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Safeguarding Southeast Asia's marine future: How ASEAN ENMAPS is tackling coastal and marine challenges

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Southeast Asia is home to some of the world's most vibrant and biodiverse marine ecosystems. From the pristine and extensive coral reefs and seagrass beds of Indonesia and the Philippines to the expansive mangroves of Indonesia, the Philippines, and Thailand, the region's coastal and marine environments are not just ecological treasures—they are lifelines for millions of people. In fact, the coral reefs of Indonesia are two to four times more expansive than those of the Philippines, and their species richness is likewise higher, further highlighting the region's extraordinary biodiversity. However, these ecosystems are increasingly under threat. Climate change, overfishing, habitat destruction, and pollution are taking a heavy toll, putting the region's marine biodiversity and the livelihoods of those who depend on it at risk.



Yellow coral goby (*Gobiodon okinawae*)
on bleached coral in Nalad, Cagayancillo, Philippines



Coral degradation as a result of blast fishing in Indonesia

In recent years, Indonesia, the Philippines, and Thailand have faced a series of alarming coastal and marine issues that underscore the need for urgent action. In Indonesia, illegal fishing and coastal development have led to the destruction of crucial mangrove habitats, while in the Philippines, overfishing, coral bleaching, and pollution (i.e. plastic and sedimentation) are pushing coral reefs to the brink of collapse. Meanwhile, Thailand is grappling with the devastating impacts of overfishing and marine debris, which threaten not only marine life but also the tourism industry.

As these challenges escalate, the need for coordinated, science-based conservation strategies have never been more urgent. Enter the project *Effectively Managing Networks of Marine Protected Areas in Large Marine Ecosystems in the ASEAN Region* (ASEAN ENMAPS), a regional initiative that aims to strengthen the resilience of Southeast Asia's marine environments through a network of marine protected areas (MPAs). By focusing on scientific research and the interconnectedness of ecosystems, ASEAN ENMAPS is poised to make a significant impact on the region's marine conservation efforts.

The urgency of regional marine conservation

The coastal and marine ecosystems of ASEAN Member States are inextricably linked. Marine species often rely on multiple habitats across national boundaries throughout their life cycles. This ecological connectivity is crucial for maintaining genetic diversity and resilience, helping marine populations withstand environmental changes and human impacts. However, with climate change accelerating, overfishing accelerating the depletion of fish stocks, and habitat destruction eroding the foundations of these ecosystems, the need for a coordinated, regional approach to marine conservation is critical.

In Indonesia, recent reports have highlighted the extensive damage caused by illegal fishing practices, which not only deplete fish stocks but also destroy essential habitats

like coral reefs and mangroves. Mangroves, which act as natural barriers against coastal erosion and provide vital nursery grounds for many marine species, are being rapidly cleared for aquaculture and coastal development. This destruction has severe implications for coastal resilience and biodiversity.

The Philippines is facing similar challenges, with coral reefs suffering from widespread bleaching events and high fishing pressure exacerbated by rising sea temperatures. Additionally, plastic pollution has emerged as a critical issue, with microplastics infiltrating marine ecosystems and posing severe risks to marine life and human health. This pollution is particularly problematic in areas like Manila Bay, where high levels of waste accumulation threaten both marine habitats and local communities.

Thailand's coastal waters are also under threat. Overfishing has led to the decline of fish populations, threatening food security and the livelihoods of coastal communities. Furthermore, the country's marine tourism industry, which relies heavily on healthy coral reefs and clear waters, is facing challenges from marine debris and habitat degradation. These issues are compounded by the impact of coastal development, which often leads to habitat loss and increased pollution.

