines adapted maritime trade influences to develop unique fishing and preservation strategies. Spices performed a critical function in improving the taste and longevity of preserved seafood, a staple inside the diet of those communities.³⁰ techniques including curing fish with salt and spices have been followed from trade practices and became valuable to local food preservation methods.

Using spices in preserving fish not only improved the taste and shelf-life of

²⁸ Ramazanova, Cardoso, and Freitas, "The Role of Social Media in the Conservation and Safeguard of Gastronomy."

²⁹ Danis Taufiq, "Discovering the Cultural Significance: What Does

Bahay Kubo Symbolize?" June 2, 2023.

³⁰ Baravilala, "Spices of the Pacific Region."

seafood but also allowed for the creation of regional specialties. These strategies exemplify how maritime trade encouraged the improvement of local food practices and culinary traditions.³¹ The integration of spices and culinary techniques from maritime trade led to the introduction of local dishes that are precise to coastal and island communities. These dishes often reflect a mix of nearby components and foreign influences, resulting in different culinary traditions that highlight the impact of maritime exchange.³² As an instance, local specialties

collectively with *sinigang na baboy* (pork stew) and *kinilaw* (raw fish salad) exhibit using spices delivered thru change and adapted to nearby tastes and ingredients. The creation of those regional dishes illustrates the dynamic nature of Filipino cuisine, formed by historic trade interactions and cultural exchanges. The influence of maritime trade on local food practices underscores the interconnectedness of Filipino culinary traditions with broader regional and global networks.³³

³¹ Kunnumakkara et al., "Traditional Uses of Spices."

³² Ramazanova, Cardoso, and Freitas, "The Role of Social Media in the Conservation and Safeguard of Gastronomy."

³³ Boutaud, Jean-Jacques, Anda Becuț, and Angelica Marinescu. 2016. "Food and Culture. Cultural Patterns and Practices Related to Food in Everyday Life. Introduction." International

Preserving the Legacy

The public awareness and scholarly focus on the pre-colonial spice trade in the Philippines have traditionally been restrained, with much of the discourse focused on postcolonial developments and contemporary issues. The rich history of maritime exchange and its impact on Filipino cuisine and lifestyle regularly remains overshadowed through more current historic events and present-day concerns.³⁴ While recent scholarship has all started to deal with this gap, highlighting the

importance of pre-colonial trade routes and spice exchanges, broader public understanding is still evolving. Scholarly efforts have increasingly focused on uncovering and documenting the intricate networks of trade that connected the Philippines to diverse regions of Asia and beyond. Studies have explored the influence of spices on Filipino cuisine, highlighting the historical exchanges that shaped local culinary practices.³⁵ However, those contributions often remain areas of interest, with restrained integration into

Review of Social Research 6, no. 1 (May): 1–3.

³⁴ Rodriguez and Pedroso, "Exploring Culinary Heritage."

³⁵ Khan, Md. A. J., et al. "Sauces, Spices, and Condiments:

Definitions, Potential Benefits, Consumption Patterns, and Global Markets." PDF. ResearchGate. Accessed August 16, 2024.

mainstream historical narratives or academic curricula.

Preserving and promoting knowledge about the pre-colonial spice trade is essential for several reasons. First, it enriches our understanding of Filipino cultural history through highlighting the complexity and depth of historical interactions with different cultures. The spice trade was not only an economic interest however additionally a catalyst for cultural exchange and the development of unique culinary traditions.³⁶ By acknowledging and preserving this thing of history, we benefit a fuller

appreciation of the cultural material that defines current Filipino identity. In addition, promoting this knowledge helps the preservation of traditional practices and helps protect intangible cultural heritage. As contemporary culinary practices evolve and global influences increase, there is a danger of losing traditional knowledge and practices which are imperative to Filipino cultural identity. Highlighting the historical importance of spices and their role in Filipino cuisine can foster a deeper connection to cultural roots and encourage efforts to preserve and revitalize

³⁶ Ramazanova, Cardoso, and Freitas, "The Role of Social Media

in the Conservation and Safeguard of Gastronomy."

traditional culinary practices.³⁷

Folk songs like "Bahay Kubo" play a crucial role in cultural education by providing a window into traditional Filipino life and practices. The song's references to diverse vegetables and vegetation, together with spices, serve as a reminder of the agricultural practices and culinary traditions of pre-colonial Philippines. Through incorporating such songs into educational settings, educators can train younger generations about the historical and cultural importance of traditional practices.³⁸ "Bahay Kubo"

not only preserves linguistic and cultural knowledge but also serves as a tool for providing lessons about sustainable living and self-sufficiency, which had been important aspects of pre-colonial Filipino life. Through songs and different cultural expressions, younger generations can study the historical context of those practices and their relevance to contemporary life.³⁹

The preservation of folk songs like "Bahay Kubo" allows a connection to historical and cultural roots by celebrating traditional values and practices. As an

³⁷ Boutaud, Becuț, and Marinescu, "Food and Culture."

³⁸ Funk, Fran. 2023. "The Meaning behind the Song: Bahay Kubo by

Jona - Beat Crave." Beat Crave. October 22, 2023.

³⁹ Taufiq, "Discovering the Cultural Significance: What Does Bahay Kubo Symbolize?"

emblem of rural Filipino life, the song reflects the simplicity and self-sufficiency of pre-colonial agricultural communities. By keeping such songs alive, communities make sure that the knowledge and traditions associated with them are not misplaced to time.⁴⁰ Incorporating these cultural artifacts into public discourse and academic initiatives reinforces the significance of historical continuity and cultural heritage. They act as cultural touchstones that remind humans of their shared records and history, fostering a sense of identification and continuity.⁴¹ Keeping and

promoting knowledge about the pre-colonial spice trade and incorporating folk songs like "Bahay Kubo" into cultural education are vital for maintaining the Filipino cultural historical past. Through enhancing public consciousness and scholarly awareness, and by the use of cultural artifacts as academic tools, we can make certain that the rich traditions and historic practices of the Philippines hold to inform and inspire future generations.

Conclusion

Spices held a significant role in the pre-colonial Philippines, not only as vital

⁴⁰ de Leon, Marguerite. 2020. "[OPINION] the Bahay Kubo and the Making of the Filipino." *RAPPLER*. June 26, 2020.

⁴¹ "Teaching About Heritage Preservation," National Park Service, accessed August 16, 2024.

trade commodities however also as fundamental factors of local culinary and cultural practices. The strategic location of the Philippines in Southeast Asia positioned it as an important player in regional and international spice change routes, connecting it with neighboring countries and far-off markets. fundamental spices including ginger, turmeric, and pepper have been not only valued for their taste and preservative traits but also for their medicinal and ceremonial uses, reflecting the deep interconnection among trade and regular life.⁴² The maritime trade networks that crisscrossed

the Philippines facilitated not just the exchange of goods however also the diffusion of culinary techniques and cultural practices. The integration of spices into Filipino cuisine, as reflected in traditional dishes and folk songs like "Bahay Kubo," highlights the profound impact of these alternate routes on local culture. The adaptation and incorporation of new spices and flavors enriched Filipino culinary traditions, at the same time as the agricultural practices and self-sufficiency depicted in folk songs offer insights into the ancient way of life of pre-colonial communities.⁴³

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⁴² Khan et al., "Sauces, Spices, and Condiments."

⁴³ Fran Funk, "The Meaning Behind The Song: Bahay Kubo by

Jona," October 22, 2023, <https://www.example.com>.

⁴⁴ Rodriguez and Pedroso, "Exploring Culinary Heritage."

Cultural expressions along with folks songs and traditional dishes not only preserve the historic memory of spice trade however additionally serve as a testimony to the rich cultural historical past of the Philippines. They illustrate how maritime trade and cultural exchange have shaped and sustained Filipino identity over centuries.⁴⁵ To completely appreciate and preserve this rich heritage, similarly studies and conservation efforts are important. there's a need for continued scholarly exploration of pre-colonial spice trade networks and their impacts

on Filipino culture. This includes investigating the historic significance of spices, the difficult trade routes, and their contributions to cutting-edge Filipino cuisine and cultural practices.⁴⁶ Moreover, preserving and promoting traditional understanding and practices through cultural education is essential. Folk songs like "Bahay Kubo" ought to be utilized as educational tools to educate younger generations about their historical and cultural significance. Efforts should be made to integrate those cultural artifacts into public discourse and academic curricula to make sure that

⁴⁵ Ramazanova, Cardoso, and Freitas, "The Role of Social Media in the Conservation and Safeguard of Gastronomy."

⁴⁶ Boutaud, Becuț, and Marinescu, "Food and Culture."

the historical roots of Filipino culinary traditions and practices aren't misplaced.^{47 48}

Celebrating and understanding the rich background of spices in pre-colonial Philippines calls for a determination to research, protect, and cultural education. By fostering a deeper appreciation of this historic and cultural legacy, we're able to ensure that the contributions of spices to the Filipino way of existence continue to inform and inspire future generations.

⁴⁷ Taufiq, "Discovering the Cultural Significance: What Does Bahay Kubo Symbolize?"

⁴⁸ Acabado, "[OPINION] The Bahay Kubo and the Making of the Filipino."

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The Maritime Legacy of Manila Hemp: Spanish Arrival and the Global Introduction of Manila Hemp in Rope Production

Jericho Babista

Abstract

This research looks at how Manila hemp, a strong and durable fiber from the Philippines, became important in global rope production when the Spanish arrived in the region. Manila hemp was highly valued for its use in making ropes and other maritime equipment due to its resistance to saltwater. This study explores how the Spanish colonial period influenced the production and trade of Manila hemp, and how it spread to become a key material in maritime industries worldwide. The aim is to show how Manila hemp played a major role in shaping global maritime history and trade.

Key Words: Manila Hemp, Spanish Colonial Period, Maritime Industry, Global Trade, Rope Production

Introduction

The onset of maritime exploration marked a transformative period in world history, leading to the discovery of new trade routes, resources, and territories. For Spain, this era was pivotal, offering an opportunity to expand its influence and wealth while also spreading Christianity. Although Spain initially focused on the Americas, its ambitions soon extended to other regions, including Africa and Asia.

A key element of Spain's expansion strategy was

Ferdinand Magellan's expedition, which aimed to find a westward route to the Spice Islands (now Indonesia). While Magellan did not reach his intended destination, his voyage underscored the strategic importance of the Philippine archipelago. By establishing a presence in the Philippines, Spain gained a critical base for projecting power and expanding its trade networks throughout Asia.

Following Magellan's expedition, Spain established a colonial foothold in the Philippines with the

founding of the first permanent Spanish settlement in Cebu by Miguel López de Legazpi in 1565. The Philippines soon became a central hub in the Manila-Acapulco galleon trade route, connecting Asia with the Americas and Europe. This trade route was instrumental in integrating the Philippines into global commerce.

During the Spanish colonial period, the Philippines emerged as a significant contributor to international trade, particularly through the export of Manila hemp (abaca). Known for its

strength and durability, abaca was crucial for maritime activities, especially in the production of ropes and textiles. The Manila-Acapulco galleon trade route played a key role in introducing Manila hemp to Europe, with Spanish being among the first to systematically export this valuable resource.

The late 18th century brought changes to the economic landscape with the gradual decline of the Manila galleon trade monopoly, leading to a more open trading environment. By 1815, the final galleon had arrived in Manila, and by

the 1830s, the city was open to foreign traders. This shift increased demand for Philippine products, including abaca. The completion of the Suez Canal in 1869 further accelerated global trade and enhanced the importance of Manila hemp.

II. Body

The Spanish Arrival and Colonization of the Philippines

The arrival of Ferdinand Magellan's expedition in the Philippines in 1521 was a transformative moment in the archipelago's history.

