

Section 2 IN DEPTH

Care to take your Gallery tour further?
Here's where to begin.

The Ocean Planet

We may call our planet Earth and ourselves Earthlings, but in fact we live on Planet Ocean, the only one of its kind in the whole solar system.

Our planet's surface is 70% water, and 97% of this water is found in the ocean (2% is ice in the polar icecaps, and only 1% is fresh water). Land masses, or continents, divide the ocean into four main basins – Pacific, Atlantic, Indian and Arctic Oceans. While we call them by different names and consider them as separate bodies of water, these oceans in fact are connected and function as one great interconnected system, so that oceanographers often speak of them as one world ocean.

It is the ocean that makes our planet “uniquely life-bearing,” scientist Isaac Asimov noted in his foreword to *The Ocean: Consider the Connections*, a book published by the Center for Environmental Education*. Earth, now said to be four and a half billion years old, was a barren place for the first one billion years of its existence, and, for the next three billion years, the ocean was the only place that harbored any form of life.

“This is not surprising,” said Asimov. “Consider the differences of sea and land. The ocean has a temperature which changes very little with the seasons, but land is exposed to extremes of temperature. The water of the ocean screens out the harsh radiation of the sun, while the air above the land is much less effective in doing this. The water of the ocean is buoyant and lifts up life forms so that they are little affected by gravity and can move easily in three dimensions, no matter how large they are. Life on land is pulled down forcefully by gravity and any animal that weighs more than twenty-five pounds or so can move about rapidly only at the cost of a large expenditure of energy.”



Sea or Ocean?

We use “sea” and “ocean” interchangeably (and that's all right) but, technically, there is a distinction between these two terms.

Oceans are those huge bodies of water that divide the continents (or join them, if that is how you want to view it). We have four major oceans: Pacific (the biggest), Atlantic, Indian and Arctic (the smallest).

Seas are smaller, shallower areas of the ocean, partly surrounded by land. They include the Mediterranean, Bering, South China, and Caribbean.



Climate Regulator

The ocean is the key regulator of global climate. It serves as a massive reservoir of water, recycling rain and preventing continents from turning into deserts. It moderates local temperatures by absorbing heat in the summer and releasing heat in the winter.

This is how it works: The ocean contains an enormous amount of water, more than one and a half quintillion (1,500,000,000,000,000,000) tons, which translates to about 250 billion liters (66 billion gallons) for each of the estimated 5.9 billion people on Earth (projected, US Bureau of Census, May 23, 1998). All this water is in constant motion, driven by the sun's energy – it is warmed by the





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sun and in turn warms the air at the ocean surface, which picks up moisture. More heat is released into the atmosphere when some of the moisture in the air condenses into clouds. The ocean – water — absorbs, and radiates, more heat than land before changing temperature, so there are almost always significant differences between land temperature and ocean temperature. These temperature differences between land and sea create winds. Winds, in turn, rise over the hotter land at daytime and generate onshore breezes, then rise faster over the warmer water at night, causing offshore breezes.



Telling On El Niño

Corals are like tiny thermometers and rain gauges. When water temperatures rise, they incorporate less strontium into their skeletons than they do under cooler conditions. In addition, their oxygen content records changes in salinity, which can be used to estimate rainfall. This makes corals a good recorder of climate history and allows scientists to study climate patterns, such as the mysterious El Niño.



Winds cause currents, pushing water along the surface and changing ocean temperature along the way. Differences in salt content and temperatures in the ocean also cause currents, this time, beneath the water surface. Currents transport heat and cold over thousands of miles – warm equatorial water towards the poles and cold polar water towards the equator – thus changing temperatures over large areas and affecting weather on land.

Often, we take for granted, maybe sometimes even ignore, these natural processes. But something always comes around to remind us of the tremendous influence the ocean has on our planet. El Niño has become a byword, what with its seemingly more and more frequent visits to our shores. This term, which originally referred to a change in surface currents along the coasts of Peru and Chile, is now generally used to describe a complex interaction of ocean and atmosphere that links the entire planet, causing the now familiar extreme changes in weather patterns in affected areas – deadly drought in some places, killer floods in others.

Life-giving Water

But however devastating a force the ocean can be, it is more than anything else a giver of life. Our seas are full of life: It is estimated that 9 out of 10 organisms on Earth live in the ocean. There are tiny one-celled chlorophyll-bearing plants floating on the ocean's surface, making food from the Sun's energy through photosynthesis, thus providing the basis for the web of life for water and land animals (these marine greens produce four times as much oxygen and food as terrestrial plants do). There are seaweeds and seagrasses, microscopic animals and huge marine mammals, vertebrates and invertebrates, turtles and fishes and octopuses, all sustained by the life-giving environment around them, all the while sustaining each other and contributing to the general well-being of the entire planet. Indeed, we humans depend on the ocean for the very air we breathe and the food we eat.