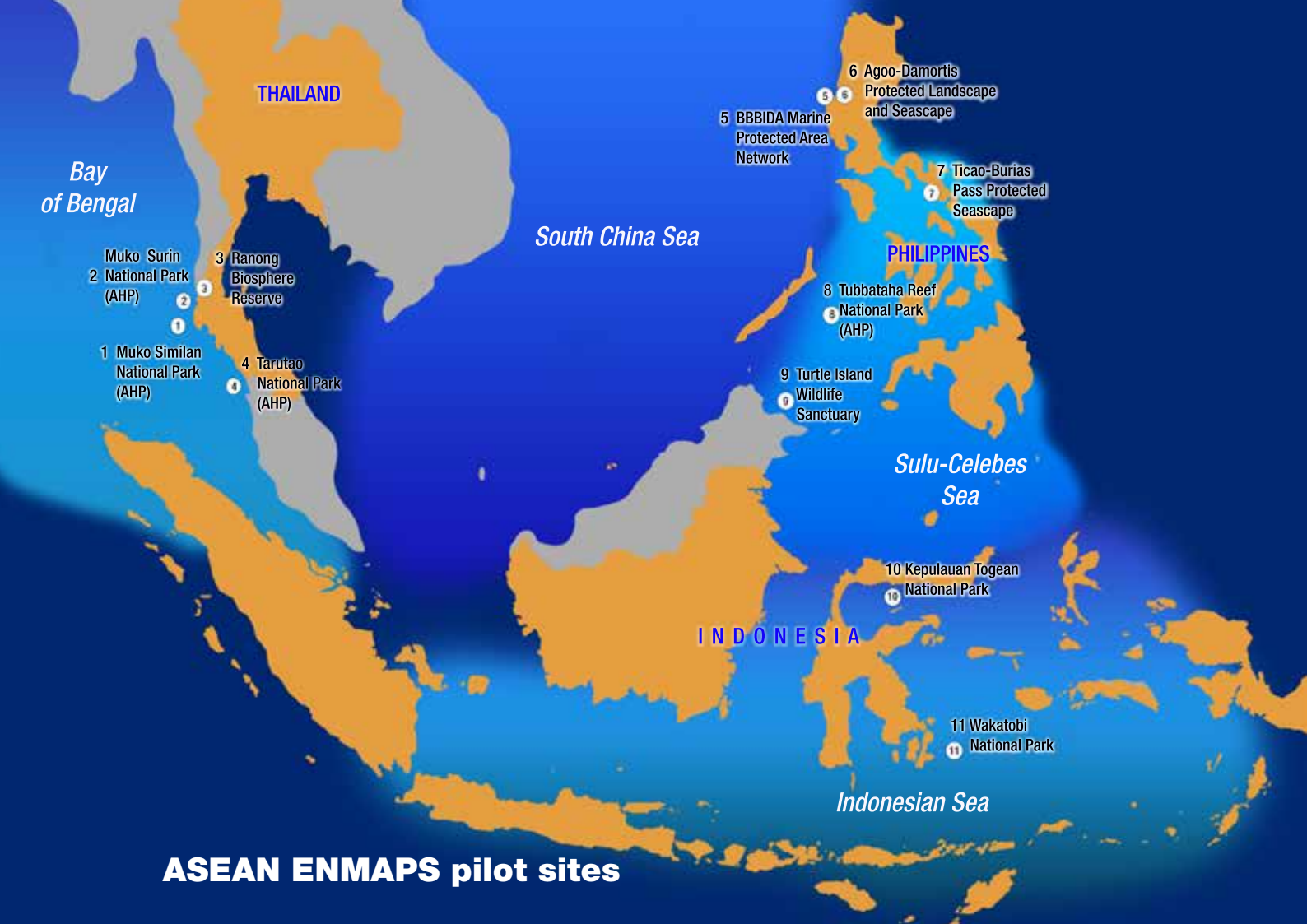
ASEAN ENMAPS: A science-driven approach

ASEAN ENMAPS is designed to address these challenges by establishing and enhancing MPAs in Indonesia, the Philippines, and Thailand, starting with 11 pilot sites within four Large Marine Ecosystems: Bay of Bengal (Thailand), Indonesian Seas (Indonesia), South China Sea and Sulu–Celebes Sea (Philippines). These efforts are not just about creating isolated protected areas but about developing a network of interconnected MPAs that function as a cohesive unit, ensuring the protection of critical habitats and species across the region.

Central to the strategy of ASEAN ENMAPS is its reliance on scientific research. The project's Component 1 focuses on building the scientific foundations necessary to configure MPA networks effectively. This involves synthesising data on marine ecosystems, fisheries, and connectivity to design MPAs that are both ecologically and economically sustainable.



Immature fish being sold at the fish market in Mahachi fishing port, Thailand.