Magellan, a Portuguese explorer sailing under the Spanish flag, established the first significant European contact with the region. This event was instrumental in integrating the Philippines into global trade networks, introducing Christianity through interactions with local leaders such as Rajah Humabon of Cebu, and highlighting the archipelago's strategic importance. Despite Magellan's death at the Battle of Mactan in April 1521, his voyage provided Spain with essential insights into the islands, setting the stage for

further exploration and eventual colonization.⁴⁹

Spanish interest in the Philippines intensified following Magellan's expedition. In 1565, Miguel López de Legazpi established the first permanent Spanish settlement in Cebu, marking the onset of formal Spanish colonization. His subsequent relocation to Manila in 1571 cemented Spanish control, transforming it into the administrative and economic hub of the

Spanish East Indies. By establishing Manila as the capital, Legazpi not only facilitated governance and administration over the archipelago but also solidified Spanish power in the region. Manila's strategic location became a pivotal element in Spain's imperial ambitions, serving as a crucial center for the galleon trade and missionary activities. This move was essential for creating a centralized colonial government and integrating the

⁴⁹ Emma Jackson, "Ferdinand Magellan's Voyage and Its Legacy in the Philippines," *Journal of Undergraduate Research at UNC Asheville*, March 26-28, 2020, Liberty University, 1971 University

Blvd., Lynchburg, Virginia 24515 USA, accessed [date you accessed the article], <https://urp.unca.edu/journal-publications/journal-online-publication/>.

Philippines into Spain's global empire.⁵⁰

During the early modern period in Europe and the colonial Americas, shipbuilding faced numerous challenges, including labor shortages, high costs, and material scarcities. However, Spain's situation improved significantly when Legazpi moved his base to Manila Bay in 1570-71. The strategic relocation revealed a wealth of skilled and

unskilled labor and access to critical shipbuilding materials such as timber and Manila hemp. Manila hemp, in particular, became a valuable resource for shipbuilding and other industries due to its cost-effectiveness. The Philippines' natural resources and the expertise of its people were instrumental in supporting Spanish colonial endeavors⁵¹.

The establishment of Spanish rule profoundly

⁵⁰ Melanie J. Magpantay, "The Sword and the Cross in Spanish Philippines," final paper, May 12, 2018, accessed September 4, 2024, https://www.academia.edu/44865224/THE_SWORD_AND_THE_CROSS_IN_SPANISH_PHILIPPINES.

⁵¹ Andrew Christian Peterson, *Making the First Global Trade Route: The Southeast Asian Foundations of the Acapulco-Manila Galleon Trade, 1519-1650* ([Honolulu]: University of Hawaii at Manoa, August 2014), <http://hdl.handle.net/10125/100380>.

impacted the Manila Galleon Trade by positioning Manila as a key hub for commerce between Asia and the Americas. Legazpi's decision to move the capital from Cebu to Manila in 1571 proved vital, as Manila's geographic location facilitated efficient trade with East and Southeast Asia. This strategic positioning enabled the creation of a trading outpost that connected with Chinese merchants eager to exchange their goods, especially silk, for Spanish silver.

Overcoming initial challenges, the Spanish capitalized on existing Chinese trade routes and relationships, fostering a prosperous trade network that would endure for centuries and establish a reciprocal trade relationship between the Americas and Asia.⁵²

The Philippines' strategic location made it an essential maritime hub for Spain. Situated between the Asian mainland and the Pacific Ocean, the archipelago served as a crucial

⁵² Lesson 04: The Manila Galleon Trade, History for the 21st Century, accessed September 5, 2024,

<https://www.history21.com/wp-content/uploads/2022/12/Silk-Trade-4.1-Reading-4-The-Manila-Galleon-Trade.pdf>.

stopover and resupply point for Spanish galleons traveling between Acapulco and Manila. This positioning facilitated trans-Pacific trade routes, with the Manila-Acapulco galleon trade becoming central to Spain's colonial economy. From 1571 to 1815, annual voyages between Manila and Acapulco maintained a steady trans-Pacific connection, linking colonial American markets directly with established commercial networks in East and Southeast Asia. Manila became a gateway for millions of pesos of New

World silver, which integrated into the Asian economy, while the galleons brought valuable Asian goods to New Spain, enriching both American and European markets.⁵³

The establishment of Manila as Spain's colonial center in Asia enabled the development of a robust local shipbuilding industry. Indigenous agriculture supported Manila and galleon crews, while the city's access to high-quality timber and plant fibers like Manila hemp, along with the labor of local inhabitants, facilitated the

⁵³ Dennis Flynn and Arturo Giraldez, *European Entry into the Pacific: Spain and the Acapulco-*

Manila Galleons (2017), <https://doi.org/10.4324/9781315255965>.

construction of some of the largest and most durable vessels of the era. This logistical advantage reduced the costs of trans-Pacific voyages and bolstered Spain's naval presence.⁵⁴

The Manila-Acapulco Galleon Trade and Suez Canal

The Manila-Acapulco Galleon Trade, operational from 1565 to 1815, was a pivotal

maritime route linking Manila in the Philippines with Acapulco in Mexico. Initiated by Spanish explorer Miguel López de Legazpi's successful voyage in 1565, this route established a significant global trade network, shaping commerce between Asia, the Americas, and Europe for over two centuries.⁵⁵ This trade route facilitated the exchange of diverse goods between the continents. Asian

⁵⁴ Andrew Christian Peterson, *Making the First Global Trade Route: The Southeast Asian Foundations of the Acapulco-Manila Galleon Trade, 1519-1650* ([Honolulu]: University of Hawaii at Manoa, August 2014), <http://hdl.handle.net/10125/100380>.

⁵⁵ Andrew Christian Peterson, *Making the First Global Trade Route: The Southeast Asian Foundations of the Acapulco-Manila Galleon Trade, 1519-1650* ([Honolulu]: University of Hawaii at Manoa, August 2014), <http://hdl.handle.net/10125/100380>.

commodities like Chinese silks, spices, and porcelain were shipped from Manila to Acapulco, while the return voyages carried Mexican silver and other New World products. The opening of Manila as a port in 1571 was instrumental in transforming it into a key trading center, attracting merchants from China, Japan, and Southeast Asia, and integrating the Philippines into the broader global commerce network. The galleon trade not only turned Manila into a bustling

economic hub but also fostered significant cultural interactions. Indigenous Filipinos played a crucial role in this trade as laborers, shipwrights, and navigators, reflecting the collaborative nature of this international commerce.⁵⁶

The economic impact of the galleon trade was profound, leading to shifts in local industries and economic practices, including a transition toward cash crops such as sugar, tobacco, and

⁵⁶ Glen Steven Saligumba and Monica Saligumba, *The Impact of Historical Spanish Colonialism in the Philippines on Economic Development* (2023), accessed September 5, 2024,

<https://www.researchgate.net/publication/367360070> [The impact of historical Spanish colonialism in the Philippines on economic development/citation/download.](#)

abaca, which marked a significant transformation in the Philippine economy.⁵⁷ The galleon trade also facilitated the export of unique Philippine products, notably abaca or Manila hemp. Highly valued for its durability in maritime use, abaca became a significant export product. This demand for local goods connected Philippine producers with international markets and contributed to the island's economic

development, highlighting its role in early globalization.⁵⁸

However, the Manila-Acapulco galleon trade faced numerous challenges. Severe weather conditions, including frequent typhoons, and navigational hazards such as shoals, reefs, and strong currents, created perilous conditions for the galleons. The lack of modern navigational aids and issues related to ship

⁵⁷Andrew Peterson, *What Really Made the World Go Around?: Indio Contributions to the Acapulco-Manila Galleon Trade* (Center for Southeast Asian Studies, University of Hawai'i at Manoa, 2011), <http://hdl.handle.net/10125/20303>.

⁵⁸ William Lytle Schurz, "Acapulco and the Manila Galleon," *The Southwestern Historical Quarterly** 22, no. 1 (July 1918): 18-37, <https://www.jstor.org/stable/30234771>.

design and construction compounded these dangers, leading to numerous shipwrecks and maritime. Additionally, human error and poor decision-making by galleon officers further contributed to these challenges.⁵⁹

The decline of the galleon trade was influenced by several factors. The 1679 ban on the importation of enslaved Asians, known as "Chinos," reduced the labor supply crucial for the trade. The rise of the

Atlantic slave trade and political changes, including Mexico's independence movement, disrupted the trade. Economic shifts and the emergence of alternative trade routes further contributed to its decline, leading to the trade's official closure in 1815.⁶⁰

The opening of the Suez Canal in 1869 marked a transformative shift in global trade. By significantly shortening the distance between

⁵⁹ William Lytle Schurz, "Acapulco and the Manila Galleon," *The Southwestern Historical Quarterly* 22, no. 1 (July 1918): 18-37, <https://www.jstor.org/stable/30234771>.

⁶⁰William Lytle Schurz, "Acapulco and the Manila Galleon," **The Southwestern Historical Quarterly** 22, no. 1 (July 1918): 18-37, <https://www.jstor.org/stable/30234771>.

Europe and Asia, the canal enhanced trade efficiency and exposed the dominance of British and Chinese traders in the Philippine economy. The canal's opening also facilitated the spread of liberal ideas, influencing Filipino socio-economic perspectives and prompting Spanish colonial policies to adapt, focusing on agrarian development while contending with foreign competition.⁶¹

The Suez Canal's impact on global trade routes

reshaped the Philippine economy and highlighted the role of Manila hemp. The canal's improved access to European markets increased the demand for Manila hemp, a durable fiber valued in maritime industries. Despite this, Spanish traders struggled against British and Chinese competitors due to their superior experience and capital. This competitive disadvantage underscored a shift in the Philippines' economic landscape, with growing foreign influence. Spanish

⁶¹ Andrew Christian Peterson, *Making the First Global Trade Route: The Southeast Asian Foundations of the Acapulco-Manila Galleon Trade, 1519-

1650* (Ph.D. diss., University of Hawaii at Manoa, August 2014), <http://hdl.handle.net/10125/100380>.

colonial policy adapted to leverage agrarian and Manila hemp production to meet European demand, reflecting the interplay between local resources and global economic forces.⁶²

The Role of Manila Hemp

Abaca, commonly known as Manila hemp (**Musa textilis Née**), is a tropical plant renowned for its exceptionally strong fibers, which can grow up

to 8 meters in height. It thrives in well-drained, loamy soils and benefits from the humid tropical climate of its native regions. Characterized by a central core, long narrow leaves, and a deep, extensive root system, abaca is primarily cultivated in the Philippines. Its fibers are prized for their strength, flexibility, and resistance to moisture and salinity.⁶³

⁶² William Lytle Schurz, "Acapulco and the Manila Galleon," *The Southwestern Historical Quarterly* 22, no. 1 (July 1918): 18-37, <https://www.jstor.org/stable/30234771>.

⁶³ David Araya-Gutiérrez, Giovanni Garro Monge, Karol Jiménez-Quesada, Dagoberto Arias-

Aguilar, and Randall Quesada Cordero, "Abaca: A General Review on Its Characteristics, Productivity, and Market in the World," *Revista Facultad Nacional de Agronomía Medellín* 76, no. 1 (2023): 10263-10273, <https://doi.org/10.15446/rfnam.v76n1.101710>.

