

Impact of marine protected areas (MPAs) governance on fisheries stocks in Tayabas Bay: Basis for policy making

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Abstract

This study aimed to examine the governance of Marine Protected Areas (MPAs) in Tayabas Bay and its impact on fishery stocks, serving as a basis for policymaking. The research involved two variables: Marine Protected Areas (MPAs) governance factors (i.e., institutional capacity, stakeholder participation, policy effectiveness, and enforcement mechanisms) and fishery stock indicators (i.e., spawning potential, productivity, efficiency, and exploitation rate). Conducted from January to March 2025, the study hypothesized that no significant relationship exists between MPAs governance and fishery stocks. Statistical treatments such as the Weighted Mean, Standard Deviation, and Pearson's r correlation were utilized to test the hypothesis and answer the research questions. A quantitative, descriptive-correlational design was employed. Data were gathered using a validated, self-constructed survey questionnaire administered to 153 purposively selected respondents from Local Government Units (LGUs), Bantay Dagat members, and Fisheries and Aquatic Resources Management Councils (FARMCs) around Tayabas Bay. The general procedure involved securing permits, administering surveys, and statistically analyzing data to determine the governance status and its relationship with fisheries sustainability. Findings revealed that well-governed MPAs significantly enhance the sustainability of fisheries stocks, demonstrating positive correlations between governance quality and fisheries indicators; hence, the null hypothesis was rejected. The study concludes that strengthening governance, particularly through institutional capacity-building, stakeholder participation, adaptive policies, and improved enforcement, is vital for sustainable fisheries management. It is recommended to institutionalize a multi-stakeholder governance framework and integrate policy harmonization across municipalities to ensure long-term ecological and socio-economic benefits.

Keywords: Marine protected areas; fisheries stocks; governance; Tayabas Bay; policy making

1. Introduction

Marine Protected Areas (MPAs) are vital tools for preserving the health of our oceans and ensuring sustainable fisheries. By designating specific zones where human activities are managed or restricted, Marine Protected Areas (MPAs) serve as sanctuaries for marine life, allowing ecosystems to recover and thrive. Research, such as that by Sarker et al. (2019), highlights their significance in conserving biodiversity, replenishing fish stocks, and safeguarding the livelihoods of coastal communities. However, while the global narrative surrounding Marine Protected Areas (MPAs) often showcases their successes, the outcomes heavily depend on how these areas are governed and managed.

Marine Protected Areas (MPAs) are not just a conservation strategy but a lifeline in the Philippines. The country, situated in the heart of the Coral Triangle, boasts one of Earth's most diverse marine ecosystems. Its coral reefs, mangroves, and seagrass beds are home to countless species and provide vital services, including food security and coastal protection. However, these resources are under immense pressure. Overfishing, habitat destruction, and climate change rapidly deplete fish stocks and degrade marine ecosystems. The stakes could not be higher for millions of Filipinos who depend on the ocean for their livelihood (Porter & Ganapin, 2021).

Marine Protected Areas (MPAs) in the Philippines have been established to address these challenges, with the aim of striking a balance between conservation and community needs. They are designed to protect fragile marine ecosystems while ensuring local fishers can continue to support their families. However, the effectiveness of these Marine Protected Areas (MPAs) varies significantly. In some regions, they have succeeded in restoring marine life and providing economic benefits. In others, poor governance, such as lack of enforcement and limited community involvement, has rendered them ineffective.

Tayabas Bay, a vital fishing ground in the Quezon and Batangas provinces, is an ideal case study to explore these dynamics. The bay is a hub of activity, teeming with life below the surface and supporting countless fishers who depend on its bounty. However, it is also a region facing significant threats. Overfishing, destructive practices, and inadequate management are pushing its resources to the brink. Marine Protected Areas (MPAs) have been implemented in Tayabas Bay to tackle these issues, but their success depends on effective governance.

Governance is the backbone of any Marine Protected Areas (MPAs)' success. It determines how rules are created and enforced, stakeholders are involved, and resources are allocated. Weak governance can lead to conflicts, noncompliance, and ineffective policies, ultimately undermining the Marine Protected Areas (MPAs) goals. Conversely, strong governance fosters collaboration, ensures sustainable practices, and builds stakeholder trust. This study focuses on understanding the role of governance in shaping the success of Marine Protected Areas (MPAs) in Tayabas Bay.

The objective is not just to evaluate the current state of fisheries in the region but to delve deeper into the governance structures that influence their management. By examining how policies are implemented, how communities are engaged, how institutions are strengthened, and how enforcement mechanisms operate, this research aims to identify both strengths and gaps in the system. The ultimate goal is to provide insights that can guide policymakers and stakeholders in making informed decisions for the future of Tayabas Bay. Moreover, it aims to bridge the gap between policy and practice, ensuring that Marine Protected Areas (MPAs) fulfill their promise of sustainability, not just for the environment but for the people who depend on it.

1.1. Background of the Study

Marine Protected Areas in the Philippines have emerged as key components of national strategies promoting sustainable fisheries management. Designed to safeguard marine biodiversity and enhance fish stocks, Marine Protected Areas (MPAs) offer a means to protect fragile ecosystems while ensuring that local communities can continue to benefit from marine resources sustainably.

However, Marine Protected Areas (MPAs) in the Philippines face significant challenges despite these efforts. One of the major hurdles is weak enforcement. Without proper monitoring and law enforcement, many Marine Protected Areas (MPAs) struggle to prevent illegal fishing activities that undermine conservation efforts. Inadequate compliance with regulations often results from limited capacity among enforcement agencies, making it easier for violations to go unnoticed.

Another critical issue is the limited participation of key stakeholders, such as local fisherfolk and community leaders. Effective governance relies heavily on inclusive decision-making, yet many Marine Protected Areas (MPAs) fail to engage these groups actively in the management process. This lack of involvement weakens the sense of ownership over the Marine Protected Areas (MPAs), making it difficult to foster community support for conservation initiatives.

Additionally, the effectiveness of policies implemented within Marine Protected Areas (MPAs) often falls short of achieving intended outcomes. Policies designed to regulate fishing activities and protect marine habitats may lack clarity or fail to address local realities, making them difficult to enforce. Poor policy coherence and misalignment with community needs further diminish the potential of Marine Protected Areas (MPAs) to meet conservation and sustainability goals.

Another pressing concern is the limited capacity of institutions responsible for managing Marine Protected Areas (MPAs). These institutions often face constraints in funding, technical expertise, and human resources, making it challenging to execute management plans effectively. Without sufficient institutional capacity, even well-designed Marine Protected Areas (MPAs) can fail to deliver the intended ecological and socio-economic benefits.

Tayabas Bay, located in the provinces of Quezon and Batangas, presents a unique opportunity to study these governance dynamics in action. This bay is one of the most important fishing grounds in the region, supporting the livelihoods of numerous coastal communities. Yet, like many other fishing areas in the Philippines, Tayabas Bay has experienced a decline in fish stocks due to unsustainable fishing practices and environmental degradation. Marine Protected Areas (MPAs) have been established in parts of Tayabas Bay with the hope of reversing these trends. Still, their success depends heavily on how well governance structures are designed and implemented.

This study focuses on Tayabas Bay to examine the relationship between Marine Protected Areas (MPAs) governance and fisheries sustainability. By exploring the current governance mechanisms in place, this research seeks to understand how enforcement and implementation impact the health of marine resources. The findings will provide valuable insights for policymakers and local governments to create more effective strategies that balance conservation with the needs of local communities, ensuring the long-term viability of fisheries in the region.

Ultimately, this study aimed to analyze governance effectiveness and highlight the human stories tied to the bay, including the fisherfolk who rely on its resources, the communities that depend on its productivity, and the future generations who will inherit the outcomes of today's decisions. By deepening our understanding of governance, this research can contribute to meaningful and sustainable solutions for Tayabas Bay and beyond.

1.2. Theoretical Framework

This study was primarily guided by Elinor Ostrom's Common-Pool Resource Theory, which emphasizes the importance of collective action, clearly defined rules, enforcement mechanisms, and stakeholder participation in governing shared resources such as fisheries. According to Ostrom (1990), communities that actively engage in decision-making processes related to resource management are more likely to develop effective, long-lasting governance systems. Moreover, institutions with strong capacity, characterized by well-defined rules, clear enforcement mechanisms, and adequate oversight, are vital in preventing overexploitation and ensuring equitable access to resources.

To enhance the analytical lens, two complementary theories are also integrated:

Adaptive Governance Theory underscores the need for flexible, learning-oriented governance systems that respond to complex ecological and social dynamics. This is essential in effectively managing Marine Protected Areas (MPAs) in changing marine conditions and emerging challenges. Adaptive governance emphasizes polycentric institutions, stakeholder inclusion, and integrating scientific and local knowledge for continuous policy improvement (Folke et al., 2005).

Stakeholder Theory emphasizes the role of inclusive governance, where the engagement of diverse stakeholders, including fishers, local governments, and NGOs, enhances policy legitimacy and effectiveness. Initially proposed by Freeman (1984), this theory underscores the ethical and practical necessity of considering all relevant interests in decision-making, especially in community-based resource management systems like Marine Protected Areas (MPAs).

Together, these theories provide a robust framework for analyzing the governance of Marine Protected Areas (MPAs) in Tayabas Bay and their impact on the sustainability of fisheries stocks. They support a comprehensive understanding of how institutions, adaptability, and stakeholder collaboration shape the effectiveness of conservation efforts.

1.3. Conceptual Framework

This study evaluated the governance of Marine Protected Areas in Tayabas Bay. It examined their impact on fish stocks through the relationship between independent and dependent variables. In this regard, the researcher developed the conceptual framework illustrated in Figure 1.

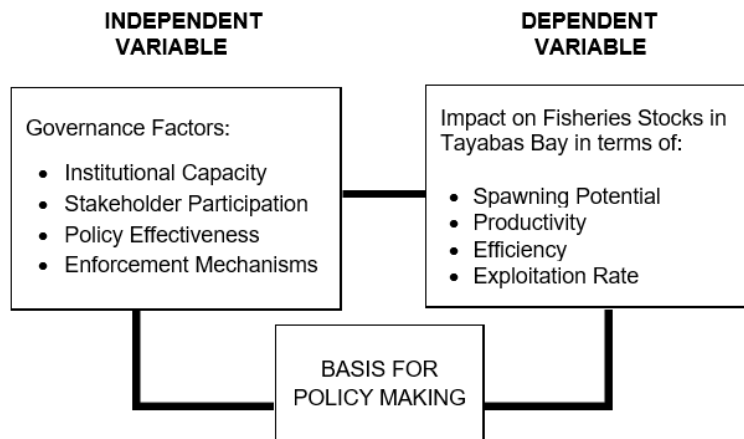


Figure 1. The Research Paradigm of the Study

The independent variable refers to the governance factors that shape the effectiveness of Marine Protected Areas. These governance factors include institutional capacity, which highlights the ability of institutions to manage and implement programs; stakeholder participation, which emphasizes the involvement of fisherfolk, local officials, and other key stakeholders; policy effectiveness, which evaluates how well existing policies address marine resource management challenges; and enforcement mechanisms, which refer to the systems in place to ensure compliance with the rules and regulations of Marine Protected Areas (MPAs).

The influence of these governance factors was measured through the dependent variable, which assesses the impact on fisheries stocks in Tayabas Bay. Specifically, the study examined this impact through key indicators: spawning potential, which refers to the ability of fish populations to reproduce effectively, ensuring the sustainability of fish stocks over time; productivity, which refers to the ability of the fishery to sustain and increase fish catch, biomass, species diversity, and population density over time; efficiency, which pertains to the effectiveness of fishing efforts in terms of resource use, catch per effort, and the adoption of sustainable practices for optimal harvest; and exploitation rate, which pertains to the proportion of fish stocks harvested within a specific period, indicating the pressure on the marine ecosystem and the balance between conservation and utilization.

The relationship between Marine Protected Areas (MPAs) governance and fisheries stock outcomes is crucial in identifying governance strengths and gaps. By analyzing these variables, the study provided evidence-based insights that can inform policymaking. The findings guided the development of effective policies and management strategies to enhance the governance and sustainability of Marine Protected Areas (MPAs) in Tayabas Bay.

1.4. Statement of the Problem

This study aimed to determine the impact of the governance of Marine Protected Areas (MPAs) on fisheries stocks in Tayabas Bay.

Specifically, it answered the following questions:

1. What is the status of governance factors for Marine Protected Areas in Tayabas Bay with respect to:
 - 1.1 Institutional Capacity
 - 1.2 Stakeholder Participation
 - 1.3 Policy Effectiveness
 - 1.4 Enforcement Mechanisms?
2. What is the influence level of Marine Protected Area governance on fisheries stocks in Tayabas Bay with respect to:
 - 2.1 Spawning Potential
 - 2.2 Productivity
 - 2.3 Efficiency
 - 2.4 Exploitation Rate?
3. Is there a significant relationship between the governance factors of Marine Protected Areas and the fish stocks in Tayabas Bay?
4. What policy measures can be formulated to strengthen the Marine Protected Area governance and ensure the sustainable management of fisheries stocks in Tayabas Bay?

1.5. Research Hypothesis

This study assessed the impact of Marine Protected Areas (MPAs) governance on the fisheries stocks in Tayabas Bay. Therefore, the researcher tested the hypothesis:

H₀: There is no significant relationship between the governance of Marine Protected Areas (MPAs) and fisheries stocks in Tayabas Bay.

1.6. Significance of the Study

The significance of this study lies in its ability to provide valuable insights that can guide policymakers in developing more effective governance strategies for Marine Protected Areas (MPAs). These insights will help ensure that governance structures in Marine Protected Areas (MPAs) are designed not only to protect marine ecosystems but also to support the livelihoods of coastal communities that rely on fisheries for their daily needs. The findings are expected to benefit the following groups:

Policy Makers

This research will serve as a foundation for crafting policies that align Marine Protected Areas (MPAs) with sustainable fisheries management. By understanding the impact of governance on fisheries stocks, policymakers can develop regulations that ensure long-term ecological balance and economic stability. Effective governance can help mitigate overfishing, reduce conflicts among fishers, and improve the overall resilience of marine ecosystems. Policymakers will benefit from evidence-based recommendations on balancing conservation efforts with local communities' socio-economic needs.

Local Communities

The results of this study will directly benefit the communities dependent on fisheries in Tayabas Bay. It will provide them with insights into how governance structures impact their access to marine resources, productivity of fish stocks, and their ability to adopt sustainable fishing practices. Understanding these dynamics will empower fisherfolk to engage more actively in decision-making processes and ensure that their needs are represented in Marine Protected Areas (MPAs) management plans. The research will also help communities develop adaptive strategies to sustain their fishing activities in the face of changing

environmental conditions.

Environmental Organization

Non-governmental organizations (NGOs) working in marine conservation will find the findings helpful in shaping their community-based programs. It will guide them in creating strategies that foster community participation and enhance the sustainability of Marine Protected Areas (MPAs). NGOs can use this research to design more effective outreach programs, build stronger partnerships with local governments, and develop community empowerment initiatives that align with Marine Protected Areas (MPAs) goals.

Fisherfolk

The research will give fisherfolk valuable information about how Marine Protected Areas (MPAs) are governed and the role they play in protecting their livelihoods. It will help them understand how effective governance can lead to improvements in fisheries productivity and economic benefits. By knowing the governance factors that influence fishery stocks, fisherfolk can adapt their fishing techniques, cooperate more effectively with local authorities, and work towards sustainable harvesting practices that ensure long-term resource availability.

Academic Researchers

This study will contribute to the body of knowledge on marine protected areas and fisheries governance. It will provide valuable data for other researchers studying similar coastal ecosystems, encouraging further investigation into sustainable resource management. The insights gained from this research can serve as a benchmark for future studies, fostering collaboration among scholars who are investigating Marine Protected Areas (MPAs) governance, fisheries sustainability, and the socio-economic impacts of marine conservation efforts.

Government Agencies

Government agencies tasked with marine resource management will benefit from the study's recommendations. It will offer them a clearer perspective on how governance practices can be strengthened to achieve sustainable fisheries outcomes while ensuring compliance and effective resource protection. The findings will enable these agencies to evaluate current policies, implement more adaptive governance models, and establish better enforcement mechanisms that align with community needs and environmental sustainability.

Through these contributions, the study aims to create a holistic understanding of how governance factors impact fisheries stocks in Tayabas Bay, offering actionable insights for various stakeholders involved in marine conservation and sustainable fisheries management. The goal is to bridge the gap between policy formulation and practical implementation, ensuring that marine resources are protected for future generations while supporting the socio-economic well-being of coastal communities.

1.7. Scope and Limitation of the Study

This study evaluated the key governance factors that directly influence the health and sustainability of fishery stocks in Tayabas Bay. These factors include institutional capacity, stakeholder participation, policy effectiveness, and enforcement mechanisms utilized in the management of Marine Protected Areas (MPAs). By concentrating on these specific aspects, the research aimed to identify the relationships between governance practices and their impact on fishery stocks. The dependent variables are fishery stock metrics, measured in terms of spawning potential, productivity, efficiency, and exploitation rate.