ASEAN ENMAPS pilot sites

Understanding habitat and species dynamics

One of the key scientific tasks under ASEAN ENMAPS is to assess the coverage areas of the 11 pilot MPA sites. This includes evaluating the location and extent of various habitats such as coral reefs, seagrass beds, mangroves, and mudflats. These habitats are not just important for their biodiversity; they are also vital indicators of ecosystem health. By understanding the distribution, composition and abundance of reef fishes, invertebrates, and algae in these habitats, ASEAN ENMAPS can design MPAs that protect the full spectrum of marine life.

Different marine species have varying sizes of home ranges, and understanding these ranges is essential for designing effective MPAs. Protecting species within their natural habitats ensures the preservation of the integrity of the ecosystem.

The reported presence of apex predators like tiger sharks in the Tubbataha Reefs Natural Park in the Philippines indicates a thriving ecosystem. These predators play a crucial role in maintaining the balance of the ecosystem, and their presence suggests that the area can support a wide range of species. Protecting such key species and their habitats ensures the long-term health and resilience of the entire ecosystem.

Fisheries assessment and sustainable management

ASEAN ENMAPS also aims to conduct detailed fisheries assessments to understand the dynamics of fisheries within its pilot MPAs. By evaluating the types of fisheries, the number of individuals engaged in fishing, their frequency of fishing and catch rates, the proportion of reef fishes in the total annual catch, and key life history characteristics (e.g. size at first maturity), the project can gauge the sustainability of fish stocks and make informed decisions for fisheries management.

This approach is crucial for maintaining the balance of marine ecosystems. For instance, in areas where a wide variety of small, specialised fishing gears are used, heavy exploitation is likely occurring, indicating the need for stricter management measures.

Conversely, in areas where only a few types of fishing gear are used, fish populations may still be relatively abundant, allowing for more sustainable practices.



Trawling and gill nets are often illegal due to their environmental harm. Both cause high bycatch (including endangered species), contribute to overfishing, and damage habitats, especially coral reefs and seafloors. Additionally, lost nets continue trapping marine life (ghost fishing), making these methods unsustainable and harmful to ecosystems.

Connectivity study: Ensuring marine populations thrive

A crucial aspect in establishing the science of ASEAN ENMAPS is the connectivity study, which aims to understand the dynamics of fish population maintenance across ASEAN ENMAPS pilot MPA sites. One of the areas that a connectivity study explores is how ocean currents transport marine species, especially larvae, between different areas or habitats. It examines the role of currents in connecting populations, ensuring genetic diversity and species survival, which is important for effective marine conservation and the planning of protected areas.

The connectivity study provides a comprehensive understanding of where replenishment larvae originate and where they settle. If larvae dominantly settle outside the MPAs, this presents an opportunity to reconfigure the boundaries of MPAs to include these critical areas.

Identifying the source of replenishment larvae is crucial. For instance, if fish populations in an MPA are thriving, it may indicate that larval replenishment is sourced from a distant reef. Knowing the location of this source reef is vital for its preservation, ensuring a continuous supply of larvae, and consequently a steady fish population in the MPA site. Similarly, it is important to track where the larvae produced within the MPA ultimately settle.

Understanding and preserving marine corridors is crucial for effective MPA management. If a development project proposes building a reclamation site in a location that intersects a marine corridor, it could block the passage of larvae, severing the connection between the source and the MPA. This disruption could have significant negative impacts on the sustainability and health of the protected marine populations. Therefore, including these corridors in conservation plans is vital to ensure the continued success and resilience of MPAs.