Historically, abaca has held significant importance in the Philippines, where it has been cultivated for centuries. Its value surged during the Spanish colonial period, becoming a crucial export commodity. During the Galleon trade from the 16th to the 19th centuries, the plant's fibers were extensively used for ship rigging due to their remarkable durability and strength. This application not only bolstered the Philippine economy but also cemented abaca's role in

global commerce, particularly when other hemp sources became scarce.⁶⁴

In the Philippines, abaca is mainly grown in the Bicol Region, Eastern Visayas, and Mindanao. The Bicol Region, including provinces like Albay, Camarines Sur, and Sorsogon, is known for producing high-quality fibers due to its favorable climate and soil conditions. Similarly, Eastern Visayas (including Leyte and Samar) and Mindanao (with areas such as Davao and Surigao) also contribute

⁶⁴ Shinzo Hayase, "Manila Hemp in World, Regional, National, and Local History," *Journal of Asia-*

Pacific Studies 31 (March 2018), <https://core.ac.uk/outputs/286959049/>.

significantly to the country's abaca output. This regional genetic diversity supports both traditional and modern cultivation methods, reinforcing the Philippines' status as a leading global producer of abaca. Processing methods for abaca fibers can vary and significantly affect the quality of the final product. Traditional hand stripping, which involves manually peeling the leaf sheaths from the plant's pseudostems, tends to preserve the fibers' strength and

quality, resulting in superior products. In contrast, mechanical decortication, an automated process, offers greater efficiency but may occasionally damage the fibers, impacting their quality. Thus, the choice of processing method is crucial in determining the strength and usability of the final abaca products.⁶⁵

Abaca's historical significance extends to its use in producing ropes and textiles during the

⁶⁵ Yllano, Orlex & Diaz, Genaleen & Lalusin, Antonio & Laurena, Antonio & Mendoza, Evelyn. (2020). Genetic Analyses of Abaca (*Musa textilis* Née) Germplasm

from its Primary Center of Origin, the Philippines, Using Simple Sequence Repeat (SSR) Markers. *Philippine Agricultural Scientist*. 103. 311-321.

colonial era, establishing it as a vital export commodity that supported Filipino farmers' livelihoods. Today, its fibers are utilized in various applications, including textiles like carpets and bags, specialty papers, and innovative biocomposites that offer sustainable alternatives to synthetic materials. Additionally, abaca remains integral to crafting handicrafts such as baskets and wallets, which support artisans

and promote cultural heritage.⁶⁶

Manila Hemp in Maritime Activities

The maritime use of Manila hemp, or abacá, has long been integral to shipbuilding in the Philippines, a practice that predates Spanish colonial rule. Indigenous communities in the archipelago were adept at utilizing abacá fibers for crafting rope, essential for their maritime activities. Abacá, derived

⁶⁶ Victor Waller and Astrid Wilsby, *Abaca in the Philippines: An Overview of a Potential Important Resource for the Country: Relating the Tensile Strength of the Single Fiber to the Microfibrillar Angle*, TRITA-CBH-

GRU 2020:021 (KTH, 2019), <https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1352495>.

from the stalks of the *Musa textilis* plant, is renowned for its strength, resilience, and water resistance, making it ideal for producing durable marine cordage. Before Spanish colonization, local populations had already established methods for harvesting and processing abacá. They would strip the fibers from the plant's sheathing, separate and dry them, and then twist them into rope. These traditional practices were well-suited to the environmental conditions of the Philippines, particularly in regions like the Southeast peninsula of Luzon, which provided

the fertile, high-rainfall environment optimal for abacá cultivation. When the Spanish established Manila as their colonial hub in Asia, they recognized the value of abacá for their maritime needs. The Spanish colonial administration quickly adopted the local practice of using abacá rope, benefiting from its superior quality compared to the often costly and unreliable European alternatives. Abacá's ability to withstand saltwater corrosion made it an invaluable resource for the Spanish navy and merchant vessels. The importance of abacá to

Spanish shipbuilding is underscored by its cost-effectiveness. For instance, re-rigging Magellan's fleet in 1519 required rope costing nearly 30% of the total vessel price, a significant expense mitigated by the use of local abacá. By the 17th century, Spanish shipbuilding records indicate that abacá rope accounted for a substantial portion of the total construction cost of ships. Under Spanish rule, the demand for abacá continued to grow, integrating seamlessly into colonial maritime practices. By the late 19th century, during the American occupation,

abacá remained a cornerstone of the Philippines' export trade, comprising about two-thirds of the total export volume. The enduring use of abacá through the Spanish and American periods highlights its vital role in the maritime industry, with traditional harvesting methods largely unchanged since pre-colonial times. Abacá's continued prominence throughout the Spanish colonial period into the 20th century underscores its significance as a critical resource for shipbuilding and maritime activities, reflecting the successful adaptation and

exploitation of local knowledge and resources by colonial powers.⁶⁷

The crucial role of Manila hemp (abacá) in maritime activities, established during the Spanish colonial era, continued to be of paramount importance during the American colonial period. The strength and durability of Manila hemp, which had been recognized and utilized by the Spanish for ship rigging and marine applications, became even more significant as

maritime activities expanded under American rule. During the American colonial era, the demand for Manila hemp grew substantially, driven by the surge in trade and military operations. The superior qualities of abacá—particularly its resistance to saltwater and decay—made it an ideal material for producing ropes essential for both naval and commercial shipping. The American military, in particular, relied heavily on Manila hemp for the manufacture of ropes

⁶⁷ Andrew Christian Peterson, *Making the First Global Trade Route: The Southeast Asian Foundations of the Acapulco-Manila Galleon Trade, 1519-1650*

(Ph.D. diss., University of Hawaii at Manoa, August 2014), 10-221, <http://hdl.handle.net/10125/100380>.

used in naval vessels and military equipment, especially during World War I. The reliability of abacá ensured that ships were well-equipped for demanding maritime operations. The increased demand for Manila hemp led to significant growth in the industry. Investments in plantations and processing facilities expanded to meet the needs of the burgeoning maritime sector. This expansion not only supported the shipping industry but also had a positive impact on the local economy. Many

Filipinos became involved in the cultivation and processing of abacá, reflecting its continued importance in the maritime and naval industries.⁶⁸

The enduring prominence of Manila hemp from the Spanish to the American colonial periods underscores its critical role in shipbuilding and maritime activities, reflecting the successful integration of local resources into global maritime practices.

⁶⁸ Shinzo Hayase, "Manila Hemp in World, Regional, National, and Local History," *Journal of Asia-*

Pacific Studies 31 (March 2018), <https://core.ac.uk/outputs/286959049/>.

The Global Spread of Manila Hemp

The story of Manila hemp, or abacá, illustrates its transformation from a local resource in the Philippines to a crucial global commodity. This evolution spans several periods of international engagement, beginning with Spanish colonial rule and extending through American and Japanese involvement.

During the Spanish colonial era, abacá was first cultivated in the Philippines, primarily in the Bicol region and later in Davao. The Spanish recognized its exceptional

strength and durability, promoting its widespread cultivation as a valuable export commodity. By the late 18th and early 19th centuries, abacá began to gain traction in European markets, bolstered by the trade routes established by the Spanish. It soon became a key export product, significantly contributing to the colonial economy of the Philippines.²¹

Following the Spanish-American War of 1898, the Philippines became a U.S. territory, marking the start of the American era. The U.S. administration recognized the economic potential of abacá and

continued to support its cultivation. By the early 20th century, Manila hemp had become a significant export commodity, with the United States and Great Britain as the main importers. In 1911, the Philippines exported 165,649,626 kilograms of abacá, valued at approximately £32,282,680. The U.S. primarily imported the finest grades, while Great Britain took the lower grades, reflecting abacá's versatility in various industrial uses²². The 1913 mutual free-trade agreement further bolstered abacá exports, making it, alongside sugar

and coconut oil, a cornerstone of the Philippine export economy. However, by the 1930s, shifts in U.S. import preferences led to a decline in abacá's prominence and a drop in its export value.²¹

During World War I, Japanese entrepreneurs started investing in abacá plantations, particularly in Davao, due to its fertile land and favorable climate. By 1918, Japanese investors controlled over half of the abacá production in the Philippines. They introduced more efficient cultivation practices, improving both the

quality and yield of the fiber to meet the American rope industry's demand for high-quality abacá. As U.S. imports declined in the 1930s, Japan increased its imports, significantly altering the global trade dynamics of Manila hemp.⁶⁹

Economically, abaca exports had a profound impact on the Philippines, contributing significantly to the country's export revenues. In the fiscal year ending June 30, 1912, abaca exports represented 32% of the

Philippines' total exports, highlighting its importance to the national economy. Despite fluctuations in production due to natural disasters, the value of abaca exports continued to rise, demonstrating its growing global significance. European manufacturers also showed increased interest in abaca, further expanding its market applications and potential innovations.²²

The global expansion of abaca has been facilitated by strong demand in

⁶⁹ Shinzo Hayase, "Manila Hemp in World, Regional, National, and Local History," *Journal of Asia-Pacific Studies* 31 (March 2018):

[page number],
<https://core.ac.uk/outputs/286959049/>.

international markets, its economic significance to the Philippines, and growing interest from manufacturers worldwide, underscoring its role as a valuable natural resource in the global economy however, the global expansion of abaca has faced challenges, such as natural disasters affecting production areas. Typhoons and droughts have impacted abaca-producing regions, leading to fluctuations in supply and prices.⁷⁰

Economic and Social Impacts of Manila Hemp

During the Spanish colonial era, Manila hemp, or abacá, emerged as a pivotal economic resource for the Philippines. The liberalization of trade policies towards the end of Spanish rule spurred a significant increase in abacá exports, driven by its high demand in international markets, particularly in the United States and Europe. Abacá's versatility in various industries—such as shipping and textiles—enhanced its global

⁷⁰ John F. Minier, "Abaca: The Rope and Twine Industry, with a Tentative Outline of Other Abaca

Industries," *Philippine Craftsman* 1, no. 7 (January 1913): 525–34.

appeal. This surge in export activity contributed to the diversification of the Philippine economy, providing an alternative to traditional agricultural products and stimulating rural economies in abacá-growing regions.⁷¹

In regions like Kabikulan, where abacá was extensively cultivated, the economic impact was particularly pronounced. The latter part of the Spanish era witnessed significant economic development in

Kabikulan. The booming abacá trade stimulated growth in local commerce, transportation, and communication services. This connectivity facilitated Kabikulan's transition from isolation in the 18th century to an active participant in trade and business. The rise in abacá production led to increased private commerce, positioning Kabikulan as a key exporter of the fiber. The high demand for abacá in Western countries for making strong ropes and

⁷¹ Glen Steven Saligumba and Monica Saligumba, "The Impact of Historical Spanish Colonialism in the Philippines on Economic Development*" (2023), accessed September 5, 2024,

https://www.researchgate.net/publication/367360070_The_impact_of_historical_Spanish_colonialism_in_the_Philippines_on_economic_development/citation/download

twines highlighted the Philippines as a crucial supplier. This success spurred additional economic activities and trade interactions beyond Kabikulan, with more vessels traveling from Bicol to Manila. The increased connectivity attracted Spanish, Ilongo, and Tagalog traders, fostering the development of local markets and enhancing the region's commercial appeal. The influx of external traders and influential families led to the development of trade infrastructure in Kabikulan, including abacá presses, warehouses, and

wharves. These improvements created employment opportunities for both abacá buyers and Filipino laborers. Additionally, the presence of Chinese shopkeepers diversified local markets and commercial activities, further boosting the region's economic vitality. However, the Spanish colonial approach to resource management had its drawbacks. The exploitation of abacá and its cultivation involved extracting wealth and labor from the local population without fair compensation. This exploitation established a cash crop economy

centered around abacá, which, while profitable, created economic dependencies and vulnerabilities. Reliance on a single crop made the region susceptible to fluctuations in global market demand and prices, leading to economic instability. Furthermore, the focus on cash crops often came at the expense of food production, jeopardizing local food security and long-term economic resilience.⁷²

Under American rule, abacá's economic importance continued to grow. Recognizing its potential as a valuable cash crop, the U.S. administration supported the expansion of abacá cultivation. Between 1902 and 1925, the area planted with abacá increased by 384%, driven by agricultural banks and loans that facilitated modern farming practices. The global demand for abacá's durable fibers, essential for industries like rope-making and textiles,

⁷² Owen, Norman. 2023. "Abaca in Kabikolan: Prosperity without Progress." In *Prosperity*

without Progress: Manila Hemp and Material Life in the Colonial Philippines, 191-211. Quezon City: Ateneo de Manila University Press.

further fueled this expansion. The American colonial government played a key role in integrating abacá into global trade networks, reinforcing its status as a major export commodity.⁷³

The cultivation of abacá in Davao underwent notable improvements. The introduction of scientific agricultural practices, including advanced farming techniques and the establishment of agricultural banks, significantly enhanced

crop yields. Davao's abacá plants, benefiting from more favorable soil conditions and improved cultivation methods, grew taller and wider compared to those in the Bikol Region. This shift in economic priorities under American rule positioned Davao as a leading region for abacá production, with increased investment and enhanced transportation infrastructure bolstering its integration into global markets.⁷³

⁷³ David Findley et al., "Colonial Policy, Ecological Transformations, and Agricultural 'Improvement': Comparing Agricultural Yields and Expansion in the Spanish and U.S.

Philippines, 1870–1925 CE," *Humanities and Social Sciences Communications* 11 (2024): <https://doi.org/10.1057/s41599-024-03310-z>.

Manila hemp's economic and social impacts were profound. While it contributed to economic growth and development, it also highlighted the challenges of dependency on cash crops and the complexities of colonial exploitation. The transition from Spanish to American rule further shaped abacá's role in the global market, influencing both its cultivation and economic significance.