However, the study was limited to a specific geographic area, the Tayabas Bay, which might not have fully captured the broader regional or national governance dynamics affecting marine resource management across different coastal regions in the Philippines.

Additionally, while the research examined the impact of governance on fisheries stocks, it might not have accounted for all external factors, such as seasonal changes, natural disasters, or other environmental

influences that also affect fish populations. Furthermore, data collection was constrained by the availability of reliable records, limited participation from all relevant stakeholders, and time-bound constraints that may restrict the depth of longitudinal analysis.

These limitations suggest that while the findings provide valuable insights, future studies may need to complement them to fully understand the complex interplay between governance and fisheries sustainability.

1.8. Definition of Terms

The following terms are defined operationally for clearer understanding in the context of this study:

Efficiency. The optimal use of resources to achieve desired outcomes, such as maximizing yields, minimizing waste, or sustaining ecological balance, with minimal input or negative impact.

Enforcement Mechanisms. The processes and tools used to ensure adherence to regulations and policies within Marine Protected Areas (MPAs) include patrols, monitoring, penalties, and community involvement to prevent illegal fishing and other harmful activities.

Exploitation Rate. It refers to measuring the intensity of use or harvesting relative to the total available population or stock.

Fisheries Stocks. The quantity of a particular fish species in a defined area is essential for maintaining sustainable fishing practices and healthy marine ecosystems.

Institutional Capacity. The ability of institutions, including government bodies, NGOs, and local organizations, to effectively manage, implement, and enforce marine conservation strategies, based on their resources, knowledge, personnel, and partnerships.

Marine Protected Areas (MPAs). A defined section of the ocean where natural or cultural resources are given legal protection through regulations that limit human activities, ensuring the conservation of marine biodiversity and ecosystems.

Governance. The system of policies, regulations, and practices implemented by government bodies, local communities, and other stakeholders to manage and conserve marine resources, ensuring sustainable use while protecting ecosystems.

Policy Effectiveness. The extent to which Marine Protected Areas (MPAs)-related policies achieve their intended outcomes, such as the recovery of fish stocks, protection of marine habitats, and sustainable fisheries management.

Productivity. The natural rate at which fish populations reproduce, grow, and replenish, which directly influences the sustainability of fishery yields and the long-term availability of fish for both local consumption and commercial use.

Spawning Potential. The capacity of a fish stock to reproduce and sustain its population over time.

Stakeholder Participation. The involvement of diverse groups, such as local fisherfolk, government agencies, conservation organizations, and researchers, in the planning, management, and governance of marine resources, ensuring diverse perspectives are considered in decision-making.

Tayabas Bay. A semi-enclosed body of water located in the southeastern portion of Luzon Island, Philippines, specifically bordered by the municipalities of Quezon and Batangas Province.

1.9. Review of Related Literature and Studies

This chapter presents reviews of literature and studies by foreign and local authors that are deemed relevant to the present investigation. The literature and studies address key concepts, theories, and empirical findings related to the study's subject. The information provided by the review has guided the researcher towards a deeper understanding of the study.

1.9.1. Related Literature

This study found relevant variables regarding the impact of Marine Protected Areas (MPAs) governance on fisheries stocks in terms of spawning potential, productivity, efficiency, and exploitation rate.

Marine Protected Areas (MPAs) are designated geographic zones in marine and coastal environments that are legally or administratively established. Its areas have been crucial in the global fight toward sustainable fisheries management and ocean biodiversity conservation. They serve as refugia from the effects of such human activity as fishing, where ecosystems have the proper conditions to recover and thrive. They perform these functions by conserving habitats and species and maintaining essential ecosystem services to human communities (Gell & Roberts, 2003, as cited in Masud & Masud, 2019). The formation of Marine Protected Areas (MPAs) is a process through which countries try to combat issues developed from problems relating to overfishing, habitat destruction, and the effects of climate change on marine resources (Schmidt et al., 2022).

In the Philippines, for example, Marine Protected Areas (MPAs) evidently play a critical role in balancing the ecological conservation achieved with the economic welfare of the coastal community. Located within the Coral Triangle, it is home to one of the richest marine ecosystems in the world, offering millions of Filipinos a lifeline (Licuanan et al., 2019). However, the success of Marine Protected Areas (MPAs) in attaining their goals greatly depends on governance structures. How Marine Protected Areas (MPAs) are managed from policy generation to enforcement grossly affects their capacity to sustain fisheries stocks.

The establishment of Marine Protected Areas (MPAs) is deeply rooted in global conservation and sustainability efforts, guided by various international frameworks and agreements. Among these frameworks is the Convention on Biological Diversity (CBD), which plays a pivotal role in providing a global platform for nations to commit to the conservation of biodiversity, the sustainable use of its components, and the equitable sharing of benefits arising from genetic resources, including the protection of marine and coastal ecosystems through targets like the Aichi Biodiversity Targets and the more recent Kunming-Montreal Global Biodiversity Framework, which aims to conserve 30% of marine and coastal areas by 2030.

Similarly, the United Nations Sustainable Development Goals (SDGs), particularly Goal 14: Life Below Water, emphasize the need to conserve and sustainably use oceans, seas, and marine resources for sustainable development, calling for actions such as the reduction of marine pollution, the management and protection of marine and coastal ecosystems, and the regulation of overfishing to ensure healthy and resilient marine environments.

Complementing these global initiatives are regional agreements tailored to specific ecological and governance contexts, such as the Coral Triangle Initiative in Southeast Asia, which focuses on the protection of the world's most biologically diverse marine region while supporting the livelihoods of millions of people, and the Barcelona Convention in the Mediterranean, which promotes the sustainable management of marine and coastal areas through a regional approach to conservation and pollution reduction. Together, these frameworks reflect a holistic and collaborative approach to marine conservation, integrating ecological, social, economic, and cultural dimensions to create Marine Protected Areas (MPAs) that are not only effective in protecting biodiversity but also equitable and sustainable for the communities and nations that depend on marine resources.

Marine Protected Areas are governed by diverse theoretical perspectives highlighting their multifaceted role. These perspectives emphasize Marine Protected Areas' ecological, social, and economic dimensions Marine Protected Areas (MPAs) and guide their governance and implementation. Through these theories, Marine Protected Areas (MPAs) governance can achieve conservation objectives, ensure sustainable fisheries management, and promote equitable community development, making Marine Protected Areas (MPAs) a cornerstone of marine and coastal resource management.

Among these theories is the Common-Pool Resource Theory which highlights the importance of

collective action among local stakeholders in managing shared resources, such as fisheries, to prevent overexploitation and ensure their sustainability. This theory emphasizes principles such as clear boundaries, collective-choice arrangements, monitoring, and graduated sanctions, key features in successful Marine Protected Areas (MPAs) governance (Alves, 2020).

It demonstrates that when stakeholders actively participate in decision-making and governance processes, they are more likely to develop innovative and context-specific solutions that balance resource use with conservation, ultimately fostering equitable and sustainable outcomes. Failure to adhere to these principles or a lack of effective collective action among stakeholders can negatively impact fisheries stocks and the broader marine ecosystem. These negative impacts, such as reduced spawning potential, decreased productivity, inefficient resource utilization, and elevated exploitation rates, ultimately threaten ecological and socio-economic stability.

Governance is the backbone of any Marine Protected Areas (MPAs)' success. Effective governance integrates institutional capacity, stakeholder participation, policy effectiveness, and enforcement mechanisms, ensuring that Marine Protected Areas (MPAs) function as intended (Day, 2022). Conversely, weak governance leads to non-compliance, conflicts among stakeholders, and the collapse of conservation efforts. Recognizing these challenges, this study focuses on the governance of Marine Protected Areas (MPAs) in Tayabas Bay, a critical fishing ground in the Philippines. By understanding the relationship between governance and fisheries stocks, this research aims to provide evidence-based recommendations for policymakers and stakeholders to enhance the effectiveness of Marine Protected Areas (MPAs) in Tayabas Bay.

The governance of Marine Protected Areas (MPAs) is not merely a technical issue but also a social and economic one. It requires the collaboration of various sectors, including government agencies, non-governmental organizations (NGOs), and local communities (Eisma-Osorio et al., 2019, as cited in Steenbergen et al., 2022). This study builds on existing literature to explore how governance practices impact fisheries stocks, specifically focusing on spawning potential, productivity, efficiency, and exploitation rates in Tayabas Bay. The findings of this research will contribute to a deeper understanding of the intricate relationship between governance and ecological sustainability, ultimately guiding policy development for marine conservation in the Philippines.

Spawning potential is also a variable found relevant in this study.

Spawning potential is a crucial variable in assessing fish population dynamics, especially in areas where fisheries are heavily relied upon for ecological balance and economic sustenance. It refers to the reproductive capacity of a fish population—essentially its ability to produce enough offspring to sustain or increase population numbers over time. This is not just a matter of how many fish there are, but is influenced by factors like the age, size, and health of the individuals within the population, the quality of their spawning habitats, and environmental conditions that support successful reproduction (Lima et al., 2023)

A fish population's spawning potential is highly indicative of its overall health and resilience. Healthy, high-spawning populations are better able to recover from external pressures, such as overfishing, habitat degradation, or the effects of climate change. These populations contribute to maintaining marine biodiversity, which in turn stabilizes ecosystems and ensures the availability of marine resources for future generations (Reid et al., 2022). For example, a robust fish population with a high spawning potential can more effectively withstand overexploitation and environmental stress, as it has the reproductive strength to bounce back after declines.

However, when fish populations experience diminished spawning potential, typically due to human-induced factors like overfishing and habitat destruction, their ability to regenerate is compromised. Studies show that overfishing has reduced the spawning potential of some species by as much as 90%, leading to a sharp decline in fish stocks and, in severe cases, local extinctions (Baliwe, 2024). This underlines the importance of proper fisheries management practices that focus not only on the quantity of fish harvested but also on maintaining a population's reproductive capacity.

Marine Protected Areas (MPAs) have proven to be a particularly effective tool for enhancing spawning potential. By limiting human activities such as commercial fishing, dredging, and coastal development, Marine Protected Areas (MPAs) create safe environments for fish to reproduce undisturbed (Gollan & Barclay, 2020). In these protected zones, fish populations are allowed to mature to optimal sizes and ages for spawning, which significantly increases the volume and viability of their offspring. Research has shown that fish within well-enforced Marine Protected Areas (MPAs) are 25-30% larger than those in adjacent fished areas, and their reproductive output can be as much as five times greater (Otieno, 2024).

Furthermore, Marine Protected Areas are instrumental in habitat conservation. They protect vital ecosystems such as coral reefs, mangroves, and seagrass beds, which serve as breeding and nursery grounds for various marine species (Laffoley et al., 2019). The preservation of these habitats is key to maintaining high spawning potential, as they provide the environmental conditions necessary for eggs to develop and juvenile fish to survive.

For example, in the Coral Triangle, an area known for its high marine biodiversity that includes the Philippines, the establishment of Marine Protected Areas (MPAs) has markedly improved the reproductive capacity of several key fish species. Studies have found that fish populations in Marine Protected Areas (MPAs) within the region have increased in size by up to 40%, with a corresponding rise in their reproductive output (Rassweiler et al., 2020). This recovery has been particularly evident in areas like Tayabas Bay, where overfishing and habitat degradation have historically threatened fish stocks. Implementing Marine Protected Areas (MPAs) in Tayabas Bay has been seen as a critical step in reversing these trends, allowing fish populations to rebuild and sustain themselves over the long term.

Additionally, Marine Protected Areas (MPAs) offer significant socio-economic benefits to local communities through the "spillover effect," wherein fish that reproduce within the protected areas migrate to adjacent non-protected areas, increasing fish catches and thus improving the livelihoods of fishers (Sultan, 2019). Research suggests that fishery yields around Marine Protected Areas (MPAs) can increase by as much as 30% due to this spillover effect, providing a clear economic incentive to protect spawning habitats.

In conclusion, protecting spawning potential is not only about preserving fish populations for future generations but also about supporting the intricate web of marine biodiversity and sustaining the livelihoods of coastal communities. Effective management practices like Marine Protected Areas (MPAs) can enhance spawning potential, restore degraded fish stocks, and ensure the long-term sustainability of marine ecosystems and the fisheries they support. The case of Tayabas Bay demonstrates the importance of incorporating spawning potential into fisheries management, highlighting the role Marine Protected Areas (MPAs) can play in achieving both ecological and economic resilience.

Productivity is a variable found relevant in this study.

Productivity in fisheries refers to the capacity of marine ecosystems to produce a sustainable output of fish and other aquatic resources over time. It reflects how well an ecosystem can support the growth and reproduction of fish populations while allowing for consistent harvesting without compromising future stocks. A productive fishery ensures a stable food supply, contributes to economic growth, and plays a vital role in maintaining the ecological health of marine environments (Alsaleh, 2023).

The concept of sustainable yields is critical to understanding fisheries productivity. Sustainable yields represent the number of fish that can be harvested while allowing populations to replenish naturally. This balance is key in avoiding overexploitation, which can lead to population collapse and significant ecosystem damage. Overfishing, habitat degradation, and environmental changes such as pollution and climate variability severely compromise productivity. When this happens, marine biodiversity is at risk, and the livelihoods of millions of people who depend on fishing are also jeopardized. For example, 10-12% of the global population is estimated to rely on fisheries for income and food security (Vianna et al., 2019).

Marine Protected Areas are a proven strategy to enhance and sustain the productivity of marine ecosystems. By reducing fishing pressure within designated zones, Marine Protected Areas (MPAs) create safe havens for fish populations to recover and thrive. Studies have shown that ecosystems within Marine

Protected Areas (MPAs) can experience up to a 200% increase in biomass compared to non-protected areas, highlighting their effectiveness in boosting fish populations (Kemp et al., 2024).

Marine Protected Areas often promote higher species diversity and resilience, making these ecosystems better equipped to cope with environmental changes. The benefits of Marine Protected Areas (MPAs) extend beyond their borders, as the spillover effect allows fish to migrate into adjacent areas, increasing fishery yields in those regions by as much as 25% (Frid et al., 2022).

Marine Protected Areas also contribute to productivity by preserving critical habitats that support key ecological processes. Coral reefs, seagrass beds, and mangroves, commonly found within Marine Protected Areas (MPAs), serve as nurseries for juvenile fish. These habitats offer food and shelter, enhancing the survival rates of young fish and significantly increasing the overall productivity of the ecosystem (Masud & Masud, 2019). Protecting these habitats is essential, as research has shown that areas with intact nursery grounds can have fish populations up to 50% more productive than degraded habitats.

Tayabas Bay, an important fishing ground in the Philippines, faces ongoing challenges due to overfishing and habitat loss, which threaten both the ecological health of the bay and the livelihoods of the local communities. The productivity of Tayabas Bay's fisheries has been declining, highlighting the urgent need for effective management solutions. Establishing and reinforcing Marine Protected Areas (MPAs) within Tayabas Bay could help restore productivity by creating conditions where fish populations and critical habitats can regenerate. The result would be not only a revitalized ecosystem but also improved fisheries yields that support the region's economic sustainability.

Governance is crucial in enhancing and maintaining fisheries productivity through Marine Protected Areas (MPAs). Strong governance frameworks—built on clear policies, community engagement, and enforcement—are essential for maximizing the benefits of Marine Protected Areas (MPAs). Local stakeholders, including fishers, policymakers, and conservation groups, must collaborate to ensure the success of Marine Protected Areas (MPAs). When well-managed, Marine Protected Areas (MPAs) serve as engines of productivity, ensuring that both the ecological and economic benefits of marine resources are sustained for generations to come (Laffoley et al., 2019).

Efficiency is also a variable found to be significant in this study.

Efficiency in fisheries refers to the optimal use of resources to maximize the benefits of fishing activities while minimizing waste, energy use, and environmental damage. It involves achieving a balance between the effort expended by fishers and the yield of fish stocks, ensuring that marine resources are harvested in a sustainable and profitable long-term way. Efficient fisheries management is crucial for ecological and economic stability, as it affects the livelihoods of communities that depend on fishing for their income (Cochrane, 2021).

Measuring efficiency in fisheries often entails assessing the ratio of inputs such as labor, fuel, and equipment costs to the output in terms of fish catch. A high efficiency level occurs when fishers can harvest substantial quantities of fish with minimal resources and environmental impact. In contrast, inefficiency arises when excessive effort or unsustainable practices lead to resource depletion, lower yields, and higher costs, ultimately undermining both ecological and economic outcomes. Overfishing, destructive fishing methods like bottom trawling, and weak governance systems are key factors that drive inefficiency in fisheries (Wang & Li, 2021).

Governance plays a central role in promoting fisheries efficiency. Effective governance involves the implementation of policies, regulations, and enforcement measures that guide fishers toward sustainable practices. For example, setting fishing quotas and seasonal closures ensures that fish populations have the time and space to recover, resulting in more productive and resilient fisheries. Additionally, governance frameworks that encourage the adoption of eco-friendly fishing technologies such as gear that minimizes bycatch or damage to marine habitats help improve efficiency by reducing waste and conserving essential ecosystems (Butt et al., 2024).