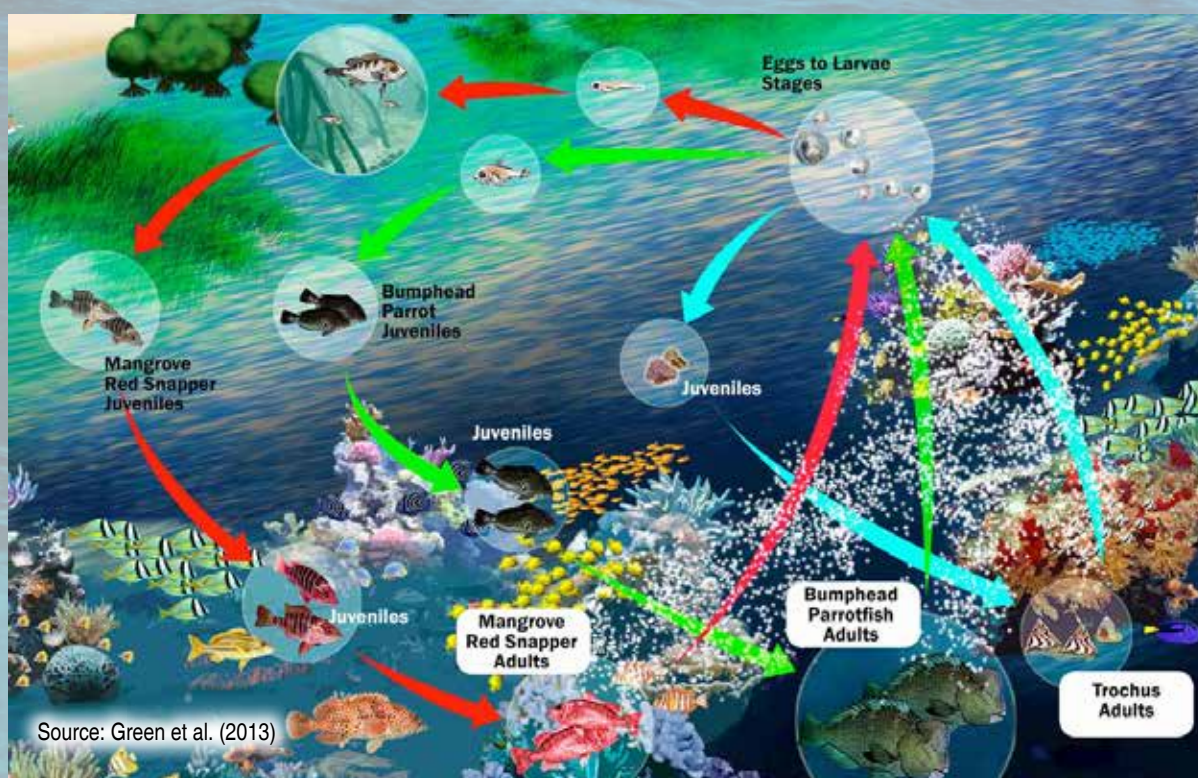
By understanding these dispersal patterns, MPA managers can protect those areas and ensure that the larvae produced are attracted to settle inside MPA habitats and contribute to sustaining healthy marine ecosystems. This knowledge enables more effective management and conservation strategies, ensuring the long-term viability of both the source and destination sites within the network.

A connectivity study also highlights the importance of marine corridors — pathways in the water that serve as “highways” for the movement of larvae between different areas. These corridors are vital for maintaining marine populations, as they facilitate the dispersal of larvae from their source to other suitable areas, where they settle and grow.

Identifying interconnected habitats

The ASEAN ENMAPS Project also aims to identify the location and extent of dominant habitat types within MPAs. These habitats, characterised by their physical, chemical, and biological attributes, support the most significant populations of organisms and play a key role in the overall ecosystem structure and function. Understanding and protecting these dominant habitats is essential for assessing biodiversity, species distribution, and ecological dynamics in marine environments.

However, the conservation should not stop only in the dominant habitat type in an area. It should extend to other habitat types as well due to the interconnection of each habitat type to each other. For example, coral reefs may be the dominant habitat in an ASEAN ENMAPS pilot site, but their interconnection with other habitats like seagrass beds and mangroves is still crucial.



The illustration above shows how fish species move among different types of habitat in their life cycles. The interconnection among habitats underscores the importance of considering all relevant habitats in marine conservation efforts. Therefore, including these corridors in conservation plans is vital to ensure the continued success and resilience of MPAs.

Fish and other marine organisms often undergo ontogenetic habitat shifts, moving between different habitats as they develop. Fish that initially settle in coral reefs may later rely on seagrass beds and mangroves for nutrition and shelter, and vice versa. This interconnectedness underscores the importance of considering all relevant habitats in marine conservation efforts.

By identifying these interconnected habitats, the project will be able to expand the conservation in MPAs to include not only coral reefs but also seagrass beds and mangroves. This approach enhances the conservation of entire ecosystems, supporting the growth and development of fish populations and ensuring the sustainability of the marine environment.