Downfall of Manila Hemp in Maritime Usage

The rise of synthetic fibers since the late 1950s has significantly impacted the demand for Manila

hemp, also known as abaca. Synthetic fibers, such as nylon and polyester, quickly became popular due to their superior performance characteristics, including increased durability, cost-effectiveness, and enhanced resistance to environmental factors like moisture and UV light. These attributes made synthetic fibers particularly attractive for applications requiring long-lasting materials, such as in the rope industry. Consequently, industries began shifting away from natural fibers like Manila hemp, leading to a decline in demand for the fiber, which had

previously been essential for making ropes, textiles, and other goods.⁷⁴

Despite this decline in traditional uses, Manila hemp has managed to maintain relevance in specific applications where its unique properties are still valued. For example, it continues to be used in the production of high-quality ropes for ship rigging and in the papermaking industry, including for currency notes.

Additionally, the Manila hemp industry has sought to adapt by exploring new applications, such as in automotive upholstery and filler materials. These efforts demonstrate the ongoing attempt to find a niche for Manila hemp in a market increasingly dominated by synthetic materials.⁷⁵

While synthetic fibers have indeed challenged the market for Manila hemp, this situation also

⁷⁴ Shinzo Hayase, "Manila Hemp in World, Regional, National, and Local History," *Journal of Asia-Pacific Studies* 31 (March 2018): [page number], <https://core.ac.uk/outputs/286959049/>.

⁷⁵ David Araya-Gutiérrez, Giovanni Garro Monge, Karol Jiménez-Quesada, Dagoberto Arias-

Aguilar, and Randall Quesada Cordero, "Abaca: A General Review on Its Characteristics, Productivity, and Market in the World," **Revista Facultad Nacional de Agronomía Medellín** 76, no. 1 (2023): 10263-10273, <https://doi.org/10.15446/rfnam.v76n1.101710>.

highlights an opportunity for innovation within the abaca industry. By focusing on its unique attributes, such as sustainability and biodegradability, and promoting its benefits in eco-conscious markets, Manila hemp could regain a competitive edge. The industry's efforts to diversify applications and emphasize its environmental advantages could help it carve out a sustainable niche, appealing to consumers and industries increasingly concerned with the ecological impact of their material choices. Thus, although synthetic fibers dominate the

market, the strategic positioning of Manila hemp as a green alternative could be key to its resurgence.

III. Conclusion

The narrative of Manila hemp is a complex interplay of opportunity and exploitation, reflecting the broader dynamics of colonialism during the Spanish era. The introduction of Manila hemp into global trade significantly enhanced maritime activities and established the Philippines as a crucial player in international commerce. However, this development also

underscores the darker realities of colonial exploitation. The Spanish colonial authorities recognized the exceptional qualities of abaca, promoting its cultivation and export to meet the demands of their expanding maritime empire. This led to economic growth in the Philippines, but it often came at the expense of local communities, who faced labor exploitation and disruption of traditional practices.

The maritime legacy of Manila hemp is particularly noteworthy, as it became an indispensable resource

for shipbuilding and naval operations. Its strength and resistance to saltwater made it the preferred material for ropes and rigging, essential for both commercial and military vessels. The reliance on Manila hemp during the age of exploration and trade not only facilitated the expansion of maritime routes but also underscored the Philippines' strategic importance in global maritime history. This legacy is evident in the way Manila hemp contributed to the success of naval powers, enabling them to navigate and control vast oceanic

territories. The integration of Manila hemp into maritime practices exemplifies how local resources were harnessed to support imperial ambitions, leaving a lasting impact on global trade networks.

The story of Manila hemp serves as a powerful reminder of the intertwined nature of resource utilization and colonial history. While it played a vital role in shaping global maritime practices, it also reflects the complexities of exploitation and economic dependency that arose from colonial rule. The dual legacy of

Manila hemp—both as a valuable resource and a symbol of colonial exploitation—invites us to critically examine the historical context of its production and trade. Understanding this legacy is essential for appreciating the historical significance of Manila hemp and its enduring impact on global trade dynamics.

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Signals Across the Seas: Maritime Smoke Signals and the Scattered Societies of the Philippines

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Abstract

As an archipelagic nation of over 7,000 islands, the Philippines has always been deeply connected to the sea, with maritime practices shaping its history, culture, and society. This paper explores the role of smoke signals in the context of the Philippines' maritime heritage, focusing on their use among scattered indigenous societies. Smoke signals, a vital form of long-distance communication, facilitated trade, defense, and social cohesion within the fragmented archipelago. From the Tausug and Sama-Bajau in the south to coastal communities across the islands, these signals served as critical tools in maintaining connections between seafaring peoples. This study highlights how such simple, yet effective methods of communication reinforced the maritime culture of the early Filipinos and shaped the development of the Philippines as a maritime nation-state. Through this lens, we better understand the integral role the sea and its accompanying practices played in shaping Filipino identity.

Key Words: Archipelagic Society, Indigenous Communication, Philippine Maritime Heritage, Seafaring Communities, Smoke Signals

Introduction

As an archipelago consisting of about 7000 islands located in the Pacific Ocean, the Philippines' history and culture have always been connected with the sea and maritime developments. The livelihoods of the native population depended upon the resources provided by the bodies of water surrounding the islands. From aquatic creatures serving as sustenance to channels and streams becoming pathways for intermingling and cooperation between the separated peoples of the archipelago, it truly is evident that the fledgling nation is deeply entrenched in its maritime

roots. Coinciding with the connections made between the scattered peoples of the Philippines, the use of traditional methods of communication is heavily relied upon, especially in the maritime landscape of the archipelago.

Being fragmented as it is and filled with precarious and a wide array of waterways and land formations, the need for a simple yet effective form of communication between the peoples of the archipelago arose. Particular among these methods that became a staple for long-distance communication is the venerable smoke signal. This article devotes itself to explore the integral role of

smoke signals in the historical context of the scattered societies and peoples of the fledgling archipelagic nation. Involved within this exploration are the means that these signals became a conduit for trade and exchange, defense and territory control, as well as cohesion within the societies enveloped within the nation that has always been and continues to be a maritime state.

The Maritime Geography of the Philippines

The island nation is comprised of a grand total of 7,641 islands and has a total area of around 300,000 square kilometers. It is divided by the three main island groups known

as Luzon, the Visayas, and Mindanao. It is one of the few countries that does not share a border with another country. The topography of the archipelago is characterized by numerous islands alongside extensive ranges of coastlines, and mountainous terrain comprising several prominent mountain ranges. This variety in landscapes proved to be a defining feature of the history and culture of the country. So much so that groups that resided along the coastal areas or waterways are considered to be more advanced than their counterparts in the

hinterlands.⁷⁶ The often treacherous terrain and waters within the archipelago became a constant challenge in the daily lives of the indigenous population to the point that they were heavily molded by it.

The country also had an abundance of forested areas that became a haven for hardwoods that were considered nearly perfect for the trade of shipbuilding. Teodoro Agoncillo claimed that the presence of such a high class of timber and the insular nature of the Indigenous population resulted in these people

groups being excellent shipbuilders to the point of not being engaged in any other form of livelihood.⁷⁷ The mountains of the archipelago made way for the prevalence of mining in the regions which was developed before the arrival of the Spanish explorers. It is said that the mountains teemed with gold deposits and other metals which became goods for trade with neighboring islands.⁷⁸

The variety of bodies of water present in the landscapes of the Philippines proved to be catalytic to the presence of a thriving fishing industry

⁷⁶Teodoro Agoncillo, *History of the Filipino People*, 8th ed. (Quezon City: C & E Pub, 2012), 52.

⁷⁷ Agoncillo, 52.

⁷⁸ Agoncillo, 51.

which is considered to be a natural activity that the population regularly partook in.⁷⁹ The differing fresh and salt waters became a hotbed for different techniques in the harvesting of aquatic creatures. Such methods include the use of nets, bows and arrows, baskets, and many more. In addition to this rich and varied fishing practice, the harvesting of pearls became a growing practice in the southern regions of the archipelago thus adding to the narrative that the surrounding waters heavily influenced the activities of the indigenous populations.

All of the aforementioned activities indicate the great importance the waters of the seas, rivers, and lakes had on the lives of the Filipinos. This ubiquitous importance can be immediately observed through the maritime practices and traditions evident in Filipino culture. These practices alongside the bodies of water that greatly influenced their existence remain to be a constant reminder of such a rich and prosperous maritime heritage that is passed down through generations of Filipinos who ought to make a living from the land they reside in.

⁷⁹ Agoncillo, 51.

Smoke Signals: A Tool for the Ages

Even before the arrival of the Spaniards and other people groups that had sailed the blue expanse of the oceans and seas, the indigenous peoples of the Philippine archipelago already maintained numerous complex and organized societies that encapsulated a strict hierarchical structure. This is evident in the presence of the categories given to people according to their status and standing in society namely, the *datus* – the head of a community, the *timawas* – the freed men, and the *oripuns* – the slaves.⁸⁰ These three

classes became the structure in which pre-sixteenth-century Filipinos, particularly in the Visayan region, organized themselves. Alongside this, early Filipinos had customs regarding *kinship* – observed in different terminologies regarding members of the family, *laws* – evident in the presence of a system of penalties that are accordingly administered to the litigants' position in society, marriage – the practice of dowry being enacted in marriages, inheritance – equal inheritance claims between both sexes⁸¹, and property that further supports this claim.

⁸⁰ Scott, William Henry. *Barangay* (Ateneo University Press, 1994), 127.

⁸¹ Scott, 127-43.

Besides a structured society, early Filipinos also attained advanced technical knowledge in the navigation of the open waters and the land they walked through, the trade of goods such as gold, sustenance, and other valuables, and the practice of agriculture. The presence of these achievements required a systematic dissemination of information and communication to coordinate the activities and agendas of the people groups within the archipelago. Although messengers were frequently used to deliver these important announcements, the smoke signal became the most convenient means of long-distance

communication. All that was needed was a large fire to signal to those who viewed the smoke pillar emanating from it that an important event was amiss in the area of the source of the fire.

Smoke signals, being a robust form of visual communication, were also proven to be a much more viable form of long-distance communication in the maritime environment that encapsulated the archipelagic nation for the vastness of the sea hinders sound-based communication as the crashing of waves can obstruct any drums and instruments or vocal sounds. Coinciding with the visual nature of smoke signals, it is not far-fetched

to conclude that its messages transcend language barriers. As indicated in an earlier passage, the sight of smoke evokes a primal sense of urgency in any person witnessing it regardless of their native tongue pushing them toward the location of the fire's source. It is precisely this inherent reaction towards the pillars of smoke that made smoke signals the ideal means of communication for the maritime culture of the early Filipinos.

Smoke Signals in Indigenous Maritime Cultures

In the island nation of the Philippines, several indigenous people groups still heavily conform and

partake in their maritime heritage. Chief among these indigenous groups are the *Tausug* and *Sama-Bajau*, both are commonly located in the southern parts of Mindanao. However, these people groups are not only found in the Philippines. They can be found in neighboring Southeast Asian nations such as Malaysia, Indonesia, and Brunei numbering at least 1.3 million with at least two hundred thousand to five hundred thousand in each nation. Their scattered presence amongst the coastlines of neighboring Southeast Asian nations indicates a strong maritime heritage.

These indigenous people groups often traveled the

seas with their belongings in tow. Due to this, they have developed a specialized boat for extended voyages that act as their temporary residence, the *lepa*. These ships are made to wade and travel across shallow waters near coastlines.⁸² These houseboats are capable of carrying an entire family inside them for they measure at around 9 to 15 meters long and at around 1.5 to 2.2 meters wide. With these ships, the *Sama-Bajau* and *Tausug* were able to spread out around the majority of the coastal regions of

Southeast Asia, further cementing their maritime heritage.

Although no written records have detailed the usage of smoke signals within these indigenous people groups' rich history, it is with the great possibility that the practice prevailed in their culture as it was the premiere form of long-distance maritime communication. The mastery over controlled fire by *Homo sapiens*, which is dated at around 790,000 years ago,⁸³ adds to the certainty of the early usage of smoke signals at

⁸² Jesusa Paquibot, "Lepa: The Sea as Home," *ICH Courier - Intangible Cultural Heritage Courier of Asia and the Pacific*, 2016.