What would life on Earth be without the ocean? Again, we quote Asimov: "Ocean life is far more important in the total scheme of things than land life is... If all land life should disappear, life in the ocean might be handicapped in some minor ways, but it would continue. If all ocean life were to disappear, however, animal life on land could continue only in greatly reduced quantity – if at all."





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Our Beautiful Seas



*"I must go down to the seas again,
to the vagrant gypsy life,
To the gull's way and the whale's way
where the wind's like a whetted knife."*

John Masefield in Sea Fever

Within our limited field of vision, we know the sea to be remarkably diverse, unpredictable, and beautiful. Indeed, the sight of the seemingly boundless, calm or not, blue ocean waters and our ever-changing coastline has been a constant source of inspiration for the poets, writers and artists among us. We seem to be forever drawn to the seas around us and, as poet John Masefield has said, "must go down to the seas again," and again. We must feel truly blessed that we live in a country with so many islands, never too far from the sea.

But how much do we really know about the sea? Despite great advances in research in the last two decades or so, scientists have yet to explore our vast ocean environment as extensively as they have even the moon's surface (less than 10% of the Philippine marine area has been thoroughly surveyed). We hardly know anything about the sea, though we instinctively sense its grandeur and hold it in awe and fascination. And why not? What little knowledge science has so far managed to uncover about the sea has been nothing short of breathtaking.

A World of Wonder

By all accounts, there is a spectacular landscape beneath the ocean like nothing we've seen on land. Here you will find the world's highest mountains, the flattest plains and the deepest canyons — the Pacific Ocean's Mariana Trench, which is 10,900 meters deep, could easily swallow Mt. Everest, which, at 8,840 meters, is the world's highest mountain above sea level.

Even more spectacular, however, are the diverse life forms nurtured by the sea. The ocean world is made up of interrelated and interconnected ecological systems, including some that we are familiar with: the beach, mangrove, coral reef and seagrass systems. Each system, no matter how seemingly small and simple, contains an amazing array of organisms, both plant and animal.

Take for example the tidepools. They seem almost inconsequential, but even these little pools of water left behind in cracks and crevices of rocky shores as the tide recedes harbors surprisingly diverse marine life: seaweeds, sea stars, crabs, sea anemones, mussels, sea urchins, periwinkles and other organisms well adapted to the harsh conditions of this environment (crashing waves, rapid changes in temperature and salinity, drying effects of low tide).



Rich Reefs

*Philippine coral reefs
host more than 2,000
species of fish, 5,000
species of clams, snails
and other molluscs,
488 species of corals,
981 species of bottom-
living algae, and
thousands of other
marine organisms.*



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And who wouldn't marvel at the underwater world's rainforests, the coral reefs? Corals are actually animals, but the analogy is not too far-off because, like rainforests, coral reefs consume carbon dioxide and give off oxygen. And, like rainforests, coral reefs support a huge number of plants and animals – sea anemones, sponges, lionfish, sea slugs, groupers, and sponges, just to name a few. In fact, one-third of all fish species can be found on coral reefs. Imagine then the many different colors and fantastic vista one can see in these underwater gardens.

Life in the ocean is about 3.5 billion years old, older than any we know on land. So it is not surprising that the ocean should have what some say are the world's most intelligent creatures, the whales. Or that we can find here so many life forms superbly adapted to their environment. Even in depths where little or no light can penetrate, some life exists. At this depth (more than 180 meters deep), the phytoplankton that most sea creatures depend on for food cannot flourish, so the animals that thrive in the so-called twilight zone (150-1,000 meters deep) must prey on one another, or eat dead animals and algae that rain from above. Nature has endowed them with the right (though often not very pretty) survival gear: huge mouths and big eyes to ensure that they catch any food that appears and, sometimes, luminous organs to attract their prey. Down on the ocean floor (3,000 meters deep), there are sea spiders, tripod fish, glass sponges, sea anemones, sea squirts, sea lilies, sea worms, crustaceans... the list goes on.



Spineless But Deadly

Some marine invertebrates (animals without backbones) have developed some rather nasty arsenal for survival. Take the cone shell – its beautifully patterned shell hides a ruthless warrior which can catch fish and other animals several times its size. It spears its prey with a harpoon-like tooth, paralyzes it with a nerve poison and then devours it. The poison is so powerful it can kill humans.