Marine Protected Areas provide a practical illustration of how governance can directly enhance

efficiency in fisheries. By designating specific zones where fishing is restricted or prohibited, Marine Protected Areas (MPAs) allow fish populations to thrive and recover, creating "spillover" effects where fish migrate into surrounding areas. This leads to higher catch per unit effort (CPUE) in regions adjacent to Marine Protected Areas (MPAs), meaning fishers can catch more fish with less effort. Research shows that fishers operating near well-managed Marine Protected Areas (MPAs) can experience a 10-30% increase in CPUE due to the abundance and health of fish stocks in protected areas (Rogers et al., 2023). This dynamic not only supports more sustainable fishing practices but also reduces the energy and resources required to achieve profitable yields.

Tayabas Bay, a critical fishing ground in the Philippines, faces challenges related to overfishing, competition for resources, and declining catch rates. To improve efficiency in Tayabas Bay, it is essential to implement governance mechanisms that are tailored to the specific socio-economic and environmental conditions of the region. This could include community-led monitoring initiatives, where local fishers are actively involved in tracking fish populations and enforcing sustainable practices, or adaptive management strategies that allow for flexible responses to changing environmental conditions. By fostering collaboration between local fishers, government agencies, and environmental organizations, these governance approaches can help enhance efficiency while addressing both conservation and economic needs.

Ultimately, efficiency is a cornerstone of sustainable fisheries management. When combined with strong governance and the conservation benefits provided by Marine Protected Areas (MPAs), efficiency not only preserves marine ecosystems but also promotes the long-term economic resilience of fishing communities. Focusing on efficiency in Tayabas Bay can set an example for other regions by demonstrating that ecological sustainability and economic development can coexist.

The exploitation rate is also a variable found to be significant in this study.

The exploitation rate refers to the proportion of a fish population harvested over a specific period. Achieving a balance between the exploitation rate and fish populations' ability to regenerate is crucial for the long-term health and sustainability of marine ecosystems. If exploitation exceeds the rate at which fish stocks can recover, overfishing occurs, leading to population declines, ecosystem degradation, and economic hardship for communities reliant on fishing. On the other hand, underutilization of resources may result in missed economic opportunities. Therefore, effective fisheries management strives to maintain an exploitation rate that allows for sustainable harvesting while ensuring that fish populations remain robust and capable of regeneration (Ben-Hasan et al., 2021).

Various factors, including the reproductive capacity of species, habitat quality, and the types of fishing methods employed, influence the balance between exploitation and regeneration. Some species may be more resilient to fishing pressures due to their life history traits, such as faster growth rates or higher reproductive output. However, even for these species, overexploitation can push populations below critical levels, making recovery difficult. Overfishing, particularly in areas where regulations are insufficient or enforcement is weak, can significantly hinder the recovery of fish stocks. This threatens biodiversity and jeopardizes food security, particularly in coastal regions where fishing is a primary livelihood. Studies have shown that regions facing unsustainable exploitation often experience a 30-50% decline in fish populations within a few decades (de Mitcheson et al., 2020).

Marine Protected Areas offer an effective strategy for managing exploitation rates and preventing overfishing. By restricting or prohibiting fishing in designated areas, Marine Protected Areas (MPAs) allow fish populations to regenerate without the pressures of commercial harvesting. However, Marine Protected Areas (MPAs)' benefits extend beyond their boundaries. Healthy fish populations within Marine Protected Areas (MPAs) often migrate to surrounding areas, providing a "spillover" effect that boosts the abundance of fish available to local fishers. Research has found that fishers operating near Marine Protected Areas (MPAs) can experience up to a 50% increase in catch rates due to the replenished stocks (Outeiro et al., 2019). This illustrates how Marine Protected Areas (MPAs) can simultaneously support ecological conservation and local economies, balancing environmental sustainability and economic needs.

Governance is crucial in managing exploitation rates, particularly within and around Marine Protected Areas (MPAs). Effective governance includes policies such as fishing quotas, seasonal closures, gear restrictions, and catch limits. These tools are essential for controlling harvest levels and preventing overfishing. However, the success of these measures depends on robust enforcement and active community engagement. Research has shown that fishers involved in the decision-making process are more likely to comply with regulations, as they feel a sense of ownership over the resources and their management (Oyanedel et al., 2020). Community participation also fosters greater awareness of the long-term benefits of sustainable exploitation rates, helping to ensure compliance and support for regulations.

In Tayabas Bay, where fishing pressure has been historically high, managing exploitation rates is critical to reversing the decline in fish stocks. The implementation of Marine Protected Areas (MPAs), coupled with strong governance frameworks, can help control overfishing and promote sustainable harvesting practices. Regular monitoring of fish populations and adaptive policies that respond to environmental and socio-economic changes will ensure that exploitation rates remain within sustainable limits. Additionally, educational programs that raise awareness among local fishers about the importance of sustainable exploitation rates will help to build a culture of responsibility and stewardship.

Ultimately, the exploitation rate serves as a vital indicator of the relationship between human activity and the health of marine ecosystems. By integrating scientific research, community involvement, and effective governance frameworks, Marine Protected Areas (MPAs) can ensure that exploitation levels are managed sustainably, securing marine resources for future generations while supporting local communities' economic needs. In Tayabas Bay, these strategies can serve as a model for achieving a harmonious balance between conservation and livelihood.

Institutional capacity is a variable significant for understanding this study further.

Institutional capacity is a critical factor in the effective governance and management of Marine Protected Areas (MPAs), directly influencing the success of conservation efforts. It refers to the ability of institutions ranging from government agencies to local organizations to establish, enforce, and monitor policies that ensure the sustainable use of marine resources. Strong institutional capacity involves the availability of resources, expertise, and coordination mechanisms that enable institutions to manage marine ecosystems efficiently and adapt to changing circumstances.

Several key elements characterize institutions with high capacity. These include adequately trained personnel, stable and sufficient funding, and a clear legal framework that guides decision-making processes. Such institutions are better positioned to monitor Marine Protected Areas (MPAs)' activities, conduct research, and implement adaptive management strategies that account for environmental variability, socio-economic challenges, and emerging threats like climate change. For example, regular monitoring of fish populations, habitat health, and regulation effectiveness requires scientific expertise and logistical support (Lucrezi et al., 2019).

Governance models play a central role in institutional capacity. Well-structured governance frameworks define the roles and responsibilities of different stakeholders, including local communities, NGOs, and government agencies. When governance is transparent and inclusive, conflicts are minimized, and there is greater cooperation in implementing conservation initiatives. Furthermore, institutions prioritizing collaboration among local communities and stakeholders foster greater public trust and engagement. Research by Picone et. al. (2020) highlights that inclusive governance frameworks not only improve ecological outcomes in Marine Protected Areas (MPAs) but also enhance community participation and compliance, creating a stronger sense of shared responsibility.

In the context of Tayabas Bay, institutional capacity is crucial for overcoming challenges such as resource limitations, weak enforcement, and jurisdictional overlaps. Managing Marine Protected Areas (MPAs) in the bay requires a coordinated effort involving multiple agencies, including local governments, national bodies, and the fishing communities. However, these stakeholders often face difficulties in synchronizing their actions due to fragmented governance structures and limited resources. Strengthening

institutional capacity in Tayabas Bay would require initiatives to build technical expertise, secure financial resources, and improve interagency coordination. Capacity-building programs, including staff training, improved monitoring systems, and increased funding for conservation efforts, are necessary to support effective Marine Protected Areas (MPAs) governance.

Enhancing institutional capacity is essential for the long-term sustainability of Marine Protected Areas (MPAs) in Tayabas Bay and elsewhere. With stronger institutions in place, Marine Protected Areas (MPAs) can be better managed to meet both ecological and socio-economic objectives, such as maintaining fish stocks, protecting biodiversity, and ensuring that local community's benefit from the conservation efforts. By investing in institutional capacity, Tayabas Bay can overcome existing governance challenges and achieve a more sustainable future for its marine ecosystems.

Stakeholder participation is an important variable in this study.

Stakeholder participation is vital to effective Marine Protected Areas (MPAs) management, as it ensures that diverse perspectives and interests are integrated into decision-making processes. This participatory approach involves engaging local communities, fishers, government officials, NGOs, researchers, and other key stakeholders in planning, implementing, and enforcing Marine Protected Areas (MPAs) policies. By promoting collaborative governance, stakeholder participation strengthens the sustainability of marine conservation efforts and enhances socio-economic benefits for those who rely on marine resources.

The active involvement of local communities is significant because they often possess extensive traditional knowledge about the marine environment, fishing practices, and ecosystem dynamics. This local expertise can significantly improve the design and management of Marine Protected Areas (MPAs), ensuring that regulations are not only ecologically sound but also socially acceptable and practical. According to Dias (2020), incorporating community insights leads to more context-specific and culturally sensitive strategies, which, in turn, foster greater support and compliance with Marine Protected Areas (MPAs) policies.

1.9.2. Related Studies

The impact of Marine Protected Area (MPAs) governance on fisheries stocks in terms of spawning potential, productivity, efficiency, and exploitation rate were identified as variables relevant to this study.

The effectiveness of Marine Marine Protected Areas (MPAs) in sustaining fisheries stocks has been the subject of numerous studies worldwide, with findings consistently highlighting their critical role in marine conservation. These studies, conducted in various geographic regions, offer empirical evidence of how Marine Protected Areas (MPAs) contribute to the conservation of marine biodiversity and the improvement of fish stocks and, by extension, the socio-economic wellbeing of local fishing communities. Marine Protected Areas (MPAs) function by limiting or, in some cases, completely restricting human activities such as fishing, thereby creating protected zones where marine life can thrive.

This allows fish populations to recover and, through processes such as the "spillover effect," benefits fishing grounds adjacent to these protected areas. The spillover effect occurs when adult fish from within the Marine Protected Areas (MPAs) boundaries migrate into surrounding areas, increasing the availability of fish stocks in these zones. This results in both ecological and economic benefits, as healthy fish populations within Marine Protected Areas (MPAs) contribute to the resilience of marine ecosystems while supporting local fishers' livelihoods.

International research on Marine Protected Areas (MPAs) provides numerous case studies that showcase their efficacy. One prominent example is the global synthesis conducted by Grorud-Colvert et al. (2021), which evaluated the biological effects of Marine Protected Areas (MPAs) across various countries. This large-scale study analyzed fish biomass, species diversity, and habitat health within Marine Protected Areas (MPAs) compared to adjacent, non-protected areas. The findings were consistent across different regions: well-enforced Marine Protected Areas (MPAs) showed significantly higher fish densities and greater

biodiversity than areas without such protection.

Specifically, fish biomass in Marine Protected Areas (MPAs) was, on average, three times greater than in non-protected areas. These ecological gains were directly linked to reduced fishing pressure within Marine Protected Areas (MPAs) boundaries, which allowed fish populations to regenerate and expand. In some regions, the spillover effect enhanced fisheries productivity by 20%, with adjacent fishing grounds reporting increases in catch rates (Cabral et al., 2020).

In the Mediterranean Sea, another region where fisheries have been under significant pressure, Marine Protected Areas (MPAs) have demonstrated remarkable success in increasing fish biomass. A study conducted in the Mediterranean found that fish biomass within fully protected zones was up to five times higher than in areas with partial or no protection. This increase was particularly significant for commercially important species such as groupers and snappers, which have been heavily overexploited in many parts of the region. The recovery of these species was attributed to the reduced exploitation within Marine Protected Areas (MPAs), which allowed them to grow and reproduce, contributing to healthier marine ecosystems. The study further highlighted that enforcement should be strict and local stakeholders should be involved to make Marine Protected Areas (MPAs) successful. If enforcement was weak, or if the local communities were not involved in Marine Protected Areas (MPAs) management appropriately, the benefit of protection significantly decreased (Albers et al., 2020).

In the Pacific region, particularly in Australia's Great Barrier Reef Marine Park, Marine Protected Areas (MPAs) have played a crucial role in the sustainability of fisheries. The Great Barrier Reef is home to one of the world's largest networks of no-take zones, where all forms of fishing are prohibited. Research conducted in this area has shown that these no-take zones have led to a significant increase in fish populations, with some studies reporting up to a 50% increase in the abundance of target species within protected areas compared to non-protected areas.

The spillover effect from these no-take zones has also been well-documented, with fishers operating near the boundaries of the protected zones experiencing higher catch rates. Beyond fisheries, the economic benefits of the Great Barrier Reef Marine Protected Areas (MPAs) are that the healthy fish populations and vibrant marine life within the park attract millions of tourists each year, generating revenue for the local economy (Cox, 2022).

In Africa, studies on Marine Protected Areas (MPAs) in coastal countries such as Kenya and Tanzania have further demonstrated their role in improving fisheries productivity. These studies reported significant increases in catch rates for fishers operating near Marine Protected Areas (MPAs), with some regions experiencing up to a 30% increase in fish catches due to the spillover effect. However, the success of Marine Protected Areas (MPAs) in these regions has been hindered by challenges such as weak governance, limited financial resources, and inadequate enforcement. In many instances, the lack of resources for monitoring and enforcement has led to illegal fishing within Marine Protected Areas (MPAs)' boundaries, undermining the potential benefits of these protected areas.

Moreover, local communities' involvement in managing Marine Protected Areas (MPAs) has been identified as a critical factor in their success. In cases where local stakeholders were actively engaged in decision-making and enforcement processes, compliance with Marine Protected Areas (MPAs) regulations was higher, leading to better ecological and economic outcomes (Di Franco et al., 2021).

The lessons learned from these international studies are particularly relevant to countries like the Philippines, where Marine Protected Areas (MPAs) play an integral role in marine conservation and fisheries management. The Philippines, an archipelago with one of the world's highest levels of marine biodiversity, has established numerous Marine Protected Areas (MPAs) to protect its rich marine resources. However, the effectiveness of these Marine Protected Areas (MPAs) varies widely depending on factors such as the size of the protected area, the level of enforcement, and the degree of community involvement.

Studies conducted in the Philippines have shown that well-managed Marine Protected Areas (MPAs) can significantly increase fish biomass and species diversity, with some areas reporting up to a 200% increase

in fish biomass within Marine Protected Areas (MPAs) boundaries (Kemp et al., 2024). However, in most Marine Protected Areas (MPAs) in the country, poor regulation enforcement and a lack of funds to create and maintain Marine Protected Areas (MPAs) limit their potential for achieving long-term conservation goals.

In Tayabas Bay, where overfishing and habitat destruction have contributed to the decline of fish stocks, the establishment of Marine Protected Areas (MPAs) offers a promising solution. By creating protected zones where fish populations can recover, Marine Protected Areas (MPAs) in Tayabas Bay could help replenish fish stocks and ensure the sustainability of local fisheries. However, for Marine Protected Areas (MPAs) to be effective, they must be supported by strong governance structures, adequate financial resources, and the active participation of local communities. Without these critical elements, the potential benefits of Marine Protected Areas (MPAs) may not be fully realized, and the long-term sustainability of fisheries in Tayabas Bay could be at risk.

The impact of Marine Protected Areas (MPAs) on fisheries stocks is well documented. Studies have been conducted on enhancing fish biomass, species diversity, and fisheries productivity. However, success in Marine Protected Areas (MPAs) depends on several factors, including the size and location of the protected area, the level of enforcement, and the degree of community involvement. Marine Protected Areas (MPAs) can only gain their full value if they have the support of a strong governance structure, sufficient funding, and direct involvement of the local communities. International studies also offer lessons learned for countries such as the Philippines to improve marine conservation, fisheries management, and other pertinent activities.

The Philippines is part of the Coral Triangle, a country with one of the world's most biologically diverse marine ecosystems. In recent years, the country has established many Marine Protected Areas (MPAs) to address the issues on overfishing, habitat destruction, declining fish stocks, and depletion of marine resources. Marine Protected Areas (MPAs) aim to maintain biodiversity, ensure marine environment protection, and promote sustainable fisheries. While Marine Protected Areas (MPAs) have been implemented in various regions of the Philippines, their effectiveness in restoring fish populations and improving marine ecosystems has been a subject of continuous research. Local studies provide crucial insights into the success and challenges of Marine Protected Areas (MPAs) in the Philippines, offering lessons that can help improve their management and governance.

One of the most significant studies was Bucol et. al (2021) did regarding fish biomass and species richness in Marine Protected Areas (MPAs) by taking the case study of Apo Island, Philippines, and Danajon Bank. Marine Protected Areas (MPAs) positively influenced fish biomass and species richness, showing a clear contrast with adjacent non-protected areas, which continued to suffer from the negative impacts of fishing activities. Apo Island, regarded as one of the most successful examples of a Marine Protected Areas (MPAs) in the country, was highlighted for its decades-long community-driven conservation efforts that have resulted in the recovery of both coral reefs and fish populations.

Successes can be attributed to several factors: high levels of community involvement in conservation activities, effective enforcement of regulations, and adaptive management approaches that allowed local communities to respond to changing ecological challenges. Ederio's study underlines the importance of community-led initiatives and local stakeholders' active participation in the success of Marine Protected Areas (MPAs) in some parts of the Philippines.