⁸³N. Goren-Inbar, "Evidence of Hominin Control of Fire at

Gesher Benot Ya`aqov, Israel," *Science* 304, no. 5671 (April 30, 2004): 725, <https://doi.org/10.1126/science.1095443>.

around the time early Filipino indigenous groups settled the coastlines of the southern part of the archipelagic nation. Furthermore, Ambeth Ocampo, a renowned Philippine historian based in the country, wrote in an article that he had plans to write a dissertation on the contribution and hindrance brought by fire in the Philippine historical context.⁸⁴ Within that particular piece, he mentioned that contained within the 55-volume historical compilation of the Philippines known as “Blair and Robertson” were records of the methods and means utilized by Filipinos,

which included the usage of flint and tinder, alongside the uses they had for the fire. Such uses include the hardening of their weapons or for agricultural activities wherein they set the mountainside alit right before they began planting.

From these, an inference can be made that the venerable and quaint smoke signal was heavily intertwined with the maritime heritage and culture of the indigenous Filipinos. This is mainly due to the smoke signal’s necessity in long-distance communication with other

⁸⁴ Ambeth Ocampo, “Sources for ‘Fire’ in Philippine History,” INQUIRER.net (INQUIRER.net, April 2019),

<https://opinion.inquirer.net/120825/sources-for-fire-in-philippine-history>.

people groups in the maritime landscape. The landscape that they are faced with while living in the islands of the Philippines and its coastlines. This therefore insinuated and cemented a deep maritime culture entrenched in the lives of the indigenous people groups of the Philippines.

The Role of Smoke Signals in Defense and Social Cohesion

Aside from the civilian and communicative usage that smoke signals inherently present themselves with for the average person, they have defensive and socially cohesive applications for those who utilize them. This also applies to the early

Filipinos who used them to live within their coastal communities. Being scattered and vulnerable to reavers, pirates, and other opposing tribes, the smoke signal served as a quick and efficient form of communication to request aid from allied and neighboring tribes.

Although written records that detailed the usage of smoke signals in warfare and defense in the precolonial context of the Philippines are yet to be found, we can infer from other historical accounts from different civilizations that usage. A prime example of military and defensive usage would be in ancient China during the Ming Dynasty when the Great Wall of China was

constructed. Chinese soldiers that were stationed all across the Great Wall regularly lit smoke signals on their beacons to alarm others of intrusion from enemy forces or barbaric tribes.⁸⁵ From there on forth, smoke signals would prove decisive in the outcomes of battles and skirmishes between rival factions.

As for the venerable smoke signal's socially cohesive usage, they prove to be effective in maintaining relations and effective connections between scattered peoples in the

archipelagic nation. This was due to the capability of facilitating communication across a wide array of landscapes presented by the maritime environment in the Philippines which ensured that those who lived in the outskirts of the central living centers remain becoming parts of a much larger network of relations that included political, economic, and social matters.

Although specific examples of this usage of smoke signals are not well detailed in the early Philippine context, it is sufficient to

⁸⁵ Yumin Du et al., "An Exploration of the Military Defense System of the Ming Great Wall in Qinghai Province from the Perspective of Castle-Based Military Settlements,"

Archaeological and Anthropological Sciences 13, no. 3 (February 16, 2021), <https://doi.org/10.1007/s12520-021-01283-7>.

infer that they were used in that manner regularly by the early Filipinos. Though a modern-day example might not be inappropriate to cite in this matter, the College of Cardinals in Rome used smoke signals to signal to the onlookers the selection of a new Pope during the assembled papal conclave. Modern-day Filipinos regularly look to this ceremonial event to this day which symbolically connects them to their ancestors that regularly used said signals for communication.

Conclusion

Although a simple means of communication, maritime smoke signals became integral to the social and cultural spheres of

fledgling seafaring peoples and scattered societies of the Philippine archipelago. Indigenous populations from the southern coastal areas were attuned to their usages in navigating the waves and coasts where they called home. These signals became instruments of war and defense, as well as a means to maintain cohesion within the scattered societies by providing a visible and efficient channel for communication. Even though these signals are comparatively insignificant to the deeds of greater men in history, they, nonetheless, can serve as a lens to view the maritime heritage of the Filipinos. By giving light to the role these smoke signals had in the

history of the Philippines, the importance of the seas and other bodies of water in the culmination of the identity and history of the Filipino people is further reinforced.

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Enhancing Maritime Safety in the Philippines: The Evolution and Impact of Barometric Technology on Typhoon Forecasting and Navigational Resilience

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Abstract

The maritime industry is a vital part of the Philippine economy, facilitating transportation and trade across the archipelago. With sea transport accounting for approximately 98% of inter-island commerce and serving 40 million passengers annually, it plays a crucial role in the nation's connectivity and global maritime workforce, which makes up more than 25% of the world's seafarers. However, the Philippines' strategic location along the Pacific typhoon belt subjects it to an average of 20 typhoons each year, five of which are typically destructive. These typhoons pose significant threats to the maritime industry, causing vessel damage, infrastructure destruction, disrupted shipping routes, and significant economic and humanitarian impacts.

This research investigates the importance of the barometer, an essential meteorological instrument, in predicting typhoons and ensuring maritime safety in the Philippines. By measuring atmospheric pressure and anticipating weather changes, barometers help seafarers navigate safely, mitigate the risks of

typhoons, and protect lives and cargo. The study explores the historical development and application of barometers in Philippine maritime practices, highlighting their role in enhancing safety and contributing to the advancement of modern weather forecasting and disaster preparedness strategies. Through this exploration, the research aims to emphasize the critical role of barometers in the resilience and safety of the Philippine maritime industry.

Key Words: Atmospheric Pressure Maritime Industry, Typhoons, , Resilience, Safety

Introduction

The Philippines is a country rich in maritime history and industry. The country relies heavily on its maritime industry for transportation and trade in which sea transport accounts for approximately 98% of inter-island

commerce and 40 million passengers each year, making it critical to the nation's connectivity making the country a significant contribution to the global maritime workforce, accounting for more than 25% of the world's 1.6 million seafarers. Due to the

country's archipelago's strategic location.⁸⁶

The Philippine' maritime industry is a critical component of its economy and culture which operates in a difficult environment characterized by the archipelago's strategic location and frequent typhoons. The country is located along the Pacific typhoon belt and is visited by an average of 20 typhoons per year, five of which are destructive.⁸⁷ These powerful storms result in significant losses for the sector, including

damaged vessels, destroyed port infrastructure, and disrupted shipping routes. The aftermath frequently causes cargo delivery delays, economic disruptions, and higher insurance costs. Furthermore, the loss of life among seafarers during these disasters creates a significant humanitarian challenge, emphasizing the industry's vulnerability to typhoons. While the nation's seafarers are world-renowned for their abilities, the threat of these powerful storms

⁸⁶ MARINA, "Philippines," MPESEAS, last modified 2019, <https://mepseas.imo.org/about/countries/philippines#:~:text=With%20thousands%20of%20islands%2C%20the>.

⁸⁷ Asian Disaster Reduction Center, "Information on Disaster

Risk Reduction of the Member Countries," Adrc.asia, last modified 2019, <https://www.adrc.asia/nationinformation.php?NationCode=608&Lang=en>.

necessitates advanced tools and knowledge for safe navigation. Barometers, which measure atmospheric pressure and predict weather changes, are vital tools in maritime operations. By monitoring these atmospheric conditions, seafarers can anticipate the arrival of storms, adjust their routes accordingly, and take the necessary precautions to protect both lives and cargo, reducing the risks posed by the region's volatile climate.

Thus, this research aims to investigate the significance of the barometer in Philippine maritime history and practice. Given the country's vulnerability to typhoons, accurate

weather forecasting is paramount for maritime safety. The barometer, as a crucial meteorological instrument, has been instrumental in predicting these storms and aiding navigation. By examining its historical development and application in the Philippine context, this research aims to contribute to a deeper understanding of its role in enhancing maritime safety and informing the development of modern weather forecasting and disaster preparedness strategies.

Technological Advancements in Barometry

A barometer is a scientific instrument that measures atmospheric pressure, the

force exerted by Earth's gravity on the surrounding air to predict weather patterns.⁸⁸ In particular, barometers measure atmospheric pressure fluctuations to predict short-term weather changes, with low pressure often indicating storms and high pressure signaling clear skies, while accounting for altitude variations in pressure readings.

The development of the barometer emerged from investigations into the physical properties of air

during the late 16th century when Galileo Galilei, a pioneer in physics and astronomy, initially experimented with water and air in a sealed vessel to study temperature variations.⁸⁹ While not directly inventing the barometer, his work on air and vacuums provided a foundation for subsequent advancements.

Evangelista Torricelli, a student of Galilei, built upon his teacher's findings by creating a mercury barometer—the oldest type of barometer.⁹⁰ He filled a

⁸⁸ National Geographic, "Barometer," Education.nationalgeographic.org, last modified 2023, <https://education.nationalgeographic.org/resource/barometer/>.

⁸⁹ Britannica, "Track the Evolution of the Barometer to

Measure Atmospheric Pressure from Galileo to Blaise Pascal," Encyclopedia Britannica, <https://www.britannica.com/video/152196/overview-pressure-development-barometer>.

⁹⁰ National Geographic, "Barometer"

glass tube with mercury and inverted it into a mercury-filled dish. Torricelli observed that the mercury level fluctuated, predicting weather changes: a falling mercury level indicated deteriorating weather, while a rising level foretold fair conditions. This groundbreaking experiment established a direct correlation between atmospheric pressure and the height of the mercury column. Torricelli's work also contradicted the Aristotelian belief that air was weightless, as he demonstrated that air pressure exerted a force on the water column.

Blaise Pascal, a renowned polymath, further explored the relationship between atmospheric pressure and altitude. He proposed that air pressure decreases with increasing height. To verify this theory, Pascal orchestrated an experiment involving his brother-in-law, Florin Périer. Périer climbed the Puy-de-Dôme mountain with a mercury barometer, while a control barometer remained at the mountain's base. As Périer ascended, the mercury level in the barometer dropped, confirming Pascal's hypothesis and providing conclusive evidence of air pressure variation with altitude.⁹¹

⁹¹ C De Hosson, Bénédicte Caillarec, and Cécile De Hosson, "Hal-01663441 Lat," Dôme

Mountain. *Latin-American Journal of Physics Education* 3, no. 2 (2009): 207, accessed

The evolution of barometers continued as the time passed by. In 1844, the French scientist Lucien Vidi invented the aneroid barometer. An aneroid barometer is a device composed of a partially evacuated, corrugated metal box.⁹² A spring counteracts the tendency of the box to collapse due to external air pressure. As atmospheric pressure fluctuates, the box expands or contracts, causing a pointer to move across a calibrated scale.

This movement corresponds to changes in air pressure, similar to a mercury barometer.^{93 94}

In 1844, the development of the aneroid barometer marked a significant advancement in barometer design.⁹⁵ Unlike its predecessors, the aneroid barometer is purely mechanical, containing no liquids, and displays measurements on a dial. This device, invented by French scientist Lucien Vidi, consists of a partially

August 15, 2024,
<https://hal.science/hal-01663441/document>.

⁹² National Geographic, "Barometer"

⁹³ PAGASA, "Weather Instruments,"
www.pagasa.dost.gov.ph,
<https://www.pagasa.dost.gov.ph/learning-tools/weather-instruments>.

⁹⁴ Claire Soares, "Performance, Performance Testing, and Performance Optimization," Elsevier eBooks (January 1, 2008): 387–470.

⁹⁵ Ajaykumar Manivannan et al., "On the Challenges and Potential of Using Barometric Sensors to Track Human Activity," *Sensors* 20, no. 23 (November 27, 2020): 6786.

evacuated, corrugated metal box.⁹⁶ A spring mechanism counteracts the box's tendency to collapse under external air pressure. As atmospheric pressure changes, the box expands or contracts, moving a pointer across a calibrated scale. This mechanism functions similarly to a mercury barometer by reflecting fluctuations in air pressure.^{97 98}

The 20th century witnessed a technological leap in barometry with the introduction of electronic components and

microprocessors. These advancements led to the development of the digital barometer. A digital barometer uses a micro-electromechanical (MEMS) sensor to measure pressure. Pressure sensing MEMS are typically tiny integrated circuits (IC), which combine electronic and mechanical elements to sense pressure.⁹⁹ Compared to traditional methods, digital barometers offer superior accuracy and speed in displaying complex atmospheric information.¹⁰⁰

⁹⁶ National Geographic, "Barometer"

⁹⁷ PAGASA, "Weather Instruments"

⁹⁸ Claire Soares, "Performance, Performance Testing, and Performance Optimization"

⁹⁹ Larry Mock, "From Mercury to Digital"

¹⁰⁰ National Geographic, "Barometer"

Historical Overview of Meteorological Tools in the Philippines

In the Philippines, before the advent of modern meteorological tools, Filipinos relied heavily on traditional knowledge and observations to forecast weather conditions. These practices, deeply ingrained in local culture and passed down through generations, provided a framework for understanding and responding to the environment.