This Side of the Sea

Spectacular is certainly a word that applies to our own patch of the ocean. Because of its archipelagic nature, the Philippines has an extensive coastline – 18,000 km, by most estimates – and a wealth of coastal resources. We have here, for instance, some of the richest coral reefs in the world (we are part of an ocean region, which also includes Indonesia, Papua New Guinea and Australia, called the “coral triangle” because of its abundance of coral reef life).

In addition, our islands are close to very deep waters, which means that we can find here a number of diverse habitats: shallow inshore waters adjacent to deep seas, deep oceanic waters close to coasts, sheltered bays, protected straits with steep slopes and strong currents, and deep isolated basins.

These habitats are home to a huge variety of marine life, including dolphins and whales and a host of other organisms, large and small alike.

Diversity Means Life

For all the beauty of the ocean bed's landscape and the individual species we find in our marine environment, it is the richness and diversity of ocean life itself that scientists say makes the ocean so efficient in giving and nurturing life.





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We know now that living things are bound together in the web of life – complex food webs, symbioses, nutrient cycles and other ecological interactions. We know that no organism can live in isolation from its environment and other living things and that the loss of one species can have far-reaching effects on many others. In the same vein, the ocean would not be the life-giving water that it is without the diverse community of organisms that live in and above it. It is this diversity, which so fascinates and intrigues us, that makes the ocean indispensable to life on land.

Learning History from Our Seas

by Boboi Costas, *The Independent Post*

Pay tribute to the ocean, the vast body of water encircling our planet, distinctly divided by land masses and yet interconnected as one. This is the call issued by the United Nations General Assembly 1994, which declared this year, 1998, as the International Year of the Ocean (IYO).

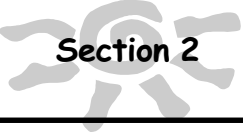
For Filipinos, who live in an archipelago of more than 7,000 islands, the seas have always been the source of life. Our waters host flora and fauna considered to be some of the most unique and diverse in the world. In a maritime country, the IYO celebration is but a fitting tribute to a priceless resource.

This year's IYO celebration is even more significant as it coincides with the commemoration of the country's first 100 years of independence. The year also marks the centennial of the Filipino as one sovereign people. Thus 1998 compels us to look back, examine our past, and perhaps draw lessons from our seas and how they have become living testaments of our struggles and liberation.

The rivers and the seas had strong influences in the precolonial period Filipinos' lives. It was sea that brought our ancestors in *barangays* to these shores. The dead was put out to sea in floating coffins, signifying travel to the other world. The Manunggul jar, one of the oldest artifacts unearthed in the Philippines, shows two anthropomorphic figures rowing in the underworld. For centuries, an indigenous community in southern Philippines, the Badjaos, has made the seas their home, their lives inextricably woven with the seasons of the sea and the sun. Tales about the sea abound in our folklore. Was it a firebrand floating in the sea that transformed into an icon of the Sto. Niño?

The first Filipino defiance against colonization was staged in Mactan waters where chieftain Lapu-Lapu defeated the *conquistador* Magellan. What was supposed to be the beginning of foreign subjugation





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was nipped in the bud. Philippine sea lanes played vital roles in the galleon trade between Acapulco and Manila, as well as the coming *barkadas* or boatloads of Jesuits, Dominicans, Franciscans and Augustinians in their evangelical missions.

But the waters also bore marauding pirates that would plunder settlements, requiring the natives to build watchtowers and *garritas* near coasts and promontories, unifying sparsely populated settlements into one *poblacion*.

Estuaries, notably Pasig in Manila and the Parian in Cebu, have figured well in history as vital waterways and entrepôts where trade with other sea-faring peddlers and artisans took place. The battle at Manila Bay, where the Philippines fell into the hands of the Americans, ended more than 300 years of Spanish colonization of the country.

In recent memory, no one would dare forget Leyte and her seas, where American forces waged a fiercely fought battle with the Japanese Imperial armies in the Pacific, ending World War II. Subic Bay, a few nautical miles from Cam Ranh Bay in Vietnam, was home to the controversial American naval base, later dismantled not by the will of the Filipino people but by the wrath of Pinatubo.

Maritime disasters have made the seas the watery graves of our Filipino brethren, reminding us of our foibles. Consequently those tragedies raised calls to reexamine our maritime policies and laws.

Meanwhile, the sea itself has become a virtual battlefield where commercial fishing companies, with their efficient gear, compete against subsistence fishers who rely on reef blasting, cyanide fishing and other destructive methods of fishing. In a war that nobody wins, the bounties of our seas, which once upon a time we thought were infinite, all too suddenly have become depleted, waking us to the fragility of life itself.

Our seas have always figured prominently in our history — so much, in fact, that they have become part of our identity and collective consciousness. Like the life our seas harbor underneath, our history teems with hues and streaks of colors: of human frailties and triumphs, of a freedom so well deserved. Not only should we revere the sea for all the life it gives, we should also respect it for all the sanctity it keeps.