Another landmark study by Mecha et al. (2022) on the Philippine Marine Sanctuary Network provides insights into the broader socio-economic benefits of Marine Protected Areas (MPAs). The research revealed that Marine Protected Areas (MPAs) not only enhanced fish stocks but also created significant livelihood opportunities for local communities. Ecotourism, in particular, has been identified as a growing industry in Marine Protected Areas (MPAs) areas, providing alternative income sources for communities traditionally dependent on fishing. By encouraging tourism, Marine Protected Areas (MPAs) have helped local economies thrive while reducing the pressure on marine resources. The study also highlighted the role of Marine Protected Areas (MPAs) in enhancing coastal resilience, protecting coastal communities from the adverse impacts of climate change and natural disasters, such as storm surges and typhoons. The research

underscores the dual role of Marine Protected Areas (MPAs) as tools for both marine conservation and socio-economic development, showing that they can simultaneously provide ecological benefits while improving the livelihoods of coastal communities.

Despite these positive outcomes, the effectiveness of Marine Protected Areas (MPAs) in the Philippines is far from universal, as highlighted by various local studies. A study by Madarcos et al. (2021) examined the perceptions of local fishers about the impact of Marine Protected Areas (MPAs) in various coastal areas. The research revealed various opinions, with some fishers expressing concerns about reduced access to traditional fishing grounds as a significant downside of Marine Protected Areas (MPAs). This issue was particularly noticeable in regions where local communities had limited involvement in Marine Protected Areas (MPAs) management and where alternative livelihoods were not provided. In areas where Marine Protected Areas (MPAs) were perceived as barriers to accessing fishing resources, compliance rates were low, and resistance to conservation efforts was high. This underscores the need for greater stakeholder engagement, ensuring that local fishers are informed and actively involved in Marine Protected Areas (MPAs) planning and management processes. Without the participation of local communities, Marine Protected Areas (MPAs) are unlikely to achieve their full potential, as communities are essential for ensuring compliance and monitoring conservation efforts.

Moreover, the performance of community-based Marine Protected Areas (MPAs) has also been a research subject, with studies highlighting the importance of institutional capacity, effective enforcement mechanisms, and strong community participation. A study by Mecha et al. (2022) examined the factors influencing the success of community-based Marine Protected Areas (MPAs) in the Philippines. The study found that Marine Protected Areas (MPAs) with robust institutional frameworks, sufficient funding, and strong enforcement mechanisms tended to perform better in terms of fish population recovery and biodiversity preservation.

Conversely, Marine Protected Areas (MPAs) that lacked these critical elements struggled with weak enforcement, limited resources, and ineffective management. The study revealed that the success of community-based Marine Protected Areas (MPAs) depended largely on the governance structure in place, emphasizing that successful Marine Protected Areas (MPAs) require not just local community participation but also the support of local and national government agencies. Furthermore, the involvement of local stakeholders in the design and management of Marine Protected Areas (MPAs) was essential for ensuring that the goals of the conservation efforts aligned with the needs and aspirations of the communities, leading to greater ownership and compliance.

In Tayabas Bay, a region characterized by a rich marine biodiversity, local studies have highlighted the alarming decline in fish stocks due to overfishing, destructive fishing practices, and habitat degradation. Despite establishing Marine Protected Areas (MPAs) in the area, research indicates that the benefits to fish populations have been uneven and insufficient in some regions. Studies show that while certain parts of the bay have witnessed positive changes in fish stocks, weak enforcement, limited resources, and inadequate stakeholder involvement have hindered the full realization of Marine Protected Areas (MPAs) benefits.

In areas where enforcement was lacking or where local communities were not adequately involved in managing Marine Protected Areas (MPAs), the positive impacts on fish stocks have been minimal. These findings underline the importance of addressing the governance and enforcement gaps that continue to affect the effectiveness of Marine Protected Areas (MPAs) in Tayabas Bay. Marine Protected Areas (MPAs) may fail to reach their conservation potential without adequate monitoring, enforcement, and active community participation.

Research in Tayabas Bay also stresses integrating scientific data with local knowledge in managing Marine Protected Areas (MPAs). Local fishers and communities possess invaluable insights into the marine ecosystem and can offer practical solutions based on their understanding of the local environment. Combining scientific research with traditional knowledge, Marine Protected Areas (MPAs) can be better designed to meet local ecological needs while respecting cultural practices. Additionally, ongoing monitoring and evaluation

are essential to assess the success of Marine Protected Areas (MPAs) and to make necessary adjustments to management strategies. Regular monitoring not only helps track the progress of fish population recovery but also ensures that conservation efforts are continuously aligned with the region's evolving ecological and socio-economic conditions.

In conclusion, while Marine Protected Areas (MPAs) in the Philippines have proven to be effective in improving fisheries stocks and conserving marine biodiversity, their success depends on a range of factors, including strong governance, active stakeholder participation, and adequate resources. The experiences and lessons learned from local studies emphasize that the effectiveness of Marine Protected Areas (MPAs) is not guaranteed and requires continuous effort and adaptation. Marine Protected Areas that are well-supported by local communities, government agencies, and other stakeholders tend to achieve their conservation and socio-economic goals more successfully.

Ensuring that Marine Protected Areas (MPAs) are appropriately managed, adequately funded, and inclusive in their approach will be crucial for realizing their full potential in sustaining fisheries stocks and protecting marine ecosystems for future generations. By addressing the challenges identified in these studies and promoting collaborative governance, Marine Protected Areas (MPAs) can continue to play a vital role in marine conservation and sustainable fisheries management in the Philippines.

Governance Factors is one of the variables needed in this study.

Governance factors are crucial in determining the success and effectiveness of Marine Protected Areas (MPAs), as they directly influence the ability of these areas to meet conservation and fisheries management objectives. Effective governance in Marine Protected Areas (MPAs) requires a combination of well-established institutional capacity, policy effectiveness, stakeholder participation, and robust enforcement mechanisms. These factors ensure that Marine Protected Areas (MPAs) conserve marine biodiversity and support sustainable livelihoods for local communities. Both foreign and local studies provide valuable insights into the role of governance in Marine Protected Areas (MPAs) effectiveness, highlighting best practices and challenges encountered in managing these protected areas.

Foreign studies offer a wealth of knowledge on the effectiveness of governance structures in Marine Protected Areas (MPAs), focusing on institutional frameworks, policy implementation, and the overall management strategies employed in various countries. One of the most comprehensive analyses of governance models in Marine Protected Areas (MPAs) was conducted by Jones and Long (2021), who examined the role of institutional capacity in ensuring sustainability across several countries. The study emphasized that institutions with clearly defined roles, adequate resources, and technical expertise tend to achieve conservation and fisheries management goals more successfully. A prime example of this success is the Great Barrier Reef Marine Park in Australia, where governance has been strengthened by significant government investment, scientific research, and practical policy implementation.

The park's management strategies, including zoning, monitoring, and stakeholder engagement, are coordinated through a centralized governing body, ensuring a unified approach to managing this ecologically sensitive area. The study found that the presence of well-resourced and well-equipped institutions was pivotal in the long-term success of the Great Barrier Reef, demonstrating that institutional capacity is a critical factor in Marine Protected Areas (MPAs) governance.

The Florida Keys National Marine Sanctuary in the United States provides another example of how governance can be optimized through a collaborative approach. Research on this sanctuary highlights the importance of adaptive policies that can evolve in response to changing environmental conditions and socio-economic challenges. The sanctuary adopted a participatory governance model that involved local communities, scientists, and policymakers in decision-making processes. This inclusive approach not only improved compliance with regulations but also fostered a sense of ownership and trust among stakeholders. As a result, the sanctuary experienced more effective enforcement of regulations and better management of marine resources. The success of this model underscores the importance of stakeholder participation in governance, as it facilitates collaboration and collective action, which are vital for the long-term sustainability

of Marine Protected Areas (MPAs).

However, the challenges faced by Marine Protected Areas (MPAs) in developing countries are starkly different from those in more developed regions. Jones & Long (2021) also pointed out the difficulties encountered by Marine Protected Areas (MPAs) in resource-limited settings, where weak institutional frameworks and insufficient funding often hinder effective governance. Studies in parts of Africa and Southeast Asia have revealed that poorly defined policies and fragmented enforcement mechanisms lead to low compliance rates and stakeholder conflicts. For instance, many African Marine Protected Areas (MPAs) suffer from limited financial resources, which restrict the capacity of governing bodies to implement effective monitoring and enforcement programs.

Additionally, the lack of coordination among government agencies and local communities often leads to confusion and inconsistent policy enforcement. In Southeast Asia, fragmented governance structures and overlapping jurisdictions have been identified as significant obstacles to the successful management of Marine Protected Areas (MPAs). These findings suggest that capacity-building initiatives and international support are critical in strengthening governance in resource-poor settings. For Marine Protected Areas (MPAs) to be successful in these regions, it is essential to develop comprehensive institutional frameworks, improve policy coherence, and enhance the capacity of local authorities to enforce regulations.

Jones and Long (2021) concluded that institutional and policy effectiveness are interdependent, with strong institutions playing a vital role in the successful implementation of policies. Furthermore, adaptive and inclusive policies provide the framework for sustainable governance by allowing policies to evolve in response to changing conditions and emerging challenges. In this regard, it is important to note that Marine Protected Areas (MPAs) that incorporate local knowledge and the expertise of diverse stakeholders are more likely to succeed. Stakeholder participation in policy formulation and implementation ensures that policies are relevant, equitable, and responsive to the needs of local communities. Moreover, such participatory governance structures help build trust among stakeholders, making it easier to achieve compliance and address conflicts as they arise.

The lessons drawn from international studies have important implications for Marine Protected Areas (MPAs) in the Philippines. In the context of the Philippines, effective governance is crucial to achieving the goals of marine conservation and sustainable fisheries management. The Philippines has established numerous Marine Protected Areas (MPAs) in response to the challenges of overfishing, habitat destruction, and declining fish stocks. However, the effectiveness of these Marine Protected Areas (MPAs) depends largely on governance factors, particularly institutional capacity, stakeholder participation, and enforcement mechanisms. Many Marine Protected Areas (MPAs) in the Philippines face challenges related to weak institutional frameworks, limited resources, and insufficient involvement of local communities in management processes. As such, the Philippines can benefit from adopting governance models prioritizing institutional strengthening, stakeholder engagement, and policy adaptation.

In conclusion, governance factors are integral to the success of Marine Protected Areas (MPAs), and their effectiveness depends on various elements, including institutional capacity, policy effectiveness, stakeholder participation, and enforcement mechanisms. The international studies reviewed highlight that Marine Protected Areas (MPAs) with strong governance structures—supported by adequate resources, scientific expertise, and inclusive policies—are more likely to achieve conservation and fisheries management goals. For Marine Protected Areas (MPAs) to be successful in developing countries like the Philippines, it is essential to address governance challenges by strengthening institutions, fostering stakeholder collaboration, and ensuring that policies are adaptable to changing environmental and socio-economic conditions. By building on the lessons learned from successful Marine Protected Areas (MPAs) worldwide, the Philippines can enhance the governance of its Marine Protected Areas (MPAs), improving their effectiveness in conserving marine ecosystems and supporting sustainable fisheries.

Local studies on governance and enforcement mechanisms in the Philippines emphasize these factors' critical role in the success of Marine Protected Areas (MPAs) and the long-term sustainability of

marine ecosystems and fisheries. The Philippines, an archipelagic country with abundant marine resources, has increasingly relied on Marine Protected Areas (MPAs) to address issues such as overfishing, habitat destruction, and the degradation of marine biodiversity. Coastal communities depend heavily on these resources for their livelihoods, making the governance of Marine Protected Areas (MPAs) a cornerstone of both environmental and socio-economic sustainability. Research conducted in various Marine Protected Areas (MPAs) throughout the country has provided valuable insights into how governance factors such as institutional capacity, policy effectiveness, enforcement mechanisms, and stakeholder participation influence the success of these protected areas and the challenges that hinder their overall effectiveness.

One of the most comprehensive studies in the Philippines is that of White (2020), which explored governance structures within the country's Marine Protected Areas (MPAs), with a particular focus on the enforcement mechanisms and the level of community participation. The findings from this study revealed that well-enforced Marine Protected Areas (MPAs), such as Apo Island and Tubbataha Reefs, had achieved remarkable ecological and economic outcomes. These areas exhibited significant increases in fish biomass, greater biodiversity, and improved ecosystem health compared to non-protected areas. Economically, the Marine Protected Areas (MPAs) contributed to the livelihoods of local fishers, with positive impacts such as the recovery of fish populations that benefited adjacent fishing grounds.

This phenomenon, known as the "spillover effect," highlights how Marine Protected Areas (MPAs) contribute to enhancing marine productivity and the resilience of marine ecosystems. Success in these areas was primarily attributed to strong enforcement measures, including regular patrols by local communities and authorities, community-led monitoring programs, and strict penalties for violations. These enforcement efforts were supported by effective coordination between local governments, non-governmental organizations, and local stakeholders, enabling the Marine Protected Areas (MPAs) to achieve their conservation goals effectively.

However, despite the successes observed in some Marine Protected Areas (MPAs), the study highlighted several significant challenges in many other parts of the Philippines. One of the most pressing issues was weak enforcement, which stems from limited funding, inadequate personnel, and insufficient training for enforcement officers. In many coastal areas, local governments face difficulties in maintaining effective enforcement efforts, which leads to illegal fishing activities and a lack of proper monitoring. Moreover, the lack of coordination between government agencies and local communities has often resulted in gaps in enforcement, which undermines the effectiveness of Marine Protected Areas (MPAs) in meeting their conservation and fisheries management objectives. As a result, several Marine Protected Areas (MPAs) have failed to reach their full potential, with ongoing degradation of marine resources and declining fish stocks, especially in regions that lack adequate financial and human resources for management.

In addition to enforcement challenges, White (2020) also explored the importance of community participation in the governance of Marine Protected Areas (MPAs). The study found that Marine Protected Areas (MPAs) that actively involved local stakeholders in decision-making processes, planning, and management tended to report higher levels of compliance with conservation rules and greater support for the objectives of the Marine Protected Areas (MPAs). One example highlighted in the study was the success of community-based Marine Protected Areas (MPAs) in Cebu, where the active involvement of local fishers and community members in the management of the protected areas contributed to the reduction of illegal fishing activities.

Participatory governance, in this context, allowed for a shared sense of responsibility, helping to foster a culture of sustainability within local communities. In these areas, fishers felt a sense of ownership and pride in protecting their marine environment, which translated into higher levels of compliance with fishing regulations. By involving the communities that directly depend on the marine resources, these Marine Protected Areas (MPAs) were able to build trust among stakeholders and improve the long-term viability of conservation efforts.

However, the study also noted that challenges related to stakeholder engagement still persist in many

other Marine Protected Areas (MPAs), particularly in areas where local communities feel excluded from the decision-making process. Without active participation from local fishers and residents, it becomes more difficult to ensure compliance and garner the support necessary to maintain the effectiveness of Marine Protected Areas (MPAs). The lack of alternative livelihoods in some areas further exacerbates these challenges, as fishers may resort to illegal or unsustainable fishing practices to meet their economic needs. In these cases, the success of Marine Protected Areas (MPAs) often depends on the provision of sustainable alternatives, such as eco-friendly tourism opportunities, capacity-building programs, and community-based livelihood projects. The need for greater stakeholder engagement is a crucial consideration for the governance of Marine Protected Areas (MPAs), as it fosters collaboration, reduces conflicts, and ultimately leads to better outcomes for both conservation and community well-being.

Another key finding in White (2020) was the need for policy integration at various levels of governance. While national policies provide a framework for Marine Protected Areas (MPAs) management, the study emphasized that the success of these policies often hinges on how well they are implemented at the local level. In many cases, national-level policies do not align with local realities, and inconsistent or fragmented policy application can hinder effective Marine Protected Areas (MPAs) governance. The study stressed that for Marine Protected Areas (MPAs) to be successful, there needs to be better coordination between national government agencies, local governments, and community-based organizations. Without strong collaboration between these levels of governance, efforts to protect and manage marine resources can become fragmented and less effective. Moreover, local governments often lack the capacity to implement national policies due to limited financial resources and technical expertise, which further undermines the success of Marine Protected Areas (MPAs).

These findings are especially relevant to Tayabas Bay, a region that has faced considerable challenges in managing its marine resources. In Tayabas Bay, local stakeholders have struggled to address issues such as overfishing, habitat destruction, and the degradation of coral reefs despite the presence of Marine Protected Areas (MPAs). One of the main barriers to the effectiveness of MPAs in Tayabas Bay is weak enforcement, which is compounded by a lack of funding and insufficient capacity for monitoring and management. In this context, strengthening governance structures is essential to overcoming these challenges.

The study suggests that capacity-building programs for local government units, increased funding for enforcement efforts, and better coordination between stakeholders could significantly improve the effectiveness of Marine Protected Areas (MPAs) in Tayabas Bay. Furthermore, integrating lessons from successful Marine Protected Areas (MPAs) in other parts of the Philippines, such as Apo Island and Tubbataha Reefs, could help improve governance structures in Tayabas Bay and enhance the long-term sustainability of its marine resources.