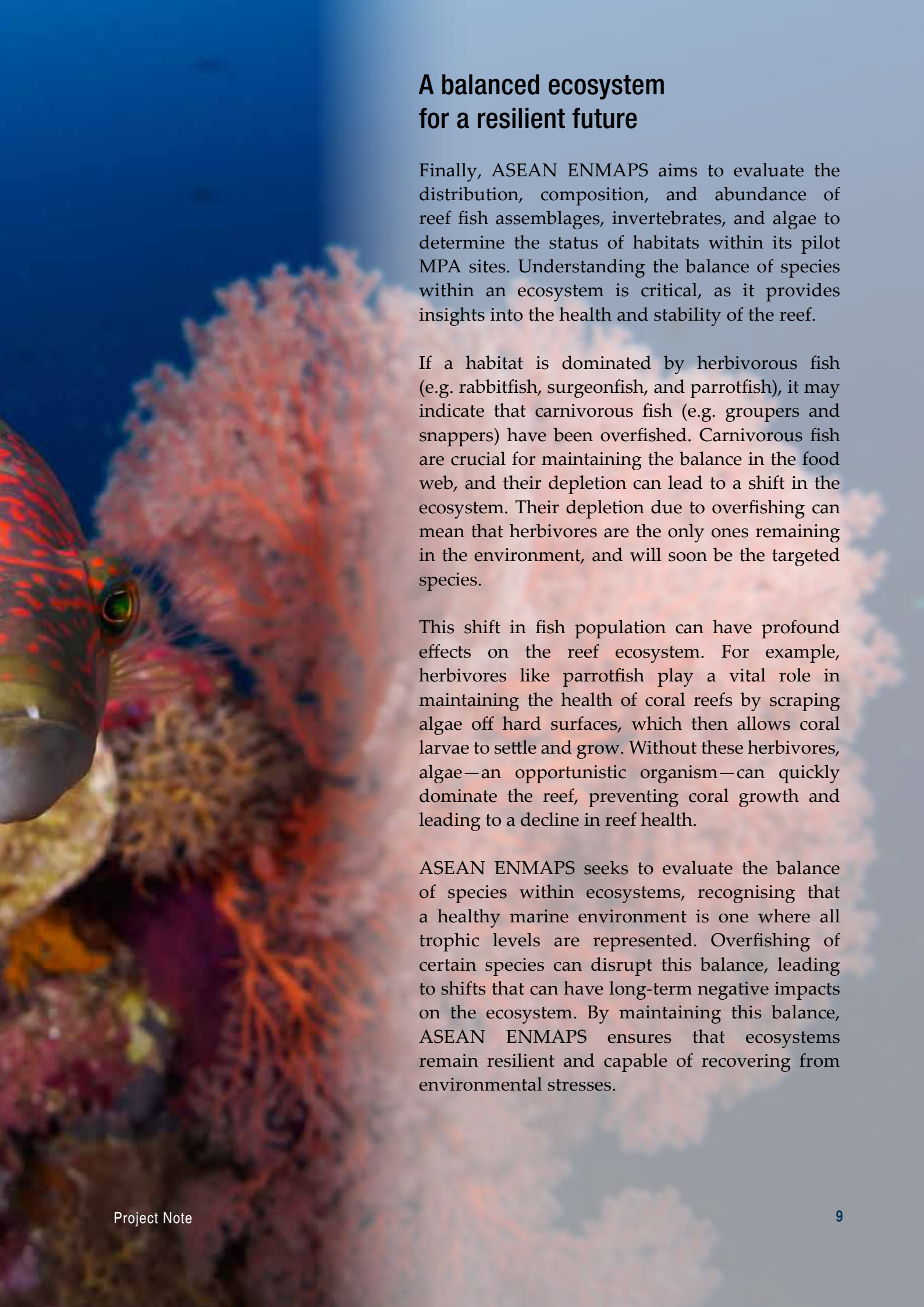
Assessing threats

ASEAN ENMAPS intends to assess the threats to each MPA site, differentiating between internal and external threats. Internal threats, which mostly originate within the management body, are generally easier to address because they fall within the direct control of the organisation. These threats can be resolved more efficiently since the management has the authority to implement necessary changes.