Creatures of the Dark Deep

Some living things in the deep, deep sea: at 2,500 meters deep and below, the sulphur-rich water nourishes bacteria, a source of food for giant clams and tubeworms. At depths of up to 5,000 meters, deep-water spiders with no eyes grow up to 60 cm long.



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Our Finite Seas

We often speak of the ocean as boundless and bottomless, but we know that it is in fact a finite – and very fragile – ecosystem. A number of plant and animal species, perhaps including many we never knew existed, have been harvested to extinction or near extinction, both locally and on a global scale: turtles, whales, sea cows, mangroves, even ‘lowly’ seagrass species. We have already lost the Steller’s sea cow, the closest relative of the endangered dugong. And we’ve almost lost the world’s largest creatures, the blue whales – until their slaughter was banned by the International Whaling Commission in 1985, they were hunted almost to extinction.

The beluga sturgeon, valued for its roe (it’s made into caviar), is already extinct in the Adriatic and could soon disappear from the Caspian Sea. Stocks of bluefin tuna and swordfish are so seriously depleted these species may soon end up on the endangered-species list. And our own grouper and giant clams are high on the list of species vulnerable to extinction.

Too Much, Too Indiscriminately

Theoretically, the ocean can continuously renew itself and supply the world with up to 100 million tons of fish every year for eternity. Indeed, from the 1940s to the late 1980s, the wild catch of marine fish increased steadily, thanks to modern and more efficient fishing techniques. Then, in the 1990s, fish catch leveled off worldwide and in some years actually declined. The reason: we’ve been overfishing and exploiting the ocean beyond its limits. According to the Food and Agriculture Organization, all 17 of the world’s major fishing areas have either reached or exceeded their natural limits. In 1987, commercial fish fleets harvested 91 million tons of fish, while small fishers took another 24 million tons.

We’re not leaving much for the ocean to replenish itself. Sometimes, it seems we’re not leaving anything at all! We use gigantic fine-mesh nets and all sorts of highly efficient fishing gears, which catch all kinds of sea creatures, even those we don’t need or want. What’s more, we pollute the ocean waters and destroy coral reefs and mangroves and other marine habitats, leaving fish and important sea organisms with no place to feed or breed.

We need not look far to see how much of the ocean’s productivity we’ve squandered in so short a time. In the Philippines, we are losing more than US\$400 million a year to overfishing of demersal and small pelagic species. Worse, our marine environment is rapidly deteriorating. In 1981, researchers reported that more than 70 percent of coral reefs in the Philippines were in poor or fair condition, 24 percent were in good condition, and only 5% were in excellent condition. By the early 1990s, according to one estimate, the incidence of reefs in poor or fair condition in our country had risen to 80 percent, no thanks to the prevalent use of destructive methods of fishing, pollution, impacts of coastal development and the sheer thoughtlessness of people.

Fool’s Paradise

The use of cyanide and dynamite may produce big fish catches – for a short period only. It also kills corals, destroying precious coral reef habitats. The destruction of many of our coral reef areas has resulted in fish production losses of 159,000 metric tons a year.





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What are the consequences? A healthy reef produces 20-30 metric tons of fish per square kilometer per year, enough to provide the seafood protein requirement of 400-700 people. One square kilometer of reef in poor condition, on the other hand, produces only 5 metric tons of fish a year, barely enough to feed 100 people – that’s at least 300 people who are deprived of health-giving seafood, or up to 700 people making do with less than 15% of the seafood protein they need!

Open Access Nightmare

One cause – some say *the* major cause – of the continued overexploitation of our marine and coastal resources is the *de facto* open access regime that is now prevailing in Philippine waters. This means that, despite laws regulating fisheries, virtually everyone is able to fish wherever and in any way they please. This situation stems from a weak legal system – even when violators are apprehended, they usually get off scot-free, simply because the evidence against them has been lost, or because the law isn’t very clear, or because there are questions about which agency or town has jurisdiction over certain resources and therefore has the authority to enforce laws, or worse because the lawbreakers have “the right connections.”

Our sea waters are divided into two main economic zones: the area from the shoreline to 15 km seaward is designated for the exclusive use of municipal fishers and is referred to as “municipal waters.” The area beyond the 15-km boundary is for commercial fishers’ use and is called “commercial waters.” Under the Philippine Fisheries Code of 1998, local governments may allow commercial fishing operations in municipal waters, if these are confined to the 10.1-15-km zone.