In conclusion, the local studies on governance in Philippine Marine Protected Areas (MPAs) underline the importance of strong enforcement mechanisms, active community participation, and effective policy integration for the success of these protected areas. While successful Marine Protected Areas (MPAs) like Apo Island and Tubbataha Reefs demonstrate the positive outcomes of well-designed governance structures, many other Marine Protected Areas (MPAs) face challenges due to weak enforcement, limited resources, and poor coordination between government agencies and local communities. Strengthening Marine Protected Areas (MPAs) governance through better coordination, capacity building, and greater community involvement can help overcome these challenges. By learning from successful examples and addressing existing gaps in governance, the Philippines can improve the effectiveness of its Marine Protected Areas (MPAs), ensuring the long-term health of its marine ecosystems and the livelihoods of its coastal communities.

The body of literature and studies reviewed provides a comprehensive understanding of the critical role Marine Protected Areas (MPAs) play in fisheries management, biodiversity conservation, and the socio-economic well-being of coastal communities. Marine Protected Areas, both globally and locally, have shown their potential to restore fish stocks, enhance marine biodiversity, and offer economic benefits, particularly to

communities that depend heavily on marine resources for their livelihoods. However, the success of Marine Protected Areas (MPAs) is not solely determined by their establishment; it largely depends on the governance frameworks in place. Institutional capacity, policy effectiveness, enforcement mechanisms, and the level of stakeholder participation all emerge as vital components of Marine Protected Areas (MPAs)' success. This synthesis aims to consolidate key findings from the literature and studies to offer a clearer picture of the interplay between governance factors and Marine Protected Areas (MPAs)' effectiveness.

Marine Protected Areas have proven to be powerful tools for the restoration and sustainable management of fisheries on a global scale. Studies have consistently demonstrated that well-managed Marine Protected Areas (MPAs) lead to significant improvements in fish biomass, species richness, and overall ecosystem health. For instance, globally, Marine Protected Areas (MPAs) have been shown to increase fish biomass by an average of 20–30% within their boundaries compared to adjacent areas that are open to fishing (Cashion et al., 2020).

The recovery of fish stocks in Marine Protected Areas (MPAs) is a direct result of reduced fishing pressure, allowing fish populations to grow and thrive. In well-managed Marine Protected Areas (MPAs), species targeted by fisheries have exhibited recovery rates exceeding 50% within five years of implementation, highlighting the potential for Marine Protected Areas (MPAs) to support long-term fisheries sustainability. In the case of Australia's Great Barrier Reef Marine Park, the combination of strict zoning regulations and rigorous enforcement has yielded both ecological and economic benefits. Fisheries adjacent to the park have seen a 25% increase in catch rates due to the spillover effect, where fish from the protected areas move into adjacent waters, contributing to increased fish abundance in fished areas.

In the Philippines, where marine resources play a critical role in food security and the economy, Marine Protected Areas (MPAs) are particularly important. Local studies provide evidence of the positive impact of Marine Protected Areas (MPAs) on fish density, biodiversity, and community livelihoods. On average, fish density within well-enforced Marine Protected Areas (MPAs) in the Philippines has increased by 30%, reflecting the capacity of Marine Protected Areas (MPAs) to contribute to the recovery of overexploited fish stocks (Sultan, 2019). Apo Island, one of the country's most successful community-led Marine Protected Areas (MPAs), has experienced a 40% increase in fish biomass over two decades of protection.

This Marine Protected Areas (MPAs) also contributed to a 20% increase in the incomes of local fishers, largely due to enhanced spillover effects that have benefitted fishing grounds outside the protected area. Similarly, the Tubbataha Reefs National Park, a UNESCO World Heritage site, generates an estimated \$5.7 million annually from fisheries and tourism, showcasing the economic potential of Marine Protected Areas (MPAs) when governance is strong and enforcement is consistent. These examples demonstrate that Marine Protected Areas (MPAs), when effectively governed, can provide substantial ecological, economic, and social benefits.

While the ecological and economic potential of Marine Protected Areas (MPAs) is clear, their success is heavily contingent upon governance structures. The literature reveals that governance factors such as institutional capacity, policy implementation, stakeholder engagement, and enforcement mechanisms are critical to ensuring that Marine Protected Areas (MPAs) meet their conservation and fisheries management objectives.

Institutional capacity refers to the ability of governing bodies to manage Marine Protected Areas (MPAs) effectively, which includes sufficient financial resources, skilled personnel, and technical expertise. Globally, Marine Protected Areas (MPAs) with strong institutional frameworks report compliance rates as high as 85%, compared to less than 50% in areas with weak institutions (Lacarella et al., 2021). The strength of institutions plays a pivotal role in the success of Marine Protected Areas (MPAs) governance. For instance, Marine Protected Areas (MPAs) in the Mediterranean Sea that are managed by well-resourced institutions have achieved a 35% higher recovery rate of commercial fish stocks than those managed by institutions with limited resources. Strong institutions are able to implement effective management plans, conduct regular monitoring and evaluation, and enforce regulations, all of which are essential for the success of Marine

Protected Areas (MPAs).

In the Philippines, however, only 30% of Marine Protected Areas (MPAs) are considered well-managed, primarily due to the limited capacity of local governments to provide adequate funding, personnel, and technical training (Avelino et al., 2019). Many local government units struggle with budget constraints, making it difficult to hire and train sufficient enforcement officers, conduct regular monitoring, and engage in long-term planning for Marine Protected Areas (MPAs). Without adequate institutional capacity, even well-designed Marine Protected Areas (MPAs) may fail to achieve their intended conservation goals. Strengthening institutional capacity at the local level is essential for improving the governance and effectiveness of Marine Protected Areas (MPAs) in the Philippines.

The effectiveness of policies governing Marine Protected Areas (MPAs) is another crucial factor that influences their success. Adaptive policies that take into account local ecological and socio-economic conditions have been shown to improve compliance and governance outcomes. Studies indicate that in regions where policies are clear, adaptable, and regularly updated, compliance rates range between 70% and 80%, compared to less than 50% in areas where policies are rigid or outdated (Gómez et al., 2021). Adaptive management allows for flexibility in response to changing environmental conditions and stakeholder needs, which is essential for the long-term sustainability of Marine Protected Areas (MPAs).

In the Philippines, policy effectiveness is often hampered by inconsistent implementation across different governance levels. Local studies reveal that 60% of local governments face challenges in aligning national policies with the specific needs and contexts of their communities (Diokno-Sicat et al., 2020). In many cases, national-level policies do not provide sufficient guidance or flexibility for local governments to address the unique ecological and socio-economic challenges they face. For example, in Tayabas Bay, fishers have expressed frustration over restricted access to traditional fishing grounds, a situation exacerbated by the lack of alternative livelihoods. This misalignment between policy and local needs often leads to non-compliance, undermining the effectiveness of Marine Protected Areas (MPAs). To improve governance, there must be greater coordination between national and local authorities, as well as a more flexible approach to policy implementation that considers the specific challenges faced by local communities.

Active involvement of stakeholders, particularly local communities, in the governance of Marine Protected Areas (MPAs) is essential for ensuring compliance and fostering a sense of ownership over marine conservation efforts. Studies have shown that Marine Protected Areas (MPAs) that engage local communities in decision-making processes report compliance rates that are up to 50% higher than those that do not (Lacarella et al., 2021). This participatory approach allows for the incorporation of local knowledge, helps build trust among stakeholders, and reduces conflict, all of which contribute to more effective management of marine resources.

In the Philippines, participatory governance has been a key factor in the success of many Marine Protected Areas (MPAs). Apo Island, for instance, has achieved compliance rates of over 90% among local fishers, largely due to the strong involvement of the community in the management of the Marine Protected Areas (MPAs) (Braga & Musiello-Fernandes, 2022). The sense of ownership fostered through community participation has not only improved compliance but also contributed to the long-term sustainability of the Marine Protected Areas (MPAs). In contrast, Marine Protected Areas (MPAs) in Tayabas Bay have faced resistance from local fishers, with surveys indicating that only 40% of stakeholders feel included in governance processes. This lack of engagement has led to low compliance rates and ongoing illegal fishing activities, highlighting the importance of involving local communities in the governance of Marine Protected Areas (MPAs).

Strict and consistent enforcement of Marine Protected Areas (MPAs) regulations is critical for maintaining compliance and deterring illegal activities such as blast fishing, the use of illegal nets, and poaching of endangered species. Marine Protected Areas (MPAs) with well-developed enforcement mechanisms report illegal fishing rates of less than 10%, while those with weak enforcement report rates exceeding 30% (Jaya et al., 2022). Regular patrolling, monitoring, and the imposition of penalties for

violations are essential components of effective enforcement.

In the Philippines, enforcement remains one of the most significant challenges for many Marine Protected Areas (MPAs). A study of 30 Marine Protected Areas (MPAs) found that 70% lacked regular patrolling and monitoring due to budget constraints and insufficient personnel (Lacarella et al., 2021). In Tayabas Bay, 60% of stakeholders identified weak enforcement as a major issue contributing to ongoing violations. Strengthening enforcement mechanisms, through increased funding, capacity-building programs, and the involvement of local communities in monitoring, is essential for improving compliance and ensuring the long-term effectiveness of Marine Protected Areas (MPAs).

Despite the growing recognition of the benefits that Marine Protected Areas (MPAs) can bring to marine conservation and fisheries management, the situation in Tayabas Bay reflects several ongoing challenges, particularly in terms of governance, enforcement, and community engagement. These challenges significantly impede the potential success of Marine Protected Areas (MPAs) in the area and underscore the need for more targeted interventions. The specific obstacles faced by Tayabas Bay point to broader governance-related gaps that require urgent attention if the full ecological and economic potential of Marine Protected Areas (MPAs) is to be realized.

One of the primary issues affecting the success of Marine Protected Areas (MPAs) in Tayabas Bay is the lack of consistent and effective enforcement. Studies and surveys conducted in the region reveal that enforcement efforts are severely hampered by limited resources, including financial and human capital. Only 40% of stakeholders in the area report regular monitoring of Marine Protected Areas (MPAs) boundaries, indicating a significant enforcement gap. This lack of adequate patrolling and monitoring leaves Marine Protected Areas (MPAs) vulnerable to illegal activities, such as dynamite and cyanide fishing, which persist in 60% of the bay's Marine Protected Areas (MPAs). The prevalence of these destructive fishing practices not only undermines the ecological goals of Marine Protected Areas (MPAs) but also poses a threat to the livelihoods of fishers who rely on sustainable fish stocks. Without stronger enforcement mechanisms in place, including regular patrols and penalties for violators, Marine Protected Areas (MPAs) in Tayabas Bay are unlikely to achieve their intended conservation outcomes.

Another significant challenge in Tayabas Bay is the limited involvement of local communities in Marine Protected Areas (MPAs) governance. Studies indicate that only 45% of fishers feel they have a meaningful voice in the decision-making processes related to Marine Protected Areas (MPAs). This lack of engagement has fostered resentment and resistance among local fishers, many of whom view Marine Protected Areas (MPAs) as restrictive rather than beneficial. The absence of participatory governance models has led to non-compliance with Marine Protected Areas (MPAs) regulations, as fishers are less likely to support conservation efforts that they perceive as being imposed without their input.

In contrast, other regions in the Philippines, such as Apo Island, have demonstrated that community-based approaches can significantly improve compliance and foster a sense of ownership among stakeholders. However, these community-driven governance models remain underutilized in Tayabas Bay, further exacerbating tensions between local communities and Marine Protected Areas (MPAs) authorities. Greater efforts are needed to involve fishers and other stakeholders in the governance of Marine Protected Areas (MPAs), ensuring that their knowledge and concerns are incorporated into management decisions.

The lack of sufficient institutional capacity is another major obstacle to the effective management of Marine Protected Areas (MPAs) in Tayabas Bay. Local government units (LGUs) in the area report that 70% of their budgets allocated for Marine Protected Areas (MPAs) management are insufficient to cover essential operational costs, including patrolling, monitoring, and staff training. This financial shortfall has a direct impact on the ability of LGUs to implement effective management plans and enforce regulations within Marine Protected Areas (MPAs). In addition to budgetary constraints, institutional fragmentation also poses a significant challenge. The overlapping responsibilities between LGUs, non-governmental organizations (NGOs), and national agencies often result in inefficiencies and coordination issues. For instance, there is often a lack of clear delineation of roles and responsibilities, leading to duplication of efforts or, conversely,

gaps in management where critical tasks are left unaddressed. Strengthening institutional capacity and improving coordination among governance bodies are essential steps toward enhancing the management of Marine Protected Areas (MPAs) in Tayabas Bay.

Another major challenge in Tayabas Bay is the inconsistent implementation of policies governing Marine Protected Areas (MPAs). Many policies lack clarity and fail to align with the realities of local socio-economic conditions. Fishers in the region report that zoning regulations, which designate specific areas for fishing and non-fishing activities, are often poorly communicated, resulting in confusion and inadvertent violations of Marine Protected Areas (MPAs) rules. This confusion is compounded by the fact that national policies governing Marine Protected Areas (MPAs) frequently do not account for the specific needs and contexts of local fishing communities. For instance, fishers in Tayabas Bay have expressed frustration with restrictive regulations that limit their access to traditional fishing grounds without providing viable alternative livelihood options. This misalignment between policy and local realities exacerbates tensions and contributes to non-compliance, ultimately undermining the effectiveness of Marine Protected Areas (MPAs) in the area. To address this issue, policymakers must work more closely with local communities to develop adaptive policies that reflect both ecological and socio-economic conditions.

The reviewed literature and studies clearly demonstrate the transformative potential of Marine Protected Areas (MPAs) in sustaining fisheries and conserving marine ecosystems. However, the success of Marine Protected Areas (MPAs) depends heavily on robust governance structures that address key issues such as enforcement, community participation, institutional capacity, and policy effectiveness. In Tayabas Bay, addressing these governance gaps can significantly enhance the effectiveness of Marine Protected Areas (MPAs) and contribute to the long-term sustainability of the bay's marine resources. By learning from successful case studies and adopting evidence-based strategies, policymakers and stakeholders in Tayabas Bay can develop governance frameworks that balance ecological preservation with socio-economic development, securing a sustainable future for both the marine environment and the communities that depend on it.

2. Methodology

This chapter covers the methods and procedures used in the study. It includes the research design, respondents, research procedure, research instrument, and statistical data treatment.

2.1. Research Design

This study employed a quantitative, descriptive research design with correlational analysis. The researcher used descriptive research to evaluate how Marine Protected Area (MPAs) governance affected fisheries stocks in Tayabas Bay. Descriptive research utilized quantitative surveys for data collection, which were then analyzed using established statistical frameworks to achieve adequate and accurate interpretations and findings.

This method involved collecting data to test hypotheses or answer questions. According to Hancock et al. (2021), this method systematically describes situations, problems, phenomena, services, or programs, provides information, and describes attitudes toward an issue. It was also noted that the purpose of the descriptive survey was to describe existing conditions, identify the standards against which these conditions could be compared, and investigate the relationships that may have existed between events. The survey design enabled the researcher to collect data without manipulating the variables.

Furthermore, this method was employed in the research to assess the impact of Marine Protected Areas (MPAs) governance on the sustainability of fish stocks and to evaluate the extent of compliance with Marine Protected Area (MPAs) regulations in Tayabas Bay.

2.2. Respondents of the Study

The researcher coordinated with the Local Government Units (LGUs) that have Marine Protected Areas (MPAs) in Tayabas Bay, including the municipalities of San Francisco, Mulanay, Catanauan, Pagbilao, and Sariaya in Quezon and San Juan in Batangas.

The respondents were stakeholders in managing marine resources within these Marine Protected Areas (MPAs). Using a purposive sampling technique, one hundred fifty-three (153) participants, representing the municipalities, were selected for the study. The sample consisted of individuals from the Local Government Units, Bantay Dagat, and Fisheries and Aquatic Resources Management Councils (FARMCs), all from the listed municipalities. These participants were asked to answer a researcher-made survey questionnaire.

2.3. Research Procedure

The research procedure for this study began with a review of various published and unpublished resources related to the researcher's stated problem. The flow chart below depicts the actions taken to make the research possible.

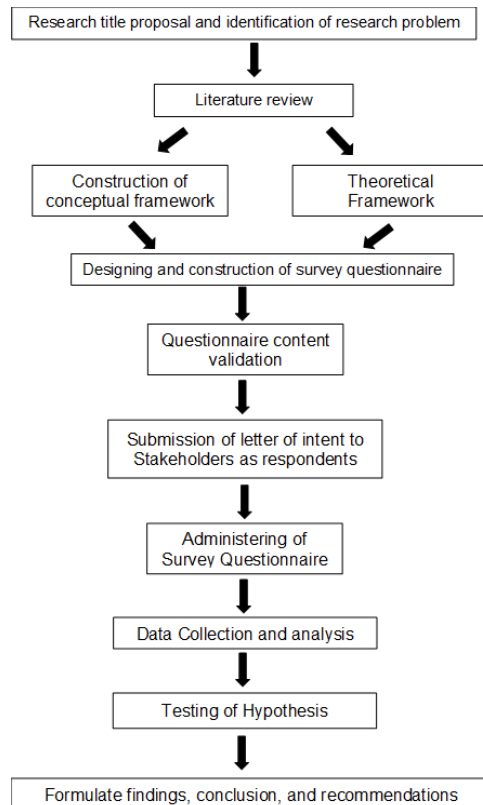


Figure 2. The Research Procedure of the Study

Figure 2 showed the research procedure of the study conducted by the researcher:

First, the researcher formulated the research title to investigate the impact of Marine Protected Areas (MPAs) governance, which was deemed critical for sustainable fisheries management. Following the approval

of the selected topic, the researcher began reviewing materials related to Marine Protected Areas (MPAs) governance and fisheries management to enhance her expertise and gather additional data for the thesis. She also searched the internet for relevant and current data. With the support of her research adviser and other panelists, she acquired sufficient information, literature, and studies to provide a solid foundation for constructing her conceptual and theoretical frameworks.