A study¹⁰¹ documented a range of traditional weather prediction methods used by residents

of Tawi-Tawi, Philippines. This study found out that the atmospheric conditions, including cloud formations, wind patterns, temperature, and visibility, served as primary indicators. Different cloud types were associated with specific weather events, such as the ominous cumulonimbus signaling an approaching storm. Wind direction and strength were also crucial factors in predicting weather changes. Astronomical observations were another essential component of traditional forecasting. Lunar phases were correlated with particular weather patterns, while

¹⁰¹ Albaris Tahiluddin et al., "Traditional Weather Forecasting: Practices of Fishers, Sailors and Old Folks in Tawi-

Tawi, Philippines," *Acta natura et scientia* 4, no. 1 (February 17, 2023): 10–16.

the sun's position in the sky was used to predict the onset of the rainy season. Furthermore, the study revealed that animal behavior was closely observed. Certain actions, like ants building high nests, were believed to foretell heavy rain. Indigenous knowledge, including local folklore and proverbs, complemented these observational methods. These cultural wisdoms were shared across generations, providing a historical context for interpreting weather patterns.

While these traditional methods offered valuable insights, their accuracy and predictability were limited. The increasing complexity of weather patterns due to climate change has further challenged the reliability of these age-old practices.

Moreover, Kerby Alvarez, an associate professor, found in his study titled "Instrumentation and Institutionalization: Colonial Science and the Observatorio Meteorológico de Manila, 1865–1899"¹⁰² that colonial meteorology in the Philippine archipelago

¹⁰² Kerby Alvarez, "Instrumentation and Institutionalization: Colonial Science and the Observatorio Meteorológico de Manila, 1865–1899," *Philippine Studies*

Historical and Ethnographic Viewpoints (2016), accessed September 2, 2024, <http://www.philippinestudies.net/ojs/index.php/ps/article/viewFile/4320/6317>.

originated from the pioneering experiments of Jesuit scientists from the Ateneo Municipal de Manila, Fathers Francisco Colina and Jaime Nonell. Beginning in January 1865, these Jesuits used rudimentary instruments to record weather data, conducting some of the earliest systematic meteorological studies in the region. Their efforts not only advanced the scientific understanding of local weather patterns but also captured the interest of the business community, which recognized the potential benefits of meteorological research for trade and navigation.

The beginnings of colonial meteorology in the archipelago can be traced

back to the experiments conducted by the Jesuit scientists of the Ateneo Municipal de Manila, Frs. Francisco Colina and Jaime Nonell (Schumacher 1965, 258). In January 1865 Father Colina put instruments such as a thermometer, hygrometer, a barometer that used oil instead of mercury, and an anemometer made of cloth and twine in an abandoned pigeon house. Twice or thrice a day, he recorded all-weather data from his improvised gadgets. The two scientists conducted a meteorological study of a typhoon that hit Manila and its nearby communities in September of that year and published it in the

Diario de Manila (ibid., 259). This initiative attracted the attention of merchants who immediately saw the value for trade of meteorological studies.

The businessmen approached and asked the superior of the Jesuits in the Philippines, Fr. Juan Vidal, to encourage the Jesuits of the Ateneo to continue studying the weather and issuing notes and warnings to seafarers (ibid.). Business owners expressed their interest in supporting the Jesuits, and gave monetary support for the purchase of additional instruments (ibid.). Dutch Consul to the Philippines Van Polanen Petel, Maximo Paterno, and Ramón

Genato signified their intention to donate funds (Saderra Masó 1915, 27). According to Colina, the observatory could further support the traders if they could acquire new instruments from Europe, such as Secchi's meteorógrafo universal (universal meteorograph that recorded simultaneously several meteorological conditions), which cost 5,000 Spanish dollars (Schumacher 1965; Repetti 1948). This instrument enabled the continuous recording of meteorological observations day and night (Schumacher 1965, 259). The Manila businessmen were able to come up with the necessary amount. In

1867, before disembarking in Spain, Colina went to Paris to personally request Secchi to make a copy of his instrument for the use of the Jesuits in Manila (Repetti 1948; Saderra Masó 1915).

The early meteorological work of Fathers Colina and Nonell set the foundation for the development of meteorological studies in the Philippines. With the backing of local businessmen and support from influential figures, the Jesuits were able to secure funding for more advanced instruments, including the innovative Secchi's universal meteorograph.

This support highlighted the increasing recognition of the importance of meteorology for economic and safety purposes, ultimately leading to a more systematic and scientifically equipped approach to understanding the region's weather patterns. These early collaborations between scientists and the business community marked the beginning of organized meteorological efforts in the archipelago.

Following its official recognition in 1884, the Observatorio Meteorológico de Manila continued to advance typhoon forecasting.¹⁰³ A

¹⁰³ PAGASA, DOST-PAGASA Annual Report on Philippine Tropical Cyclones 2017: An

Official Publication of the Weather Division, 2019.

pivotal moment came in 1886 with Fr. Federico Faura's development of a specialized barometer for mariners operating in Philippine and South China Sea waters. Building upon this innovation, Fr. José Maria Algué introduced the barocyclonometer in 1897, a refined instrument capable of predicting typhoons across the entire Far East. The innovation was so remarkable that it drew significant interest from the U.S. Navy. Recognizing its potential to enhance weather forecasting, the Navy began using the barocyclonometer in 1911 for its operations across the Atlantic. This adoption underscored the instrument's effectiveness and marked a milestone in

the global integration of advanced meteorological tools. Algué's contributions extended beyond instrumentation, with his 1894 publication "Baguios ó ciclones Filipinos: Estudio teórico-practico "Typhoons or Filipino cyclones: A study in Theory and Practice" offering invaluable guidance to mariners on understanding and navigating typhoon-prone waters. These advancements solidified the Philippines' role as a leader in barometric technology and typhoon research.



Fig. 1. Faura's barómetro aneroide

Source: Alvarez 2016, 409



Fig. 2. Algué's barociclonometr

Source: Saderra Masó 1915, MOA 1937, and Alvarez 2016

The Barometer and Typhoon Prediction

The Philippines is highly susceptible to natural hazards and disasters, particularly tropical cyclones (TCs). There are more TCs entering the Philippine Area of Responsibility (PAR) than anywhere else in the world. With an average of 20 TCs traversing the PAR annually, and roughly half making landfall, the country endures a relentless onslaught of typhoons. The concentration of TCs formation and intensification during the July to October period exacerbates this vulnerability, subjecting the nation to a persistent threat of heavy rainfall,

flooding, strong winds, and storm surges.¹⁰⁴ The country is prone to tropical cyclones due to its geographical location which generally produce heavy rains and flooding of large areas and also strong winds which result in heavy casualties to human life and destruction to crops and properties. Thus, it is of utmost importance to have sufficient knowledge on such maritime phenomena for beneficial purposes.¹⁰⁵

Typhoons have been a formidable force shaping the Philippines' maritime history. Situated in the

typhoon belt, Philippine maritime transport and navigation are exposed to the hazards of typhoons and hurricanes. As an archipelago, shoals, rocks, reefs, tide rips and eddies characterized the many maritime routes and presented real dangers to navigation.¹⁰⁶ Even in this modern day, Philippine maritime travel routes are described at best as unpredictable, at worst

¹⁰⁴ PAGASA, "Tropical Cyclone Information," last modified 2021, <https://www.pagasa.dost.gov.ph/climate/tropical-cyclone-information>.

¹⁰⁵ PAGASA, "Weather Instruments,"

<https://www.pagasa.dost.gov.ph/learning-tools/weather-instruments>.

¹⁰⁶ Efen Isorena, *Maritime Disasters in Spanish Philippines*, 62

hazardous.¹⁰⁷ ¹⁰⁸ The maritime industry in the Philippines operates in a challenging environment characterized by frequent typhoons and hurricanes, coupled with outdated navigational infrastructure. Reliance on aging forecasting equipment and inadequate dissemination of weather information exacerbates the risks faced by vessels. The limited number of operational lighthouses and outdated navigational charts further compromise safety at sea. As a result, seafarers often rely heavily on experience

and intuition for navigation, underscoring the critical need for improved maritime infrastructure and forecasting capabilities to enhance safety and efficiency in the Philippine waters.¹⁰⁹

The number of maritime accidents in the country peaked in 1990 but gradually declined in subsequent years. The month of September is the peak of the country's typhoon season, and is also the month with the highest incidence of maritime

¹⁰⁷ Anthony Perez, Carl Abelardo, and Rafael Consunji, "The Sinking of the MV Doña Paz - a Critique on Maritime Disaster Preparedness in the Philippines: An Analysis of the Event," ACTA MEDICA PHILIPPINA 45, no. 3 (2011).

¹⁰⁸ Efren Isorena, "Maritime Disasters in Spanish Philippines: The Manila-Acapulco Galleons, 1565-1815," IJAPS 11, no. 1 (2015): 53–83.

¹⁰⁹ Katerina Leyritana et al., "The Sinking of the MV Doña Paz"

accidents.¹¹⁰ Maritime incidents can be categorized into two types: force majeure and operational; force majeure incidents occur when vessels encounter adverse weather conditions such as strong winds, waves, storms, typhoons, and squalls, meanwhile, operational incidents result from vessel system failures, including navigation and propulsion issues, as well as human error.¹¹¹ In particular, the role of the barometer and other meteorological tools are to prevent force majeure incidents. The barometer measures the atmospheric

pressure. The pressure exerted by the atmosphere at a given point as measured by a barometer. It can be measured in millibars or inches of mercury, among others. Watching a barometer for a drop in atmospheric pressure helps forecasters determine when a hurricane is approaching.

Conclusion

The Philippines' reliance on its maritime industry for trade, transportation, and economic stability underscores the critical need for effective weather forecasting and

¹¹⁰ Joseph Badajos, *Enhancement of Maritime Safety in the Philippines*, 1999, accessed December 12, 2023, <https://commons.wmu.se/cgi/vi>

[ewcontent.cgi?article=1076&context=all_dissertations](http://www.aims-museo-maritimo.com/ewcontent.cgi?article=1076&context=all_dissertations).

¹¹¹ Joseph Badajos, *Enhancement*, 1999

navigational safety. Situated in a region frequently impacted by typhoons, the country's maritime sector faces significant challenges, including vessel damage, disrupted trade routes, and loss of life. This research has highlighted the essential role of the barometer in predicting these destructive weather events, enabling seafarers to make informed decisions that protect both lives and cargo. By tracing the historical development and application of barometers in the Philippines, this study demonstrates how advancements in meteorological tools have significantly contributed to maritime safety and efficiency.

The use of barometers has not only improved the ability to forecast typhoons but has also laid the groundwork for developing modern weather prediction technologies. Moving forward, continued investment in meteorological research and advanced forecasting tools will be crucial to enhancing the resilience of the Philippine maritime industry against the increasing threats posed by climate change. By building on the legacy of tools like the barometer, the Philippines can ensure that its maritime sector remains a vital and secure component of its economy and culture, adapting to the challenges of the future.

while safeguarding its rich maritime heritage.

barometric data can further enhance maritime safety.