But there have been numerous reports of encroachment of municipal waters by commercial fishers, who use illegal fishing methods that demolish entire generations of reproducing adults as well as juvenile fishes, or destroy coral reefs and other nearshore habitats. Meanwhile, the small fishers themselves, faced with diminishing catch, often resort to illegal and destructive forms of fishing. They use chemicals to stun, kill or drive out fishes from their hiding places. Or sometimes they use dynamite, smiting a huge number of fish, wanted or not, and making a hole up to 5 meters in diameter in the reef, devastating coral colonies that took more than 30 years to grow, all in a single sweep, in a matter of seconds.

The rest of us must share the blame for our ocean’s rapid decline. For ages, we’ve been using the ocean as dumping ground for our garbage, mindless of the damage our action wreaks on delicate marine ecosystems. Ships dump 600,000 tons of oil into the sea every year. Industries discharge noxious chemicals. Households pour sewage and wastes (44% of marine pollution [by weight] comes from land-based activities while 45% comes from air-borne pollution). To top it all, coastal populations continue to increase – according to one estimate, by the year 2020, 75 percent of us will be living within 60 km of a coastline, spewing more wastes, more plastics, more sewage into our already severely stressed seas.

There is still time to make amends, but it’s running out fast. We must change our ways, or face the collapse of the ocean world – and human life itself.





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Endangered Coasts

One Coastal Community

Compared to some countries in Southeast Asia such as Malaysia and Thailand, the Philippines is surrounded by deep waters ranging from 2,000 meters to 4,000 meters. Its shallow waters are relatively narrow and close to shore. However, with its more than 7,000 islands, the country is supported by large productive areas of diverse marine ecosystems, which provide shore protection and nutrient cycling as well as valuable economic goods.

Indeed, the Philippines is one big coastal community of more than 70 million people. The country's coastline stretches to more than 18,000 km, and its coastal waters cover an area of 266,000 sq km. Seventy percent of its more than 1,500 municipalities are located in the coastal area, which is home to millions of people for whom the sea is an ordinary, but often little understood, fact of life.

Coastal fishing activities account for between 40 percent and 60 percent of the country's total fish catch. All told, the fisheries sector accounts for about 4 percent of GNP and directly employs over a million Filipinos, more than half of whom are engaged in small-scale fishing. Fish and other marine products supply up to 70 percent of the total animal protein intake and 30 percent of the total protein intake of Filipinos. And, with the growth of tourism in coastal areas, Philippine coastal resources are predicted to become even more economically valuable over time.

An Uncertain Future

But time is not on the coastal communities' side. Overfishing, over-exploitation and pollution are putting tremendous strain on Philippine coastal resources, resulting in the loss of fishery habitats, water quality and various types of marine life from corals to seagrasses to fishes.

Already vulnerable to natural phenomena such as typhoons, cyclones and coastal storms, coastal communities are facing even greater risk from all kinds of unmanaged and potentially harmful human activities. Open access has resulted in over-exploitation of coastal resources -- many of the Philippines' 50 major fishing grounds are overfished: San Miguel Bay, Lamon Bay, Lingayen Gulf, Manila Bay, the Batangas coastline, Ragay Gulf, Moro Gulf, Davao Gulf, Samar Sea, Visayas Sea, and the Pacific side of Bohol.

Dynamite fishing, the use of cyanide, industrial pollution, domestic wastes and siltation are destroying the coral reefs. Mangrove forests are being converted into fishponds, beach resorts and residential and industrial estates, further reducing the natural habitats of the various fish, shellfish and crustaceans found in the coastal areas. The result: declining fish catch, which has already led to a situation where most fishing activities are becoming economically non-viable. Fishery experts say that in many areas around the country today, the limits of sustainable fishing has already been reached or even exceeded.



Power Fishing

Some 'industrial-size' fishing operations use computerized ships as large as football fields and nets that can gather up to 120 metric tons in a single sweep. So-called 'longlines' stretch for tens of kilometers -- armed with thousands of hooks, they snag tuna and swordfish as well as sea turtles, marlins and sharks. Other vessels have satellite-navigation systems that enable them to pinpoint a good fishing spot, or home in on giant groupers as they gather to spawn.





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Worse, the much touted biodiversity of our coastal waters is threatened. Listed in the Wildlife Conservation Society of the Philippines' Red Data Book of Threatened Animals are seven species of giant clams that used to abound in Philippine waters. Giant clams inhabit shallow clear waters of coral reefs and are found only in the Indo-Pacific region (including the Philippines), with Micronesia and Guam forming the northernmost limit and Northern Australia, the southernmost. Indiscriminate harvesting has resulted in the decline and local extinctions of these species. Also in the Red Data Book are 19 marine mammal species, including the dugong, which depend primarily on seagrasses for food. In addition, at least one seagrass species, *Halophila beccarii*, is endangered, if not already harvested to extinction from Philippine waters.