The researcher created a self-made questionnaire to determine whether effective Marine Protected Areas (MPAs) governance positively impacted fisheries stocks in Tayabas Bay. Her research adviser, a statistician and a subject specialist, reviewed the questionnaire for feedback and corrections. Additionally, a language critic examined it for grammar and sentence structure. Simultaneously, she submitted a letter of intent to the Local Government Units (LGUs), while experts verified its content.

After obtaining approval and securing permission from the LGUs, the researcher sent a letter of intent to target respondents requesting permission to administer the questionnaire. She personally administered the questionnaire, and responses were collected from the respondents. The data gathered in the study were then carefully tallied, tabulated, and analyzed using statistical methods to arrive at reliable findings and valid conclusions.

2.4. Research Instruments

The researcher utilized a self-constructed questionnaire to gather the data needed for the study. The items included in the questionnaire were based on the researcher's readings, personal experiences, observations, and informal interviews with stakeholders. The questionnaire underwent content validation, during which three experts in governance and fisheries science were consulted for their suggestions and revisions. Additionally, a language critic was also asked to check the grammar and sentence composition.

The questionnaire used a four-point Likert scale, with the following verbal descriptions and interpretations observed:

Scale	Range	Verbal Descriptors	Interpretation
4	4.00 – 3.00	Strongly Agree	Very High
3	2.99 – 2.00	Agree	High
2	1.99 – 1.00	Disagree	Low
1	1.00 – 0.99	Strongly Disagree	Very Low

2.5. Treatment of Data

The data obtained were presented in tabulated form, analyzed, and interpreted by the researcher using the following procedures and statistical techniques:

Minitab 14 was used to compute the data gathered from the responses.

The Weighted Mean was used to determine the ratio of the respondents' responses across different factors and the total number of responses.

Standard Deviation was used to show the degree to which individual responses to the questionnaire deviated from the mean.

Pearson's r was used to determine whether there was a significant relationship between Marine Protected Areas (MPAs) governance and the fisheries stocks in Tayabas Bay.

3. Results and Discussion

This chapter presents the various results and discusses the findings from analyzing the data collected in this study. All specific questions from Chapter 1 regarding the statement of the problem are answered in this chapter, supported by tables. It presents the data collected about the significant relationship between Marine Protected Areas (MPAs) governance factors and Fisheries stocks in Tayabas Bay. In particular, the study aimed to address the following:

3.1. Status of Marine Protected Areas (MPAs) Governance Factors

In this study, the status of Marine Protected Areas (MPAs) governance factors includes Institutional Capacity, Stakeholder Participation, Policy Effectiveness, and Enforcement Mechanisms.

Table 1 shows the status of Marine Protected Areas (MPAs) governance factors in terms of Institutional Capacity. It includes the indicators, mean, standard deviation, and interpretation.

The local government supports the Marine Protected Areas (MPAs). The mean ($M = 3.38$) implies a very high level of status of Marine Protected Areas (MPAs) governance factors in terms of Institutional Capacity, supported by a standard deviation ($SD = 0.63$). Also, Marine Protected Areas (MPAs) governance also has an established system for effectively addressing environmental threats and emergencies. While the mean is lower ($M = 3.24$) with a standard deviation ($SD = 0.72$), it still indicates the Marine Protected Areas (MPAs) have enough resources like funding and equipment.

Table 1 Status of Marine Protected Areas (MPAs) Governance Factors in terms of Institutional Capacity.

Indicator		<i>M</i>	<i>SD</i>	<i>Interpretation</i>
1.	The Marine Protected Areas (MPAs) has enough resources like funding and equipment.	3.24	0.72	High
2.	The Marine Protected Areas (MPAs) team is well-trained for their tasks.	3.32	0.64	Very High
3.	Local government provides good support for the Marine Protected Areas (MPAs).	3.38	0.63	Very High
4.	Monitoring and evaluation of the Marine Protected Areas (MPAs) are done regularly and work well.	3.27	0.72	Very High
5.	The Marine Protected Areas (MPAs) governance has an established system for addressing environmental threats and emergencies effectively	3.34	0.66	Very High
Overall Mean		3.31		Very High

Note. The mean was interpreted using the following 4.0-3.26 Very High, 3.25-2.51 High, 2.50-1.76 Low, 1.75-1.00 Very Low

The status of Marine Protected Areas (MPAs) governance factors in terms of Institutional Capacity attained a weighted mean score of 3.31, which was verbally interpreted as very high among the respondents.

These findings are well-supported by a growing body of literature that underscores the crucial role of institutional capacity in the effective governance of Marine Protected Areas (MPAs). According to Gell and Roberts (2003, as cited in Masud & Masud, 2019), Marine Protected Areas (MPAs) that are well-resourced and systematically managed are more likely to achieve their dual goals of conserving marine biodiversity and ensuring sustainable fisheries. This is echoed by Day (2022), who emphasizes that institutional support comprising adequate funding, trained personnel, and organizational efficiency is a foundational element of

successful Marine Protected Areas (MPAs) implementation.

On a global scale, Marine Protected Areas (MPAs) that demonstrate high levels of institutional capacity often report better conservation outcomes. Jones and Long (2021) found that such institutions typically exhibit clear governance structures, well-defined roles and responsibilities, and consistent funding streams, enabling them to manage resources more effectively and adaptively. Similarly, Lucrezi et al. (2019) argue that the presence of technically trained staff and access to necessary tools and technologies are vital in conducting accurate monitoring, enforcement, and adaptive management within Marine Protected Areas (MPAs).

Furthermore, governance effectiveness depends not solely on internal capacity but also on inclusivity and stakeholder engagement. Picone et al. (2020) highlight that Marine Protected Areas (MPAs) governed through inclusive frameworks wherein community stakeholders, local governments, and NGOs collaborate tend to have higher compliance rates and more substantial ecological outcomes. This inclusive governance model fosters a sense of shared responsibility and trust, enhancing institutional actions' legitimacy and effectiveness.

In the context of the Philippines, Avelino et al. (2019) report that only about 30% of Marine Protected Areas (MPAs) are considered well-managed, primarily due to significant institutional limitations. These include insufficient financial resources, understaffing, and gaps in technical capacity, particularly at the local government level. Such constraints hinder regular monitoring, effective enforcement, and timely response to environmental threats. As a result, even well-designed Marine Protected Areas (MPAs) may fall short of achieving their intended goals without adequate institutional support.

These studies underscore the indispensable role of institutional capacity in shaping the success of Marine Protected Areas (MPAs). They reveal that investments in capacity-building, sustained funding, and inclusive governance structures are critical for ensuring that Marine Protected Areas (MPAs) function not just as designated conservation zones on paper but as effective tools for ecological resilience and fisheries sustainability in practice.

Table 2 presents the status of Marine Protected Areas (MPAs) governance factors in terms of stakeholder participation. It includes the indicators, mean, standard deviation, and interpretation.

Stakeholders agree that they are involved in making Marine Protected Areas (MPAs) policies. The mean score ($M = 3.11$) with a standard deviation ($SD = 0.76$) implies that while stakeholders participate in policymaking, there may still be opportunities to enhance their involvement. The statement "Marine Protected Areas (MPAs) management listens to stakeholders" received the lowest mean score ($M = 3.06$) with a standard deviation ($SD = 0.79$). Although still interpreted as "Agree," this implies that some stakeholders perceive room for improvement in how Marine Protected Areas (MPAs)' management considers their concerns and inputs. Communication between Marine Protected Areas (MPAs) managers and stakeholders is viewed positively, with a mean score ($M = 3.13$) and a standard deviation ($SD = 0.75$). This indicates that communication is generally clear and regular, fostering engagement between both parties. Stakeholders also agree that their feedback is used in Marine Protected Areas (MPAs) policies, as shown by the mean score ($M = 3.11$) and standard deviation ($SD = 0.78$). This reflects that stakeholder input plays a role in shaping governance decisions. Lastly, stakeholders perceive active involvement in decision-making beyond consultation, such as co-management initiatives. This statement received the highest mean score ($M = 3.13$) with a standard deviation ($SD = 0.81$), indicating that some forms of shared governance are in place.

The status of Marine Protected Areas (MPAs) governance factors in terms of stakeholder participation attained an overall mean score of 3.11 and was verbally interpreted as high among the respondents.

These findings align with a vast body of literature emphasizing that genuine stakeholder engagement is critical to the success of Marine Protected Areas (MPAs). Dias (2020) points out that incorporating community insights leads to more culturally appropriate and context-specific policies, fostering more substantial compliance and local ownership. Similarly, Madarcos et al. (2021) found that active community

participation helps reduce resistance and increases the legitimacy of Marine Protected Areas (MPAs) initiatives. Tranter et al. (2022) also underscore that participatory governance enhances rule compliance and biodiversity outcomes, especially in regions like the Coral Triangle, which includes the Philippines.

Table 2 Status of Marine Protected Areas (MPAs) Governance Factors in terms of Stakeholder Participation.

Indicator	<i>M</i>	<i>SD</i>	<i>Interpretation</i>
1. Involved in making Marine Protected Areas (MPAs) policies.	3.11	0.76	High
2. Marine Protected Areas (MPAs) management listens to stakeholders.	3.06	0.79	High
3. Communication between Marine Protected Areas (MPAs) managers and stakeholders is clear and regular.	3.13	0.75	High
4. Stakeholders' feedback is used in Marine Protected Areas (MPAs) policies.	3.11	0.78	High
5. Stakeholders are actively involved in decision-making beyond consultation, such as co-management initiatives.	3.13	0.81	High
Overall Mean	3.11		High

Note. The mean was interpreted using the following 4.0-3.26 Very High, 3.25-2.51 High, 2.50-1.76 Low, 1.75-1.00 Very Low

Further supporting these findings, Picone et al. (2020) stress that inclusive governance structures enhance ecological effectiveness and build community trust, while White (2020) highlights how stakeholder-driven Marine Protected Areas (MPAs) such as those in Apo Island and Cebu benefit from higher compliance and fish biomass recovery. Mecha et al. (2022) add that co-management and local involvement strengthen conservation efforts and contribute to livelihood opportunities, mainly through eco-tourism and sustainable fisheries initiatives. The importance of participatory frameworks is also reflected in Jones & Long (2021), who emphasize that Marine Protected Areas (MPAs) with stakeholder-inclusive governance tend to perform better across ecological and socio-economic indicators.

These studies affirm that stakeholder participation is not merely a procedural requirement but a foundational element of Marine Protected Areas (MPAs)' effectiveness. Ensuring that stakeholders are consulted, actively engaged, and empowered in governance processes is essential to achieving long-term conservation goals and enhancing community support for Marine Protected Areas (MPAs) in Tayabas Bay.

Table 3 displays the status of Marine Protected Areas (MPAs) governance factors regarding policy effectiveness. It includes the indicators, mean, standard deviation, and interpretation.

Stakeholders generally agree that Marine Protected Areas (MPAs) policies effectively address key issues in fisheries management. Though some challenges remain, they believe Marine Protected Areas (MPAs) help reduce illegal fishing ($M = 3.18$, $SD = 0.83$). The most vigorous agreement was on the policies' role in promoting sustainable marine resource use ($M = 3.40$, $SD = 0.64$). Stakeholders also feel that policies are regularly updated based on research and feedback ($M = 3.24$, $SD = 0.73$), and are responsive to emerging fisheries issues ($M = 3.31$, $SD = 0.63$). Additionally, there is support for adaptive management strategies in response to environmental and socio-economic changes ($M = 3.20$, $SD = 0.68$), though ongoing improvements are suggested.

The status of Marine Protected Areas (MPAs)' governance factors in terms of policy effectiveness attained an overall mean score of 3.24, which was verbally interpreted as high among the respondents.

These findings are supported by a broad body of literature that underscores the critical role of

effective, adaptive, and context-specific policies in achieving Marine Protected Areas (MPAs) goals. Brueckner-Irwin et al. (2019) emphasize that effective policies are marked by their clarity, adaptability, and alignment with local contexts, particularly in dynamic and biodiversity-rich environments. Likewise, Day (2022) asserts that policy effectiveness is foundational to Marine Protected Areas (MPAs)' functionality, particularly in translating governance frameworks into conservation outcomes.

Table 3 Status of Marine Protected Areas (MPAs) Governance Factors in terms of Policy Effectiveness.

Indicator	<i>M</i>	<i>SD</i>	<i>Interpretation</i>
1. Marine Protected Areas (MPAs) policies have reduced illegal fishing.	3.18	0.83	High
2. The policies help in using marine resources sustainably.	3.40	0.64	Very High
3. Marine Protected Areas (MPAs) policies are updated based on research and feedback.	3.24	0.73	High
4. Policies are adjusted to solve new problems in fisheries.	3.31	0.63	Very High
5. The Marine Protected Areas (MPAs) policies include adaptive management strategies to respond to environmental and socio-economic changes.	3.20	0.68	High
Overall Mean	3.24		High

Note. The mean was interpreted using the following 4.0-3.26 Very High, 3.25-2.51 High, 2.50-1.76 Low, 1.75-1.00 Very Low

Gómez et al. (2021) further highlight that adaptable and locally responsive policies improve compliance and ecological results, especially when incorporating scientific monitoring and stakeholder input. Local evidence from White (2020) also illustrates that Marine Protected Areas (MPAs) sites like Apo Island and Cebu have benefited significantly from strong and context-sensitive policy frameworks, which helped drive ecological recovery and community participation.

Moreover, Mecha et al. (2022) and Sultan (2019) affirm that well-crafted Marine Protected Areas (MPAs)' policies yield biodiversity benefits and provide socio-economic gains through tourism and spillover effects. These studies collectively affirm that for policies to be effective, they must be informed by science, responsive to change, and integrated with local realities.

Cashion et al. (2020) and Jones and Long (2021) add that dynamic policy mechanisms, especially those designed to account for climate change and socio-ecological variability, are essential for long-term Marine Protected Areas (MPAs) resilience. In this context, the high but not “very high” overall score ($M = 3.24$) suggests an opportunity for continuous policy refinement in Tayabas Bay, particularly in how research and feedback are translated into actionable updates.

These studies and findings reinforce that policy effectiveness is not static but requires constant evaluation, adjustment, and stakeholder collaboration. Ensuring that Marine Protected Areas (MPAs) policies remain science-based, adaptive, and inclusive will enhance their legitimacy and impact in Tayabas Bay.

Table 4 Status of Marine Protected Areas (MPAs) Governance Factors in terms of Enforcement Mechanisms.

Indicator	<i>M</i>	<i>SD</i>	<i>Interpretation</i>
1. There is enough patrolling to enforce Marine Protected Areas (MPAs) rules.	3.21	0.87	High

2. Rule violators are dealt with quickly and fairly.	3.21	0.81	High
3. Reporting illegal fishing is easy and efficient.	3.15	0.81	High
4. Local communities help in enforcing Marine Protected Areas (MPAs) rules.	3.29	0.68	Very High
5. There are strict penalties and incentives that effectively encourage compliance with Marine Protected Areas (MPAs) regulations.	3.08	0.86	High
Overall Mean	3.19		High

Note. The mean was interpreted using the following 4.0-3.26 Very High, 3.25-2.51 High, 2.50-1.76 Low, 1.75-1.00 Very Low

Table 4 presents the status of Marine Protected Areas (MPAs) governance factors related to enforcement mechanisms. It includes the indicators, mean, standard deviation, and interpretation.

Stakeholders agree that there is enough patrolling to enforce Marine Protected Areas (MPAs) rules. The mean score ($M = 3.21$) with a standard deviation ($SD = 0.87$) implies that patrolling efforts are generally sufficient, though there may still be occasional gaps in coverage or consistency. The same mean score ($M = 3.21$) was recorded for the statement "Rule violators are dealt with quickly and fairly," with a standard deviation ($SD = 0.81$). This indicates that stakeholders perceive enforcement actions as generally timely and just, though there could be room for improvement in ensuring swift and impartial handling of violations. The ease and efficiency of reporting illegal fishing received a mean score ($M = 3.15$) with a standard deviation ($SD = 0.81$). While stakeholders agree that reporting mechanisms are in place, improvements may be needed to streamline the process and encourage greater participation. The highest mean score ($M = 3.29$) was observed in the statement "Local communities help in enforcing Marine Protected Areas (MPAs) rules," with a standard deviation ($SD = 0.68$). This implies that community involvement is a strong component of enforcement, reflecting active participation in safeguarding Marine Protected Areas (MPAs). The lowest mean score ($M = 3.08$) was recorded for the statement "There are strict penalties and incentives that effectively encourage compliance with Marine Protected Areas (MPAs) regulations," with a standard deviation ($SD = 0.86$). While stakeholders agree that penalties and incentives exist, their effectiveness may need further reinforcement.