While this research provides valuable insights into the role of barometers in maritime safety, further studies are needed to deepen our understanding of their impact. The research faced limitations, particularly in sourcing stories or accounts of maritime accidents directly linked to weather conditions and the use of barometers. Additionally, there was a lack of statistical analysis exploring the relationship between barometer readings and maritime accidents. Addressing these gaps in future research is crucial for a more comprehensive understanding of how

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Enhancing Maritime Safety and Efficiency: The Role of GPS (Global Positioning System) in Philippine Fishing Vessel Operations

Vielka Lanz Iryl R. Quinante

Abstract

The Philippine fishing industry plays a vital role in the country's economy and food security, but it continues to face serious risks due to unpredictable weather, dangerous sea conditions, and limited access to modern equipment. This paper shows how Global Positioning System (GPS) technology can help address these challenges by improving safety and increasing overall efficiency. From ancient navigation tools such as the compass and sextant to today's satellite-based systems, navigation methods have evolved to keep seafarers safe and help them travel more accurately. GPS allows fishermen to determine their exact location, avoid dangerous areas, and quickly send their position to rescuers in case of an emergency. It also helps authorities monitor fishing activities and reduce illegal or unreported fishing. The paper finds that fully integrating GPS into the Philippine fishing industry, through government support, better access, and stronger enforcement, can significantly protect fishermen's lives, prevent accidents, and support the sustainable use of marine resources.

Key Words: GPS, Global Positioning System, Philippine Maritime, and Safety.

Introduction

The Philippines, an archipelago of more than 7,641 islands, has long been recognized as a maritime nation with a deep connection to the sea. Even before the arrival of the colonizers, it is known that the Philippines has already had a record in having early maritime evidence.¹¹² It was also

recorded that the early Filipinos were able to build their own ships or boats.¹¹³ The Philippines have a total land area of 301,000 km², a total area of 2,200,000 km² of marine waters including the exclusive economic zone or EEZ, and the coastline with a total area of 36,289 km.¹¹⁴ It is part of the coral triangle, a marine area that is located in the western Pacific Ocean.

¹¹² Tan, Rita. 1991. Participation of the Philippine in the Nanhai Trade, 9th-16th Centuries . In Roads of Dialogue: "Manila as an Entrepot in the Trans-Pacific Commerce." https://en.unesco.org/silkroad/sites/default/files/knowledge-bank-article/participation_of_the_philippines_in_the_nanhai_trade9th-16th_centuries.pdf.

¹¹³ Aguilar, Glenn. 2006. "The Philippine Indigenous Outrigger

Boat: Scaling Up, Performance and Safety." ResearchGate. Marine Technology Society. September 2006. https://www.researchgate.net/publication/233644288_The_Philippine_Indigenous_Outrigger_Boat_Scaling_Up_Performance_and_Safety.
¹¹⁴ Lamarca, Napoleon Salvador. 2018. Fisheries Country Profile: Philippines (2018). SEAFDEC. June 13, 2018. <http://www.seafdec.org/fisheries-country-profile-philippines-2018/>.

Together with Indonesia, Malaysia, Papua New Guinea, Timor Leste and Solomon Islands, the Philippine waters were included wherein the people depend on its coral reefs for food, making money out of it, and protection from storms and tropical depression.¹¹⁵

The Philippine fishing industry is a vital component of the nation's economy, providing livelihoods to millions and contributing significantly to the country's food security.

With its extensive coastline and rich marine biodiversity, the Philippines is one of the world's top fish-producing nations.¹¹⁶

The industry is characterized by a mix of commercial, municipal, and aquaculture fishing, with small-scale municipal fishing making up a large portion of the sector.¹¹⁷ However, the industry faces significant challenges, particularly in terms of safety and efficiency. Fishermen often contend with unpredictable weather

¹¹⁵ WWF. 2019. "Coral Triangle | Places | WWF." World Wildlife Fund. 2019. <https://www.worldwildlife.org/places/coral-triangle>.

¹¹⁶ Menasveta, Deb . n.d. The Sustainable Contribution of Fisheries to Food Security in Southeast Asia.

<https://www.fao.org/4/x6956e/x6956e07.htm>.

¹¹⁷ Lamarca, Napoleon Salvador . 2022. "Fisheries Country Profile: Philippines." SEAFDEC. July 9, 2022. <http://www.seafdec.org/fisheries-country-profile-philippines/>.

conditions, including the frequent typhoons that hit the archipelago.¹¹⁸ Navigational hazards, such as shallow waters and coral reefs, also pose risks. Furthermore, many small-scale fishermen lack access to modern equipment, relying instead on traditional methods, which can be both inefficient and dangerous.¹¹⁹ These challenges not only threaten the safety of fishermen but also impact the overall productivity and sustainability of the industry.

The introduction of GPS (Global Positioning System) technology has offered a transformative solution to these challenges, which provides fishermen with the tools necessary to enhance both safety and efficiency at sea. In the maritime sector, GPS technology is used to improve navigation, enhance safety, and optimize operations. It enables vessels to determine their exact location, plot courses, avoid hazards, and coordinate with other

¹¹⁸ "Less Catch, Less Cash: How Climate Change Is Affecting Fisherfolk..." n.d. IOM Regional Office for Asia and the Pacific. <https://roasiapacific.iom.int/stories/less-catch-less-cash-how-climate-change-affecting-fisherfolk-philippines>.

¹¹⁹ Smith, Hillary, and Xavier Basurto. 2019. "Defining Small-

Scale Fisheries and Examining the Role of Science in Shaping Perceptions of Who and What Counts: A Systematic Review." *Frontiers in Marine Science* 6, no. May (May). <https://doi.org/10.3389/fmars.2019.00236>.

vessels. In addition to basic navigation, GPS can be integrated with other technologies, such as weather forecasting systems and communication tools, to provide comprehensive situational awareness and support decision-making processes.¹²⁰

GPS technology is crucial in enhancing the safety and operational efficiency of fishing vessels in the Philippines. By reducing navigational errors, improving search and rescue operations, and optimizing fishing routes, GPS significantly mitigates the risks faced by

fishermen and improves the productivity of their operations. This paper will explore the importance of GPS in enhancing maritime safety, its role in improving operational efficiency, and the challenges associated with its adoption in the Philippine fishing industry.

Evolution of Navigation Systems

The evolution of navigation systems from ancient times to the present has been marked by significant advancements. In ancient times, navigators relied on natural elements such as winds, sea currents, and celestial bodies, like the

¹²⁰ "What Is Global Positioning System? GPS Explained." n.d. SINAY Maritime Data Solution.

<https://sinay.ai/>.
<https://sinay.ai/en/maritime-glossary/gps/>.

North Star, to determine their position. Key instruments developed during this era included the compass, which is believed to have originated in China, and the astrolabe, which allowed sailors to measure the angles of celestial bodies. The sextant emerged as another vital tool, enabling navigators to determine their ship's position by measuring the angle between a celestial object and the horizon.

As navigation technology advanced, the introduction of RADAR (Radio Detection

and Ranging) during World War II provided significant improvements in distance measurement and target identification.¹²¹ Following the war, systems like LORAN (Long Range Navigation)¹²² and DECCA utilized radio signals for position determination,¹²³ primarily serving military and commercial vessels. These systems represented a significant leap forward in navigational accuracy and reliability. The late 20th century saw the advent of satellite navigation systems, with the Global Positioning System (GPS)

¹²¹ Imperial War Museum. n.d. "How Radar Changed the Second World War." Imperial War Museums. Imperial War Museums. <https://www.iwm.org.uk/history/how-radar-changed-the-second-world-war>.

¹²² "Loran | Radio Navigation." n.d. Encyclopedia Britannica. <https://www.britannica.com/technology/loran>.

¹²³ Ferrara, Angelo. 1967. "Electronic Positioning Systems for Surveyors."

and its Russian counterpart GLONASS revolutionizing maritime navigation.

These systems provided unprecedented accuracy and real-time positioning capabilities, transforming how vessels navigate the seas. The integration of GPS with other technologies, such as Electronic Chart Display and Information System (ECDIS) and Automatic Radar Plotting Aid (ARPA), has further enhanced navigational safety and efficiency.¹²⁴ In addition to GPS and GLONASS, other systems like the European

Geographic Navigation Service (EGNOS) and the Wide Area Augmentation System (WAAS) have been developed to improve the accuracy and integrity of satellite navigation. These advancements reflect the ongoing commitment to enhancing maritime safety and operational effectiveness. As the maritime industry keeps changing, these navigation systems—from ancient tools to modern satellite technology—show how people have always worked hard to make sea travel safer and more efficient.¹²⁵

¹²⁴ Terpsidi, F, N Nikitakos, and D Papachristos. 2019. "Maritime Industry Revival through Systems Digitalization." *Journal of Multidisciplinary Engineering Science and Technology (JMEST)*

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¹²⁵ *Ibid.*

Global Positioning System (GPS) Technology in Maritime Sector

GPS technology employs a distinctive information system approach known as Geographic Information System (GIS), a computer-based tool that enables the creation, management, viewing, and storage of geographically referenced data. This includes location-based data, such as that provided by the Global Positioning System (GPS). Initially introduced by the Department of Defense in 1978 under the name "NAVSTAR GPS" (Navigation Satellite Timing and Ranging Global Positioning System), GPS is a global navigation satellite system designed to determine location, speed,

direction, and time. Originally developed for military applications, GPS has since become integral to numerous civilian activities, ranging from navigation and mapping to time synchronization and asset tracking. According to the Federal Radio Navigation Plan, radio navigation systems can be classified into active and passive types. These systems work by transmitting precise signals, which are then received by a navigation receiver. The receiver calculates the time it takes for the signal to travel and multiplies it by the speed of light to determine the distance from the transmitter. GPS technology is widely used across various modes of

transportation, particularly land, air, and sea, to track the location of objects, assess ship performance, evaluate safety factors, and more. Some GPS service providers include Fox Logger GPS Tracking System 2.0, Advance GPS Tracker, GPS Track Server ID, Coherent Navigation (Apple, Inc.), and Marine Traffic.¹²⁶

Enhancing Maritime Safety through GPS Technology

Safety is a major concern for the Philippine fishing industry. The unpredictable nature of the

ocean, coupled with frequent typhoons and navigational hazards, makes fishing a dangerous occupation. Many fishermen lack access to modern communication and navigation equipment, which makes them more vulnerable to accidents and difficult to rescue in emergencies.

The Global Positioning System, or GPS, is mainly used for accurate positioning and navigation, which the maritime industry relies on. It serves as a foundational technology for systems like

¹²⁶ Quintania, Melani, Danny Faturachman, T Husain, Bayu Pasupati, and Ahmad Taufik. 2021. "Utilization of GPS Technology in the Maritime Sector on Motor Sailing Yachts."

IOP Conference Series. Earth and Environmental Science 698, no. 1 (March): 012039–39. <https://doi.org/10.1088/1755-1315/698/1/012039>.

the Automatic Identification System (AIS), the Global Marine Distress and Safety System (GMDSS), and Vessel Monitoring Systems (VMS).¹²⁷ The Automatic Identification System (AIS) is a maritime communication system that enhances the safety and efficiency of navigation. It uses GPS to automatically broadcast a vessel's real-time position, speed, course, and other relevant data to nearby ships, shore stations, and traffic monitoring centers. AIS is primarily used to prevent collisions, improve

situational awareness, and assist in maritime traffic management.¹²⁸ The Global Marine Distress and Safety System (GMDSS) is an internationally recognized communication system designed to enhance the safety of maritime travel and ensure that ships can quickly alert rescue authorities in case of distress. It uses a combination of satellite and terrestrial radio communication systems to transmit distress signals, maritime safety information, and facilitate ship-to-ship and ship-to-

¹²⁷ O'connor, Alan, Michael Gallaher Kyle, Clark-Sutton Daniel, Lapidus Zack, T Oliver, Troy Scott, Dallas Wood, et al. 2019. "Economic Benefits of the Global Positioning System (GPS) Final Report."

https://www.rti.org/sites/default/files/gps_finalreport.pdf.

¹²⁸ "AIS Frequently Asked Questions | Navigation Center." 2024. [uscg.gov](https://www.uscg.gov). 2024. <https://www.navcen.uscg.gov/ais-frequently-asked-questions>.

shore communication.¹²⁹ GPS plays a critical role in GMDSS by providing precise location data, which is included in distress signals to help rescuers quickly locate vessels in emergency situations. This system is mandatory for most international ships and is a vital part of global maritime safety. A Vessel Monitoring System (VMS) is a satellite-based tracking system used to monitor the location and movement of commercial fishing vessels. It allows authorities to track vessels in real-time by transmitting data on the ship's position, speed, and

course at regular intervals. VMS is primarily used for enforcing fisheries regulations, ensuring compliance with legal fishing zones, preventing illegal, unreported, and unregulated (IUU) fishing, and managing marine resources more effectively. Many VMS use GPS to provide accurate location data.¹³⁰ While GPS is the main navigation tool for most vessels, smaller recreational boats are an exception. Those maritime technologies and systems either rely entirely on GPS or incorporate it for certain functionalities, and without

¹²⁹ "Global Maritime Distress and Safety System (GMDSS)." n.d. www.fcc.gov.
<https://www.fcc.gov/wireless/bureau-divisions/mobility-division/maritime-mobile/ship-radio-stations/global-maritime>.