Conservationists remain cautiously hopeful. In their preface to the Philippines' Red Data Book, William L. R. Oliver of Fauna & Fauna International (UK) and Lawrence R. Heaney of The Field Museum of Natural History (US) sounded this alarm: "Although there is no time to spare, *there is still time* to save the natural diversity that is the patrimony of the nation, and to prevent the worst of the environmental problems that will result if past conditions were to continue. But while we work and hope for the future, the chain saws reverberate and the lahar flows amidst looming cycles of floods and droughts. The hard lessons of Ormoc and Pinatubo are being learned, but slowly, and too little is being done by too few people with too little support. The time for everyone to make their best efforts is now, at all levels of society, nationally and internationally. The future of the biota and the people of the Philippines hangs in the balance."



Looking Up

The picture is bleak but there are ongoing and successful international conservation efforts designed to protect not only individual species but also the overall sustainability of our seas.

One of the first environmental campaigns, Save the Whale, is also one of the most successful. It was an offshoot of the rapid growth of commercial whaling, which hunted down whales almost to extinction (as one species became scarce, another one was quickly chosen to take its place). Amid mounting concern for the future of whales, the

International Whaling Commission was established in 1946 to regulate the whaling industry. A quota system was put in place, but because there was no scientific data from which countries could determine how many whales they could catch, quotas were not kept and whale stocks continued to decline. In 1985, as public concern became more widespread, member-countries of the commission agreed to implement a ban on commercial whaling.

- *The United Nations has produced a treaty to protect stocks of fish that straddle the coastal zones of two or more countries or migrate through international waters in the open oceans. The treaty will take effect after 30 or more countries ratify it.*
- *In 1989, the UN General Assembly passed a resolution that called for a ban on ocean-going drift-netting beginning June 1992.*
- *An international law prohibits the world's merchant ships and other sea-going craft (fishing boats, yachts and passengers) from throwing plastic into the sea. These vessels are required to dispose of their garbage in such a way that it will have no effect on the marine environment.*



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Seagrasses Under Siege

Why Care About Seagrasses?

Though not as attractive as coral reefs or as visible as mangroves, seagrasses are as important, both ecologically and economically, as all the other coastal ecosystems. They harbor a diverse community of marine organisms and serve as an essential link between mangroves and coral reefs.

Seagrasses are the only group of submerged flowering plants in tropical and temperate marine environments. They grow in the intertidal region to depths of 30 meters, and are most conspicuous in the shallow subtidal area.

Largely taken for granted, seagrasses perform many important functions. They stabilize and hold bottom sediment even under the force of hurricanes and storms. They slow and retard water currents and waves, and regulate water turbidity by trapping sediment through leaf action. They provide shelter and refuge for adult and young marine animals, many of which are commercially important. They provide food for fish, sea turtles and other marine animals, including the endangered Dugong and the Green sea turtle. They trap debris and small particles and produce dissolved organic matter, thus contributing to nutrients cycle within the ecosystem. They also serve as a nursery ground for many fish species.

Sadly, like the other coastal ecosystems, seagrass ecosystems in the Philippines are under threat from various natural and man-made forces – typhoons, tidal waves and volcanic activity as well as mining, aquaculture, deforestation and blast fishing. Seagrass beds are a primary target for development aimed at meeting the country's growing need for extra space for food and food production, settlement, waste disposal and recreation. Thousands of hectares of seagrass beds are believed to have been lost as a result of reclamation of coastal areas for housing, airports and piers and commercial complexes, and from pollution and siltation due to deforestation.

There are efforts to protect the seagrass beds that have been left intact. The declaration of certain areas as reserves and marine parks remains a big challenge, but there are attempts to rehabilitate degraded beds using seagrass transplantation in limited areas.

Protecting Seagrasses: Guidelines for Coastal Zone Development

1. Dredging and filling should generally be avoided in areas that are dominated by seagrass beds. When these activities take place in contiguous areas, care should be taken to ensure that silt is not transported into the seagrass beds. This can be achieved by the use of various devices called silt barriers and by a dredging strategy that ensures that nearshore circulation and tidal currents move the silt away from seagrass areas.