The status of Marine Protected Areas (MPAs) governance factors in terms of enforcement mechanisms attained an overall mean score of 3.19, which was verbally interpreted as high among the respondents.

These findings resonate with a vast body of literature highlighting enforcement as a cornerstone of effective Marine Protected Areas (MPAs) governance. As Day (2022) emphasizes, enforcement mechanisms ensure that Marine Protected Areas (MPAs) function as intended by maintaining compliance and deterring violations. The role of community enforcement is well-supported by White (2020), who documents that community-led patrolling and monitoring in successful Philippine Marine Protected Areas (MPAs), such as those in Apo Island and Cebu, result in improved compliance and fish biomass recovery. Similarly, Eisma-Osorio et al. (2019), as cited in Steenbergen et al. (2022), argue that participatory enforcement fosters local ownership and enhances ecological outcomes.

The slightly lower perception of penalties and incentives reflects concerns raised in local studies regarding insufficient deterrents and rewards in Philippine Marine Protected Areas (MPAs). Jaya et al. (2022) and Lacarella et al. (2021) report that many Marine Protected Areas (MPAs) in the Philippines suffer from weak enforcement capacity due to limited financial and human resources, leading to inconsistent application of sanctions. This concern is echoed in Tayabas Bay, where enforcement challenges persist due to funding constraints and jurisdictional fragmentation.

Furthermore, Alves (2020)'s application of the Common-Pool Resource Theory supports the importance of enforcement, noting that monitoring and graduated sanctions are critical to prevent resource

overexploitation. This theory aligns with findings from Tayabas Bay, where stakeholder involvement in enforcement reflects the principles of collective action and shared responsibility.

International and local case studies affirm that community involvement in enforcement significantly boosts compliance. For instance, Rogers et al. (2023) found that areas adjacent to well-enforced Marine Protected Areas (MPAs) experienced a 10–30% increase in catch per unit effort (CPUE), highlighting the tangible ecological and economic benefits of strong enforcement. Likewise, Picone et al. (2020) demonstrate that inclusive enforcement frameworks foster community trust and commitment to conservation.

Moreover, Masud and Masud (2019) emphasize that enforcement is critical to maintaining the ecosystem services provided by Marine Protected Areas (MPAs), such as habitat preservation and fish population recovery. This is especially important in Tayabas Bay, where enforcement lapses have historically contributed to ecological degradation and declining fish stocks.

Collectively, these findings and literature underscore that while enforcement mechanisms in Tayabas Bay are generally functional and community-driven, their effectiveness could be further enhanced by strengthening institutional capacity, streamlining reporting systems, and reinforcing incentive structures. Sustained investment in enforcement and community-based monitoring will be key to realizing the full potential of Marine Protected Areas (MPAs) in protecting marine resources and supporting sustainable livelihoods.

3.2. Level of Fisheries Stocks in Tayabas Bay

In this study, the level of Fisheries stocks in Tayabas Bay refers to Spawning Potential, Productivity, Efficiency, and Exploitation Rate.

Table 5 shows the level of Fisheries stocks in Tayabas Bay. It includes the indicators, mean, standard deviation, and interpretation.

Table 5 *Tayabas Bay's Fisheries Stocks Level in terms of Spawning Potential.*

	Indicator	<i>M</i>	<i>SD</i>	<i>Interpretation</i>
1.	Fish stocks have more time to reach maturity and reproduce before being caught.	2.91	1.09	High
2.	There is an increase in the number of mature fish capable of spawning.	2.94	1.08	High
3.	There is an increase in the spawning frequency of fish populations	2.94	1.00	High
4.	Fish species produce more eggs or larvae due to better protection and improved conditions.	2.98	1.05	High
5.	Fish nurseries and juvenile habitats have improved, supporting the survival of young fish.	3.07	0.98	High
	Overall Mean	2.95		High

Note. The mean was interpreted using the following 4.0-3.26 Very High, 3.25-2.51 High, 2.50-1.76 Low, 1.75-1.00 Very Low

The fish nurseries and juvenile habitats have improved, supporting the survival of young fish. The mean ($M = 3.07$) suggests a high level of Fisheries stocks in Tayabas Bay in terms of Spawning Potential, supported by the standard deviation ($SD = 0.98$). Also, fish species produce more eggs or larvae due to better protection and improved conditions. While the mean is slightly lower ($M = 2.91$) with a standard deviation ($SD = 1.09$), it still indicates the Fish stocks have more time to reach maturity and reproduce before being caught.

The level of Fisheries stocks in Tayabas Bay in terms of Spawning Potential attained an overall mean

score of 2.95, which was verbally interpreted as high among the respondents.

These results affirm the role of Marine Protected Areas (MPAs) in creating safe environments that enhance reproductive conditions for fish. Gollan and Barclay (2020) state that Marine Protected Areas (MPAs) contribute to more extensive and resilient fish populations by restricting human activities, particularly fishing, in key reproductive zones. Otieno (2024) also found that reproductive output in Marine Protected Areas (MPAs) can be up to five times greater than in adjacent areas open to fishing, underlining the reproductive advantage conferred by protection.

Local and international literature supports these findings. Laffoley et al. (2019) emphasize that Marine Protected Areas (MPAs) protect crucial ecosystems like coral reefs and seagrass beds that serve as breeding and nursery grounds, directly supporting the spawning potential of marine species. Baliwe (2024) further stresses that overfishing has reduced spawning potential in many regions by as much as 90%, highlighting the urgency of Marine Protected Areas (MPAs)-based protections.

In the context of the Philippines, Rassweiler et al. (2020) report that Marine Protected Areas (MPAs) in the Coral Triangle, including Tayabas Bay, have led to a marked increase in reproductive capacity among key species. These Marine Protected Areas (MPAs) provide critical space for fish to reach reproductive maturity, essential for long-term stock recovery. Sultan (2019) similarly highlights the socio-economic benefits of protecting spawning grounds, mainly through the spillover effect that improves fishery yields in nearby areas.

Moreover, Reid et al. (2022) explain that healthy, high-spawning fish populations are more resilient to external pressures such as climate change and habitat loss. This resilience is further supported by findings from Masud and Masud (2019), who note that Marine Protected Areas (MPAs) preserve vital ecosystem services that support human communities, including food security through sustained fish production.

These studies collectively demonstrate that spawning potential is not only a key indicator of fish stock health but also a direct reflection of effective Marine Protected Areas (MPAs) governance. The relatively high ratings across all indicators in Table 5 suggest that Tayabas Bay's Marine Protected Areas (MPAs) play an important role in supporting ecological sustainability. However, the variability in responses and the relatively moderate scores highlight the importance of continued monitoring, community engagement, and adaptive management to ensure that these gains are maintained and further enhanced.

Table 6 presents the productivity level of fisheries stocks in Tayabas Bay. It includes the indicators, mean, standard deviation, and interpretation.

Stakeholders agree that the total fish catch has consistently increased over the past years. The mean score ($M = 2.75$) with a standard deviation ($SD = 1.04$) suggests a positive trend in fish catch. However, variability in responses indicates that the increase may not be uniform across different areas or periods. The statement "The fish biomass has increased" received a mean score ($M = 2.83$) with a standard deviation ($SD = 0.83$). This indicates agreement among stakeholders that the overall fish biomass is improving, although the moderate standard deviation suggests fluctuations in observed changes. The diversity of fish species has improved, as reflected in a mean score ($M = 2.73$) and a standard deviation ($SD = 1.05$). While respondents generally agree with this statement, the relatively high standard deviation suggests inconsistencies in perceived species diversity across different fishing grounds or seasons. The highest mean score ($M = 2.85$) was recorded for the statement "The density of fish populations has increased," with a standard deviation ($SD = 1.06$). This suggests that stakeholders perceive a rise in fish population density, though variations in responses indicate that some areas may experience more significant improvements than others. The average size and weight of harvested fish have significantly increased over time, with a mean score ($M = 2.77$) and a standard deviation ($SD = 1.08$). While the respondents agree with this observation, the high standard deviation suggests that fish size and weight changes may not be consistently experienced across different fisheries.

The productivity level of fisheries stocks in Tayabas Bay attained an overall mean score of 2.75, which was verbally interpreted as high among the respondents. However, the relatively high standard deviations across the indicators suggest variability in perceptions and possible fluctuations in fisheries

productivity.

These findings are consistent with the literature highlighting the role of Marine Protected Areas (MPAs) in boosting fisheries productivity. According to Rassweiler et al. (2020), Marine Protected Areas (MPAs) significantly increase fish population size, reproductive output, and biodiversity when effectively enforced. This aligns with the perception in Tayabas Bay that Marine Protected Areas (MPAs) have helped improve fish density and biomass.

Table 6 *Tayabas Bay's Fisheries Stocks Level in terms of Productivity.*

Indicator	<i>M</i>	<i>SD</i>	<i>Interpretation</i>
1. The total fish catch has shown a consistent increase over the past years.	2.75	1.04	High
2. The fish biomass has increased.	2.83	0.83	High
3. The diversity of fish species has improved.	2.73	1.05	High
4. The density of fish populations has increased.	2.85	1.06	High
5. The average size and weight of harvested fish have significantly increased over time.	2.77	1.08	High
Overall Mean	2.75		High

Note. The mean was interpreted using the following 4.0-3.26 Very High, 3.25-2.51 High, 2.50-1.76 Low, 1.75-1.00 Very Low

Kemp et al. (2024) further support this, reporting that Marine Protected Areas (MPAs) can lead to a 200% increase in biomass compared to non-protected areas. These areas often become reservoirs of marine life, contributing to the "spillover effect" that benefits adjacent fisheries. This phenomenon may explain the perceived rise in catch and population density in Tayabas Bay.

Frid et al. (2022) and Gollan and Barclay (2020) also highlight how Marine Protected Areas (MPAs) contribute to higher species diversity and improved ecosystem resilience, both of which are reflected in the stakeholder feedback regarding species diversity and biomass improvements.

Moreover, Laffoley et al. (2019) stress that Marine Protected Areas (MPAs) help preserve critical habitats like coral reefs and seagrass beds, which are essential for the reproduction and growth of many marine species. As noted by stakeholders, this habitat protection directly supports the increase in average fish size and biomass.

Despite the positive outlook, the variability in responses calls attention to the importance of adaptive management. Day (2022) and Otieno (2024) emphasize the need for ongoing monitoring and flexibility in Marine Protected Areas (MPAs) governance to respond to ecological changes and ensure that productivity gains are sustained. This approach is particularly vital in areas like Tayabas Bay, where localized conditions can vary and affect outcomes differently.

Finally, Alsaleh (2023) notes that fisheries productivity is not only a biological outcome but also a socio-economic one. Productivity improvements translate into better food security and livelihoods, reinforcing the importance of maintaining these gains through effective Marine Protected Areas (MPAs) management and continuous stakeholder engagement.

Table 7 presents the efficiency level of fisheries stocks in Tayabas Bay. It includes the indicators, mean, standard deviation, and interpretation.

Fishers generally agree that fishing has become more efficient due to increased abundance and improved practices. They report more productive trips with less time and resources needed ($M = 2.85$), though there is some variability in experiences. Catch per unit effort (CPUE) has improved ($M = 2.83$), and sustainable fishing practices and gear have enhanced efficiency and reduced environmental impact ($M = 2.95$). The strongest agreement was on the adoption of improved fishing strategies that boost catch while minimizing harm to the environment ($M = 2.99$), though responses still vary across different areas.

Table 7 *Tayabas Bay's Fisheries Stocks Level in terms of Efficiency.*

Indicator	<i>M</i>	<i>SD</i>	<i>Interpretation</i>
1. The abundance of fish has made fishing trips more productive, reducing the time spent in fishing.	2.85	1.01	High
2. The catch per unit of effort (CPUE) has improved, meaning fishers now catch more fish with the same or less effort.	2.83	0.97	High
3. Fishing activities require fewer resources (e.g., fuel, manpower) due to higher fish availability.	2.85	0.92	High
4. Sustainable fishing practices and gear has improved, enabling fishers to catch fish efficiently and environmentally friendly.	2.95	0.98	High
5. Fishers have adopted improved fishing strategies that maximize catch while minimizing environmental impact.	2.99	1.04	High
Overall Mean	2.88		High

Note. The mean was interpreted using the following 4.0-3.26 Very High, 3.25-2.51 High, 2.50-1.76 Low, 1.75-1.00 Very Low

The efficiency level of fisheries stocks in Tayabas Bay attained an overall mean score of 2.88, which was verbally interpreted as moderately high among the respondents.

These findings are consistent with those of Wang & Li (2021) and Cochrane (2021), who emphasized that a combination of biological, technological, and governance-related factors often shapes fisheries efficiency. Butt et al. (2024) emphasized the critical role of governance in promoting eco-friendly and efficient fishing technologies, particularly in areas where marine resource governance is actively enforced.

Additional literature further supports these conclusions. Tranter et al. (2022) observed that efficiency improves significantly in communities where fishers are trained in gear selectivity and sustainability practices, an outcome seen in several community-managed Marine Protected Areas (MPAs) in Southeast Asia. Mecha et al. (2022) added that local fisher cooperatives that adopt efficient gear and engage in joint resource monitoring often experience increased yield and reduced operational costs.

Rogers et al. (2023) point out that the proximity of fishing activities to well-managed Marine Protected Areas (MPAs) enhances CPUE and trip profitability. This is likely due to the "spillover effect" and improved biomass inside the protected zones, which benefits adjacent fishing areas—a dynamic that may explain the positive responses from Tayabas Bay fishers.

Moreover, Gell and Roberts (2003, as cited in Masud & Masud, 2019) emphasized that Marine Protected Areas (MPAs) serve as refuges for fish to grow and reproduce undisturbed, contributing to improved fishery productivity outside their boundaries. These ecological benefits often lead to more efficient fishing patterns, especially in communities with access to capacity-building and co-management support.

While the results are encouraging, the variability in standard deviations across responses suggests differing levels of efficiency gains across Tayabas Bay. This underlines the need for localized adaptive management, as Day (2022) advocates, to tailor interventions based on specific community needs, resource conditions, and fishing practices.

Table 8 *Tayabas Bay's Fisheries Stocks Level in terms of Exploitation Rate.*

	Indicator	<i>M</i>	<i>SD</i>	<i>Interpretation</i>
1.	The rate of fish harvested is sustainable and does not exceed the reproductive capacity of fish stocks.	2.94	0.90	High
2.	The Marine Protected Areas (MPAs) has reduced overfishing in the area.	3.03	0.86	High
3.	Fish stocks are being exploited at levels that allow for long-term sustainability.	2.95	0.89	High
4.	The exploitation rate of fish stocks has decreased since the establishment of the Marine Protected Areas (MPAs).	3.03	0.78	High
5.	The establishment of the Marine Protected Areas (MPAs) has led to a measurable decline in destructive fishing practices.	3.01	0.90	High
	Overall Mean	2.96		High

Note. The mean was interpreted using the following 4.0-3.26 Very High, 3.25-2.51 High, 2.50-1.76 Low, 1.75-1.00 Very Low

Table 8 presents the level of fisheries stocks in Tayabas Bay in terms of exploitation rate. It includes the indicators, mean, standard deviation, and interpretation.

Stakeholders generally agree that Marine Protected Areas (MPAs) have positively impacted the sustainability of fish stocks. They believe the rate of fish harvesting is sustainable ($M = 2.94$), and fish are being exploited at levels that support long-term sustainability ($M = 2.95$), though some variation in views exists. Marine Protected Areas are seen as effective in reducing overfishing ($M = 3.03$) and lowering the exploitation rate of fish stocks ($M = 3.03$). Additionally, stakeholders agree that Marine Protected Areas (MPAs) have contributed to a decline in destructive fishing practices ($M = 3.01$), although differences in perception suggest that the impact may vary across locations.

The level of fisheries stocks in Tayabas Bay in terms of exploitation rate attained an overall mean score of 2.96 and was verbally interpreted as high among the respondents. The moderate standard deviation indicates some variability in the respondents' perceptions, but the establishment of Marine Protected Areas (MPAs) has a positive impact on reducing overfishing and destructive practices.

These findings are well-supported by existing literature. Ben-Hasan et al. (2021) emphasize that maintaining the balance between fish exploitation and natural regeneration is critical to long-term sustainability. Overexploitation, if unchecked, leads to the collapse of fish stocks, while well-managed Marine Protected Areas (MPAs) act as safeguards by allowing fish populations to recover and stabilize.

Outeiro et al. (2019) further illustrate how Marine Protected Areas (MPAs) reduce exploitation rates by enforcing spatial restrictions. These restrictions lead to population growth within protected zones and subsequently enhance fish abundance in nearby areas through the "spillover effect." This biological response contributes to sustainability and supports fishers' livelihoods.

Local studies echo these global findings. In the Philippine context, White (2020) observed that Marine Protected Areas (MPAs) with effective enforcement mechanisms, such as Apo Island and Tubbataha Reefs, showed significant reductions in illegal and destructive fishing. These sites reported not just ecological recovery, but increased economic returns through improved fishery yields—benefits attributed to robust governance and community participation.