External threats, however, pose a greater challenge. These threats arise from outside the management body and often require engagement with external stakeholders to fully understand and address the issues. For instance, external threats may involve industries or activities that negatively impact the project site but fall outside the management's immediate jurisdiction.

A case in point is the impact of the mining industry in Lanuza municipality, located in Surigao del Sur, Philippines.

Mining activities produce significant amounts of silt, which flow into the marine environment and consequently devastate coral reefs. The protected area's management body is unable to directly mitigate this threat because the authority over the mining industry lies with a different regulatory body. Addressing such external threats would involve navigating complex bureaucratic processes, such as advocating for a ban on harmful mining activities, which requires coordination with multiple government agencies and stakeholders.



A balanced ecosystem for a resilient future

Finally, ASEAN ENMAPS aims to evaluate the distribution, composition, and abundance of reef fish assemblages, invertebrates, and algae to determine the status of habitats within its pilot MPA sites. Understanding the balance of species within an ecosystem is critical, as it provides insights into the health and stability of the reef.

If a habitat is dominated by herbivorous fish (e.g. rabbitfish, surgeonfish, and parrotfish), it may indicate that carnivorous fish (e.g. groupers and snappers) have been overfished. Carnivorous fish are crucial for maintaining the balance in the food web, and their depletion can lead to a shift in the ecosystem. Their depletion due to overfishing can mean that herbivores are the only ones remaining in the environment, and will soon be the targeted species.

This shift in fish population can have profound effects on the reef ecosystem. For example, herbivores like parrotfish play a vital role in maintaining the health of coral reefs by scraping algae off hard surfaces, which then allows coral larvae to settle and grow. Without these herbivores, algae—an opportunistic organism—can quickly dominate the reef, preventing coral growth and leading to a decline in reef health.

ASEAN ENMAPS seeks to evaluate the balance of species within ecosystems, recognising that a healthy marine environment is one where all trophic levels are represented. Overfishing of certain species can disrupt this balance, leading to shifts that can have long-term negative impacts on the ecosystem. By maintaining this balance, ASEAN ENMAPS ensures that ecosystems remain resilient and capable of recovering from environmental stresses.

The long history of overfishing in Bolinao, Pangasinan, Philippines sequentially decimated top carnivores first, followed by the next trophic groups until fisherfolk heavily targeted the remaining herbivores.

In 1998 following the worst episode of coral bleaching, nearly 90% of hard corals in Bolinao bleached. Because very little of the herbivores remained, opportunistic algae began colonising the spaces the hard corals previously occupied. Without herbivores clearing sites for coral larvae to settle, the entire reef system of Bolinao, Pangasinan shifted from coralline to an algal community. Recently, it has shifted to a blue fire coral community.

This example underscores the importance of maintaining a balanced fish population.

In contrast, the balanced fisheries community in Tubbataha Reefs Natural Park enabled the ecosystem to recover naturally from coral bleaching within 2–3 years. This demonstrates the resilience of a well-managed marine environment.

Sheila Vergara, July 2024



Overfishing is still happening now in Pangasinan, Philippines. This photo shows that herbivorous fish (the colourful fishes above) are being sold in the fish market in Bani, Pangasinan. This may indicate that fisherfolk have shifted to herbivores as their target species due to depleted fish stock.

The path forward

The ASEAN ENMAPS project represents a crucial step forward in the goal of conserving Southeast Asia's marine environments. By leveraging scientific research and focusi

ng on the interconnectedness of ecosystems, the project aims to create a resilient network of MPAs that will safeguard the region's marine biodiversity for generations to come.

As the world grapples with the escalating impacts of climate change, the success of initiatives like ASEAN ENMAPS will be vital in ensuring the long-term sustainability of our planet's oceans. Through its science-driven approach and commitment to regional cooperation, ASEAN ENMAPS is setting the standard for marine conservation in Southeast Asia, offering hope for a future where both people and nature can thrive.

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ASEAN ENMAPS is a regional initiative designed to enhance the management of networks of marine protected areas and marine corridors within selected Large Marine Ecosystems in Indonesia, the Philippines, and Thailand. It has 11 pilot sites within the four Large Marine Ecosystems of Bay of Bengal, Indonesian Sea, South China Sea, and Sulu-Celebes Sea. The project is implemented by the UNDP through the funding of the GEF, and with the ACB as the executing agency.

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