¹³⁰ Fisheries, NOAA. n.d. " | NOAA Fisheries."
www.fisheries.noaa.gov.
<https://www.fisheries.noaa.gov/topic/enforcement/vessel-monitoring>.

it, their operational efficiency would be significantly reduced.¹³¹

GPS technology plays a crucial role in addressing these safety challenges. One of its primary benefits is the reduction of navigational errors. With real-time positioning data, fishermen can accurately determine their location, plot safe routes, and avoid hazards like coral reefs and shallow waters. GPS can also help fishermen stay within designated fishing areas, reducing the risk of accidental boundary violations, which can lead to legal troubles or confrontations with other

vessels. Moreover, GPS enhances search and rescue operations. In the event of an emergency, such as engine failure or a storm, GPS allows vessels to send precise location data to rescue authorities, significantly reducing response times. This is especially important in the Philippines, where small-scale fishermen often venture far from shore in unregistered or poorly equipped boats.

Challenges in the Philippine Fisheries Sector

Overfishing, which occurs when fish are harvested at a rate faster than they can naturally reproduce, poses

¹³¹ O'Connor et al., Economic Benefits of the Global Positioning System.

a significant threat to marine ecosystems. This can happen directly or indirectly, such as through bycatch, where non-target species are unintentionally captured during fishing.¹³² The overexploitation of marine resources has contributed to the decline in fish stocks, raising concerns about long-term food security. Asia-Pacific Fishery Commission (APFIC) members in the Philippines highlighted it as one of the several challenges in the fisheries sector. These challenges also include an excessive number of fishers and

dwindling marine resources.

Additionally, there is a significant gap in the availability of accurate data on fish populations and fishing capacity. This situation is driven by factors such as shrinking fish stocks, deteriorating coastal ecosystems, unfair distribution of fishing benefits, and internal conflicts within the industry.¹³³ These issues have increased the urgency for better fisheries management practices, including more effective monitoring, control, and surveillance

¹³² UNFCCC. 2022. "Plenty of Fish?" Unfccc.int. June 10, 2022. <https://unfccc.int/news/plenty-of-fish>.

¹³³ "Theme II: Current Status in Capacity Reduction and Control

of IUU Fishing." 2015. Fao.org. 2015. <https://www.fao.org/4/ah999e/ah999e06.htm>.

(MCS), to ensure sustainable fishing and protect marine biodiversity. One major innovation is the use of vessel monitoring systems (VMS), which utilize GPS to track the location and activities of fishing vessels.¹³⁴ VMS has enhanced the efficiency of fisheries MCS by providing wider coverage at a lower cost. However, its adoption in developing countries, such as the Philippines, remains limited due to challenges like high costs, equipment maintenance, and the need for satellite communication systems.

In the Philippines, while commercial vessels are

tracked through the Western and Central Pacific Fisheries Commission's (WCPFC) VMS, there is no national system in place for smaller, municipal fisheries. Given that most fishers in the country operate small- to medium-sized vessels, the cost of satellite-based VMS is often unaffordable. An alternative solution could be using low-cost GPS data loggers to monitor municipal fisheries. These devices could help improve compliance with local regulations and address key management issues in Philippine fisheries, providing a more cost-effective option for fishers

¹³⁴ "Vessel Monitoring System." 2024. Nafo.int. 2024.

<https://www.nafo.int/Fisheries/ReportingRequirements/VMS>.

who cannot afford traditional VMS systems.¹³⁵

Moreover, in small-scale fishery management, GPS tracking offers a more precise way to measure fishing effort in hours per trip compared to traditional methods. Unlike map-based interviews that rely on counting trips without considering actual fishing time, GPS tracking provides detailed

data on the location and duration of fishing activities. This method allows for more accurate monitoring of fishing pressure and supports better spatial management of small-scale fisheries by offering a clear picture of fishing effort distribution.¹³⁶

¹³⁵ Fernandez, Perry Neil, Arnold Gaje, and Ricaardo P. Babaran. 2019. "Comparison of Low-Cost Global Positioning System (GPS) Data Loggers for Their Potential Application in Fishing Vessel Monitoring System in the Philippines." *Asian Fisheries Science* 32, no. 2 (June). <https://doi.org/10.33997/j.afs.2019.32.02.002>.

¹³⁶ Behivoke, Faustinato, Marie-Pierre Etienne, Jérôme Guitton, Roddy Michel Randriatsara, Eulalie Ranaivoson, and Marc Léopold. 2021. "Estimating Fishing Effort in Small-Scale Fisheries Using GPS Tracking Data and Random Forests." *Ecological Indicators* 123, no. April (April): 107321. <https://doi.org/10.1016/j.ecolind.2020.107321>.

International Approaches to GPS-Enhanced Fishing Vessel Safety

In addition to its role in managing fisheries, GPS technology has proven to be crucial for enhancing maritime safety. Fishing boats often face the risk of collisions with larger ships because they lack effective communication systems. While ships use radars, they sometimes fail to detect smaller boats. Currently, there are no reliable systems to warn fishing boats about incoming ships or to notify others if an accident occurs, leading to

frequent and unnoticed accidents.¹³⁷ Global Positioning System (GPS) aims to prevent such collisions by improving safety measures for fishing boats, especially for small boats.

This need for better maritime safety measures is particularly evident in cases like the issue faced by Tamil Nadu fishermen, who frequently drift into Sri Lankan waters, leading to dangerous encounters and arrests. Many fishermen stray into these waters due to engine failures or strong currents, often without realizing

¹³⁷ Subash, TD., Akhil S. Pradeep, Abin Rajan Joseph, Anto Jacob, and PS. Jayaraj. 2020. "Intelligent Collision Avoidance System for Fishing Boat." *Materials Today: Proceedings* 24, no. January (January): 2457–63. <https://doi.org/10.1016/j.matpr.2020.03.776>.

Proceedings 24, no. January (January): 2457–63. <https://doi.org/10.1016/j.matpr.2020.03.776>.

they are crossing into restricted areas. To address this problem, a GPS-based system is being proposed to enhance safety for these fishermen. This system would include an alarm that activates when approaching the maritime boundary and use GPS to track the boat's location. If necessary, it can send emergency alerts to the Indian Navy for quick assistance.¹³⁸

Similar approaches have been adopted by other countries to improve the safety of their fishing vessels. For example, nations such as the United

States and Australia have implemented GPS technology to monitor fishing activities, prevent collisions, and ensure vessels remain within designated boundaries. These international examples demonstrate the effectiveness of GPS in enhancing maritime safety and can provide valuable insights for implementing a similar system in Tamil Nadu. By integrating GPS technology, Tamil Nadu can better protect its fishermen, prevent accidental boundary crossings, and align with global best practices in maritime safety.

¹³⁸ Raja Nandhini, S. Malarvizhi, A. Praveen, C. Mohanraj, and R. Srinivasan. 2016. "Intelligent Navigation System Boats Using GPS." *International Research*

Journal of Engineering and Technology.
://www.irjet.net/archives/V3/i1/I
RJET-V3I1202.pdf.

Solutions and Future Outlook

Several initiatives could be implemented to promote the wider adoption of GPS technology in the Philippine fishing industry. These include government-led incentives for commercial fishing operators to install Vessel Monitoring Systems (VMS), subsidies for small- and medium-scale fishers to access GPS devices, and partnerships between local governments, maritime authorities, and international advocacy groups to enhance awareness of the technology's benefits. Public education campaigns could further emphasize the role of GPS in preventing illegal,

unreported, and unregulated (IUU) fishing and improving the safety of fishing vessels at sea.

Oceana Philippines, an international advocacy group, has already called on the government to make VMS mandatory on all commercial fishing vessels to improve transparency and protect fishermen, particularly in light of the recent sinking of a Filipino boat by a Chinese ship in the West Philippine Sea. VMS, which is mandated by the amended Fisheries Code, enables real-time tracking of vessel movements, speed, and location, helping to curb IUU fishing, human trafficking, and forced labor. Without a comprehensive VMS, the

Philippines remains vulnerable to threats against ocean governance, food security, and national honor. Gloria Ramos, Oceana's vice president, has underscored the urgent need for stronger oversight and science-based decision-making to safeguard the nation's marine resources.¹³⁹

In alignment with Oceana's advocacy, the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) has launched the Integrated Marine Environment Monitoring System

(IMEMS) Project, a comprehensive initiative designed to combat IUU fishing through the integration of GPS, communication, and law enforcement functionalities. IMEMS monitors Philippine-flagged vessels in real time, ensuring compliance with maritime regulations and improving the sustainability of fisheries. By installing GPS-based VMS transceivers on 5,000 commercial vessels, IMEMS strengthens both fisheries management and the country's response to emergencies at sea.¹⁴⁰

¹³⁹ "Oceana: Transparency at Sea through Vessel Monitoring Technology Protects Lives and Fisheries." 2021. Oceana Philippines. September 10, 2021.

<https://ph.oceana.org/press-releases/oceana-transparency-sea-through-vessel-monitoring-technology-protect-s/>.

¹⁴⁰ "BFAR Uses Tech to Monitor Fishing Vessels in Open Sea -

The integration of GPS technology in projects like IMEMS offers a tangible solution to the longstanding issues of maritime safety and transparency in Philippine waters. This real-world application of GPS tracking helps prevent accidents and illegal fishing activities while fostering sustainable fishing practices. By connecting GPS systems with conservation and enforcement efforts, the Philippine government is not only improving the operational efficiency of its fishing industry but also ensuring the safety of its fisherfolk and the long-term viability of its

marine ecosystems. This technological shift reflects a promising future in which GPS-enabled systems play a crucial role in maritime governance and food security in the Philippines.

Conclusion

The role of GPS in enhancing maritime safety and efficiency in the Philippine fishing industry cannot be overstated. The integration of GPS technology is vital in addressing the pressing issues of maritime safety and operational efficiency in the Philippine fishing industry. In providing

Philippine Information Agency.”
2025. Philippine Information
Agency. August 14, 2025.

<https://pia.gov.ph/bfar-uses-tech-to-monitor-fishing-vessels-in-open-sea/>.

accurate real-time positioning, improving route planning, and supporting systems such as AIS, GMDSS, and VMS, GPS helps to substantially reduce navigational errors and supports faster response during emergencies, which ultimately secures the lives of fishermen and promotes greater productivity. These benefits reflect a significant evolution from traditional navigation methods, which relied on natural indicators and basic instruments, to highly advanced satellite-based systems. The continued development of navigation, from early tools like the compass and astrolabe to RADAR, LORAN, and modern

satellite systems, demonstrates the enduring commitment to making navigation safer and more efficient. At the same time, this paper also highlights the persistent challenges facing the Philippine fisheries sector, such as overfishing, limited access to navigation equipment, and lack of effective monitoring systems for small-scale fisheries. The international use of GPS for boundary monitoring, collision avoidance, and fisheries management further illustrates its effectiveness that offers models that can inform local practices. Finally, the initiatives pursued by the Philippine government and advocacy groups, such as the IMEMS project and

the push for mandatory VMS adoption, show that GPS technology can serve not only as a tool for operational improvement but as a key strategy for sustainable fisheries governance. Collectively, these insights affirm that the comprehensive use of GPS-enabled systems is essential for strengthening maritime safety, promoting resource sustainability, and safeguarding the long-term viability of the Philippines' fishing sector.

As the industry continues to evolve, GPS technology will play an increasingly important role in promoting sustainable fishing practices and protecting the lives of those who depend on the

sea for their livelihoods. With the right support and infrastructure, GPS has the potential to transform the future of fishing in the Philippines. Hence, the future of the Philippine fishing industry lies in embracing technological advancements, with GPS at the forefront of efforts to ensure the long-term safety and productivity of its fishermen and marine ecosystems.

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