Cashion et al. (2020) and Guggisberg et al. (2022) stress that Marine Protected Areas (MPAs) contribute to lowering exploitation by curbing harmful practices like dynamite and cyanide fishing, which

have long-term ecological consequences. This is consistent with the respondents' perception in Tayabas Bay that destructive practices have measurably declined since the establishment of Marine Protected Areas (MPAs).

In addition, Jaya et al. (2022) show that consistent enforcement and strong local governance reduce illegal activities and keep exploitation within sustainable limits, particularly in Marine Protected Areas (MPAs) with active community involvement. This suggests that continuous investment in enforcement, capacity-building, and participatory governance is essential for ensuring that the improvements in Tayabas Bay are sustained and scaled.

Ultimately, while stakeholder perceptions are generally positive, the moderate standard deviations across indicators highlight some inconsistencies, perhaps due to uneven implementation of Marine Protected Areas (MPAs) policies or varying levels of enforcement across locations. This underlines the importance of adaptive management, as Day (2022) recommended, to tailor Marine Protected Areas (MPAs) strategies to local conditions, monitor progress, and make data-driven policy adjustments to maintain the balance between conservation and community benefit.

3.3. Test of Relationship between the Status of Marine Protected Areas (MPAs) Governance Factors and the Fisheries Stocks in Tayabas Bay

To test the significant relationship between the status of Marine Protected Areas (MPAs) Governance Factors and the Fisheries Stocks in Tayabas Bay regarding Spawning Potential, Productivity, Efficiency, and Exploitation Rate, they were treated statistically using Real Statistics Data Analysis Tools and the Pearson product-moment correlation coefficient.

Table 9 Significant Relationship between the Status of Marine Protected Areas (MPAs) Governance Factors and the Fisheries Stocks in Tayabas Bay

Marine Protected Areas (MPAs) Governance Factors		Fisheries Stocks in Tayabas Bay			
		Spawning Potential	Productivity	Efficiency	Exploitation Rate
Institutional Capacity	Pearson Correlation	0.6725	0.6281	0.6262	0.5384
	Significance (2-Tailed)	<0.0001	<0.0001	<0.0001	<0.0001
	N	153	153	153	153
	Analysis	<i>Sig</i>	<i>Sig</i>	<i>Sig</i>	<i>Sig</i>
Stakeholder Participation	Pearson Correlation	0.6410	0.6775	0.6295	0.5292
	Significance (2-Tailed)	0.0123	<0.0001	0.0001	0.0079
	N	153	153	153	153
	Analysis	<i>Sig</i>	<i>Sig</i>	<i>Sig</i>	<i>Sig</i>
Policy Effectiveness	Pearson Correlation	0.5786	0.5667	0.5383	0.4844
	Significance (2-Tailed)	<0.0001	<0.0001	<0.0001	<0.0001
	N	153	153	153	153
	Analysis	<i>Sig</i>	<i>Sig</i>	<i>Sig</i>	<i>Sig</i>
Enforcement Mechanisms	Pearson Correlation	0.6911	0.6202	0.6275	0.5892
	Significance (2-Tailed)	<0.0001	<0.0001	<0.0001	<0.0001
	N	153	153	153	153
	Analysis	<i>Sig</i>	<i>Sig</i>	<i>Sig</i>	<i>Sig</i>

Note. The correlation coefficient value (r) was interpreted using the following 0.00-0.19 Very Weakly Positive, 0.20-0.39 Weakly Positive, 0.40-0.59 Moderately Positive, 0.60-0.79 Strongly Positive, 0.80-1.00 Perfectly Positive

The results indicate a strong positive correlation between Marine Protected Areas (MPAs) governance factors and the fisheries stocks in Tayabas Bay, suggesting that improvements in governance significantly impact fishery sustainability. Institutional capacity, stakeholder participation, policy effectiveness, and enforcement mechanisms show statistically significant relationships with spawning potential, productivity, efficiency, and exploitation rate.

Among these factors, enforcement mechanisms exhibit the highest correlation with fisheries stocks, emphasizing the crucial role of strict implementation and compliance in sustaining fish populations. The findings reinforce the importance of effective governance in ensuring the success of Marine Protected Areas (MPAs) and highlight the need for continuous policy enhancement, stakeholder engagement, and strengthened enforcement strategies to maintain and further improve fisheries sustainability in Tayabas Bay.

4. Summary, Conclusion, and Recommendations

This chapter presents a summary of the study's findings, conclusions, and recommendations based on the research conducted on the impact of Marine Protected Areas (MPAs) governance on fisheries stocks in Tayabas Bay.

4.1. Summary

The study analyzed the governance of Marine Protected Areas (MPAs) in Tayabas Bay and its effects on fisheries stocks. Specifically, it sought to answer the following questions: the status of Marine Protected Areas (MPAs) governance factors in terms of institutional capacity, stakeholder participation, policy effectiveness, and enforcement mechanisms; the level of Marine Protected Areas (MPAs) governance's influence on fisheries stocks in Tayabas Bay with respect to spawning potential, productivity, efficiency, and exploitation rate; whether there is a significant relationship between Marine Protected Areas (MPAs) governance factors and the fisheries stocks in Tayabas Bay; and the policy measures that can be formulated to strengthen MP governance and ensure the sustainable management of fisheries stocks in Tayabas Bay.

This research utilized a quantitative descriptive-correlational design. The study focused on selected Marine Protected Areas (MPAs) within Tayabas Bay; data were from primary stakeholders, including Bantay Dagat, FARMCs, and LGUs. A structured survey instrument was used to gather quantitative data on governance factors and fisheries stock indicators. The responses were analyzed using descriptive statistics (mean, standard deviation) to interpret perceptions and statistical tests (such as Pearson correlation) to determine the relationship between governance and fisheries outcomes. The framework was anchored on Ostrom's Common-Pool Resource Theory, which emphasizes the role of governance mechanisms in managing shared resources like fisheries.

The study's findings reveal significant insights into the governance of Marine Protected Areas (MPAs) in Tayabas Bay and their influence on fisheries stocks. The study examined four key governance dimensions, institutional capacity, stakeholder participation, policy effectiveness, and enforcement mechanisms as well as their relationship with indicators of fisheries stock health, namely spawning potential, productivity, efficiency, and exploitation rate.

In terms of institutional capacity, the study revealed noticeable variation among Marine Protected Areas (MPAs). Institutions operated with clear mandates, sufficient financial resources, and competent personnel in areas where governance was strong. These elements allowed for effective conservation planning and implementation. Conversely, Marine Protected Areas (MPAs) with limited resources and administrative capacity struggled to enforce regulations and manage marine resources, resulting in weaker conservation outcomes.

Stakeholder participation also emerged as a critical factor. Some Marine Protected Areas (MPAs) demonstrated strong community involvement, with active engagement from fishers, non-governmental

organizations, and local government units. This collaborative approach contributed to the success of conservation programs. However, in other areas, participation was hindered by insufficient awareness efforts, lack of coordination, and conflicting interests, which led to resistance from some local fishing communities and reduced compliance with Marine Protected Areas (MPAs) regulations.

When examining policy effectiveness, the study found that most Marine Protected Areas (MPAs) had established policy frameworks aligned with conservation goals. However, the effectiveness of these policies was often compromised by implementation issues, such as resource limitations and outdated guidelines. These challenges reduced the policies' ability to adapt to changing ecological and socio-economic conditions, ultimately affecting their impact on marine biodiversity and fish stocks.

The presence and quality of enforcement mechanisms significantly influenced Marine Protected Areas (MPAs)' performance. In Marine Protected Areas (MPAs) where enforcement was strong, characterized by regular patrolling, clear penalties, and accessible reporting systems, illegal fishing activities were minimized, resulting in healthier ecosystems. On the other hand, Marine Protected Areas (MPAs) with weak enforcement structures experienced continued violations, including poaching and the use of destructive fishing methods. These shortcomings were attributed to limited personnel, inadequate equipment, and a lack of consistent monitoring systems.

The status of Marine Protected Areas (MPAs) governance factors in terms of Institutional Capacity, Stakeholder Participation, Policy Effectiveness, and Enforcement Mechanisms arrived at a grand mean score of 3.21 and a standard deviation of 0.62, and was verbally interpreted as high among the respondents (Table 5). This means that the status of Marine Protected Areas (MPAs)' governance factors is functioning effectively. The results imply that stakeholders are engaged in governance processes, policies contribute to sustainability and adaptability, and enforcement mechanisms are sufficiently implemented.

In terms of the influence of Marine Protected Areas (MPAs) governance on fisheries stocks, the findings were equally compelling. Well-governed Marine Protected Areas (MPAs) showed clear benefits in enhancing the spawning potential of fish populations, as evidenced by the presence of more mature and reproductively active individuals and improved juvenile habitats. These areas served as vital breeding grounds, helping replenish stocks within Marine Protected Areas (MPAs) boundaries and nearby fishing zones.

Productivity was also positively influenced by strong Marine Protected Areas (MPAs) governance. Marine Protected Areas (MPAs) with robust management practices supported higher fish biomass and yields, especially in areas adjacent to no-take zones. This productivity was primarily linked to well-enforced regulations and ecological protections.

Regarding efficiency, Marine Protected Areas (MPAs) that practiced sound governance exhibited more sustainable use of marine resources. This included higher catch per unit effort and reduced environmental impacts. In contrast, Marine Protected Areas (MPAs) with governance deficiencies faced issues such as overfishing, which compromised long-term fishery sustainability.

The exploitation rate was found to be closely tied to the quality of enforcement. Marine Protected Areas with inadequate enforcement mechanisms reported higher fishing pressure and depleted stocks, whereas those with strong enforcement strategies effectively reduced overfishing and helped maintain ecological balance.

The study established a statistically significant relationship between Marine Protected Areas (MPAs) governance and fisheries stock indicators. High levels of institutional capacity, stakeholder participation, policy effectiveness, and enforcement were strongly associated with improved outcomes in spawning potential, productivity, efficiency, and exploitation rate. This affirms that comprehensive and inclusive governance systems are key to the success of Marine Protected Areas (MPAs) in achieving both conservation and socio-economic objectives.

4.2. Conclusion

This study set out to test the null hypothesis (H_0): There is no significant relationship between Marine Protected Areas (MPAs) governance and fisheries stocks in Tayabas Bay. Based on the statistical analysis and the study findings, the null hypothesis is rejected. The data revealed a significant positive relationship between Marine Protected Areas (MPAs) governance factors, specifically institutional capacity, stakeholder participation, policy effectiveness, and enforcement mechanisms, and the condition of fisheries stocks, as measured by spawning potential, productivity, efficiency, and exploitation rate.

This confirms that the quality and structure of governance within Marine Protected Areas (MPAs) directly influence fishery resources' ecological outcomes and sustainability. Marine Protected Areas (MPAs) with more potent, inclusive, and better-resourced governance frameworks were associated with healthier and more productive fish populations. In contrast, those with weak governance experienced overexploitation, diminished stock levels, and reduced ecological resilience.

Therefore, the study concludes that Marine Protected Areas (MPAs) governance significantly affects fisheries stock sustainability in Tayabas Bay. Strengthening governance dimensions through adequate institutional capacity, participatory decision-making, effective policies, and robust enforcement is essential for achieving the dual goals of marine biodiversity conservation and improved livelihoods for coastal communities.

4.3. Recommendations

In light of the findings and the established significant relationship between Marine Protected Areas (MPAs) governance and fisheries stock sustainability, the following recommendations are proposed to enhance governance effectiveness and ensure long-term ecological and socio-economic benefits:

First, institutional capacity must be strengthened through increased and sustained funding for Marine Protected Areas (MPAs) management bodies. This should be accompanied by regular training for personnel in areas such as ecological monitoring, enforcement, and community engagement. Equipping local institutions with the tools and knowledge necessary for effective governance is essential for achieving long-term conservation goals.

Second, stakeholder engagement should be institutionalized through co-management frameworks that empower local communities, particularly fisherfolk. This can be achieved by forming local Marine Protected Areas (MPAs) councils with defined roles, hosting regular consultations, and implementing community-based monitoring programs. Such approaches foster ownership, increase compliance, and build trust between stakeholders and authorities.

Third, policy instruments should be regularly updated and localized to reflect scientific data and stakeholder feedback. Regulations must be adaptive, ensuring they respond effectively to emerging ecological trends, such as climate variability and changes in fish population dynamics.

Fourth, enforcement mechanisms need to be modernized and supported by technology and community involvement. Patrolling efforts can be enhanced by integrating mobile reporting systems, GPS tracking, and even drone surveillance. Additionally, community watch groups (e.g., *bantay-dagat*) should be formally recognized and incentivized, providing local enforcers with the legal and logistical support needed to uphold Marine Protected Areas (MPAs) regulations.

Fifth, Marine Protected Areas (MPAs) performance should be monitored regularly using standardized tools such as the Management Effectiveness Tracking Tool (METT). This enables the assessment of institutional performance, stakeholder participation, and ecological health, and allows for data-driven improvements in Marine Protected Areas (MPAs) governance.

Sixth, alternative livelihoods aligned with Marine Protected Areas (MPAs) goals must be developed to reduce fishing pressure and support community well-being. Opportunities such as eco-tourism, sustainable

aquaculture, and value-added fish processing can generate income while reinforcing conservation efforts.

Lastly, Marine Protected Areas (MPAs) governance should be integrated into broader coastal resource management strategies at the regional and national levels. This includes aligning Marine Protected Areas (MPAs) objectives with national biodiversity targets, harmonizing policies across municipal boundaries, and fostering inter-agency coordination for enforcement and resource management.

These policy measures provide a comprehensive framework for improving the governance of Marine Protected Areas (MPAs) in Tayabas Bay. They offer a pathway toward more resilient marine ecosystems and sustainable coastal livelihoods by addressing institutional, social, regulatory, and ecological dimensions.

Table 10 Action Plan and Framework for Integrated and Multi-stakeholder Governance

Component	Specific Actions	Responsible Entities	Time Frame	Expected Outcomes	Success Indicators
1. Institutional Capacity	<ul style="list-style-type: none"> - Increase and sustain funding for Marine Protected Areas (MPAs) bodies - Conduct regular training on enforcement and monitoring 	LGUs, BFAR, DENR, MPA Management Councils	Q1–Q4, Year 1	<ul style="list-style-type: none"> - Improved Marine Protected Areas (MPAs) planning and execution - More competent local staff 	<ul style="list-style-type: none"> - Number of trained personnel - Annual Marine Protected Areas (MPAs) budget increases
2. Stakeholder Engagement	<ul style="list-style-type: none"> - Form local Marine Protected Areas (MPAs) councils - Conduct regular consultations - Implement community-based monitoring programs 	LGUs, FARMCS, NGOs, Fisherfolk Associations	Q2–Q4, Year 1	<ul style="list-style-type: none"> - Greater community ownership and participation - Improved compliance 	<ul style="list-style-type: none"> - Attendance records - Number of community-led initiatives
3. Policy Effectiveness	<ul style="list-style-type: none"> - Review and update Marine Protected Areas (MPAs) policies - Integrate scientific data and local feedback into policy-making 	LGUs, Academe, BFAR, Policy Makers	Year 2	<ul style="list-style-type: none"> - More adaptive and science-based policies - Reduced resistance from stakeholders 	<ul style="list-style-type: none"> - Number of revised policies - Level of policy acceptance
4. Enforcement Mechanisms	<ul style="list-style-type: none"> - Introduce tech-based patrols (GPS, drones) - Institutionalize Bantay Dagat units - Provide incentives and equipment 	LGUs, PNP Maritime, BFAR, Bantay Dagat	Q1–Q4, Year 2	<ul style="list-style-type: none"> - Reduced illegal fishing - More effective Marine Protected Areas (MPAs) protection 	<ul style="list-style-type: none"> - Number of patrols - Reported violations and apprehensions
5. Performance Monitoring	<ul style="list-style-type: none"> - Adopt Management Effectiveness Tracking Tool (METT) - Schedule bi-annual assessments 	LGUs, BFAR, Research Institutions	Q2, Q4 annually (Year 2 onward)	Regular evaluation of Marine Protected Areas (MPAs) health and governance	<ul style="list-style-type: none"> - METT score improvements - Reports generated and acted upon
6. Alternative Livelihoods	<ul style="list-style-type: none"> - Support eco-tourism, aquaculture, and value-added processing - Provide training and startup assistance 	LGUs, DTI, BFAR, NGOs	Year 2–3	<ul style="list-style-type: none"> - Reduced dependency on fishing - Improved income for local communities 	<ul style="list-style-type: none"> - Number of participants - Income from alternative livelihoods
7. Integrated Governance	<ul style="list-style-type: none"> - Align Marine Protected Areas (MPAs) with national biodiversity strategies - Enhance inter-agency collaboration - Harmonize policies across municipalities 	DENR, BFAR, NEDA, LGUs	Year 3–4	<ul style="list-style-type: none"> - Unified and efficient Marine Protected Areas (MPAs) management - Improved regional marine conservation planning 	<ul style="list-style-type: none"> - Number of inter-LGU collaborations - Integrated coastal management plans implemented

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