Extinction Clock

Steller's sea cow: discovered in 1741, extinct by 1767, the first marine mammal to become extinct in modern history

Bluefin tuna: population — 40,000 adults, down from 250,000 twenty years ago

Blue whales: over 29,000 slaughtered in one hunting season in the 1930s; current world population: a few thousand





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2. Proposed coastal engineering works (e.g. piers) that significantly alter circulation patterns should be designed to prevent or minimize either erosion or deposition in nearby seagrass areas.
3. Present liquid-waste disposal procedures should be reviewed and modified where needed to prevent harmful wastes (industrial effluents, urban runoff, bilge water pumping, etc.) from entering seagrass areas.
4. Trawling practices and other damaging capture fishery activities should be modified to minimize damage to seagrass beds during fishing operations. The most effective means would be to ban bottom trawling from the seabeds where seagrass meadows occur.
5. Water diversion schemes which change natural salinity should take into account the effect on seagrass communities and associated organisms. Maintenance of salinity within acceptable ranges can be achieved through an appropriate scheduling of water release.
6. Measures should be taken to prevent oil spills from contaminating seagrass communities. This can be achieved through siting measures, a monitoring program, and the development of an oil spill contingency plan.
7. Seagrass beds should be identified and mapped in a resource inventory before any of the above kinds of projects and activities are approved.

FACTS AND FIGURES

- The Philippines has 16 known species of seagrasses, the highest number in the Indo-Pacific region and the second highest worldwide (second only to Australia, which has 23 species). These species are valued mainly for their role as fish nursery areas and as foraging grounds for food fish, dugong, turtles and wading birds.
- Seagrass beds in the Philippines support at least 172 species of fish, 46 species of invertebrate, 51 species of seaweeds, 45 species of algal epiphytes, 1 species of sea turtle, and 1 species of dugong.
- In Bais Bay, Negros Oriental, rabbitfish population alone consumes about 0.637 metric tons wet-weight of the seagrass, *Enhalus acoroides*, per day, equivalent to 0.32 grams wet-weight per square meter per day.
- Seagrasses represent one of the most highly productive, tropical marine ecosystems. Dry-weight values of gross primary productivity have been estimated as high as 8 grams of carbon per square meter per year.
- Although seagrasses are a relatively hardy group of plant species, they are extremely sensitive to excessive siltation, shading, water pollution, and fishing practices that use bottom trawls which scrape the beds.
- Approximately 30 to 50 percent of the seagrass habitat in the Philippines has been lost to heavy siltation and coastal development.



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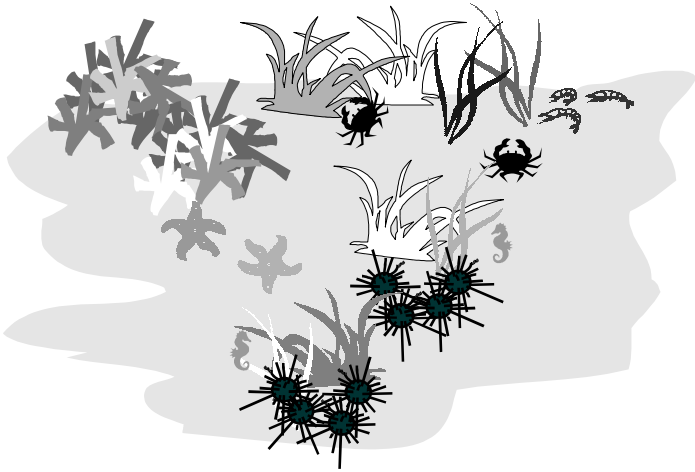
- The removal of seagrass beds from the marine ecosystem results in lower productivity and decreases water quality. Typically, when a seagrass community is eliminated, its marine animal associates also disappear from the area.
- One species that may be considered endangered, if not completely lost, is *Halophila beccarii*. Specimens were last collected in Manila Bay more than eight decades ago. The species is said to still thrive in the South China Sea and Bay of Bengal.
- In many areas, the disappearance of seagrass communities is only noted by local fishermen because, unlike mangroves and coral reefs, seagrass communities are not visually obvious to most observers.



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Though not as attractive as coral reefs or as visible as mangroves, seagrasses are as important, both ecologically, as all the other coastal ecosystems.

They harbor a diverse community of marine organisms and serve as an essential link between mangroves and coral reefs.





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Mangroves in Trouble

The Philippines has lost some 60% of its total mangrove area, and mangroves remain vulnerable to loss from fishpond development, industrial development, and cutting for firewood and charcoal production. Should such loss continue, already declining fisheries will suffer more losses, and related habitats, such as coral reefs and seagrass beds, will be further threatened.

Why care about mangroves?

Mangroves, trees that live in the coastal zone in tropical and subtropical forests from as far north as the southern United States to as far south as the northern coast of Australia, form an important link between the shore and coastal ecosystems. These trees can form dense forests along coastlines and rivers and act as effective traps of sediment, nutrients and pollutants. They control freshwater surface flow, stabilize coastal areas, export detritus and act as refuges for fish fry.

In the Philippines, mangrove forests are composed of 97 species of trees, many of them commercially important. Mangroves have been used for centuries by Filipinos for food, forage for animals, building materials, fuel, folk medicine and various other purposes. In fact, Manila, the Philippine capital, was originally named *Maynilad* (meaning ‘there is *nilad*’) after a mangrove species known locally as *nilad* and found extensively in the Pasig River delta.

Mangrove forests in the Philippines covered about 450,000 hectares at the beginning of the century. This area has shrunk to about 150,000 hectares, and abundant growth can now only be found in Palawan and some areas of southern Mindanao. The rate of loss has slowed, but mangrove forests are under continued threat from the expansion of areas used for fishponds, housing and industry, and the harvesting of wood for charcoal, cooking and construction. If we do not act to stop these threats, all mangrove forests in the Philippines could be gone in less than 40 years.

What can you do to help?

Scientists can:

- advise on appropriate management techniques for mangrove forests
- evaluate human impacts on mangroves
- help in training and public awareness programs

Governments can:

- identify issues related to the use of coastal resources, particularly mangroves
- adopt and implement policies that are consistent with sound coastal management





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- encourage local people's organizations to apply for Community-Based Forest Management Agreements (CBFMA) and other tenurial instruments that allow local people to manage the resource
- support local people applying for CBFMAs
- protect existing mangrove reserves

Conservation organizations, aquariums, museums and schools can:

- establish and support mangrove forest conservation projects
- set up mangrove forest awareness campaigns and mount exhibits on the importance of mangrove forests to the coastal waters
- develop and integrate information on mangroves in school curricula
- produce and distribute slide shows, brochures, video and other educational materials
- raise funds to protect and manage local mangrove forests
- encourage tourism in selected mangrove areas
- develop and advocate sound management policies for mangrove conservation
- support local management of mangroves through CBFMAs and other instruments

The tourism industry and local industrial operations can:

- ensure that their operations do not discharge sewage, sediment or other pollutants to mangroves
- offer to take part in and support public awareness programs
- support local people applying for CBFMAs

Local communities and you as individuals can:

- support the application for CBFMAs
- organize groups to apply for CBFMAs
- raise the issue of mangrove management with your local government units (LGUs)
- ask LGUs to provide funding for the protection and management of mangroves

FACTS AND FIGURES

- Mangrove forests are important to many marine species that rely on them for shelter and food.
- Fisheries associated with mangrove forests, much of it collected by the poorest of the poor, contribute some 0.67 tons per hectare per year to total fisheries.
- A hectare of *nipa* can yield as much as P30,000 per year in shingles.
- The Philippines has a total of 97 mangrove species; the major species are *bakawan*, *bungalon*, *apiapi*, *pototan* and *nipa*.





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- The Philippines' mangrove area has shrunk from 450,000 hectares at the beginning of the century to less than 150,000 hectares today primarily as a result of fishpond development.
- In 1988, as much as 118,000 cubic meters of firewood was harvested from mangrove forests in the Philippines.
- Palawan, with approximately 40,000 hectares of mangrove forests, has the largest remaining mangrove area in the Philippines.
- The Community-Based Forest Management Agreement (CBFMA) is an effective method of giving local people control over large tracts of mangrove forests. CBFMAs allow people's organizations to use the mangrove resources in sustainable ways, including taking fish and shellfish, harvesting *nipa*, tourism and a variety of other activities.
- Banacon Island in Bohol may be the largest community-based mangrove plantation in the country. The plantation was started in the late 1950s and is now more than 400 hectares in area.
- Mangrove forests are of interest to tourists in the Philippines. One site at Bais Bay in Negros Oriental has set up a boardwalk so visitors can explore the forest without getting muddy or wet!





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60% of the Philippines' total mangrove area has been lost to fishpond and industrial developments, cutting for firewood and charcoal production. Should such loss continue, already declining fisheries will suffer more losses, and related habitats, such as coral reefs and seagrass beds, will be further threatened.





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Lost Reefs

*These jewels of the sea are being damaged
at an accelerating rate
If this decline continues, there could be a
significant loss of the world's reefs and their resources
during the next century.*

Why care about reefs?

Coral reefs are among nature's most spectacular and beautiful creations. They are home to a dazzling array of marine life consisting of nearly a million species. Up to 3,000 species may co-exist on a single reef, where the density of fishes can be 100 times greater than the ocean average. Many reefs dwarf our most architecturally ambitious structures — they can grow to tens of meters high and as long as 2,000 kms. These “rainforests of the sea” rank as one of the most complex and diverse ecosystems in the world.

Coral reefs are found in over 100 countries of the tropical seas. For thousands of years coastal communities have relied on reefs for a host of products. Today, people continue to depend on reefs for:

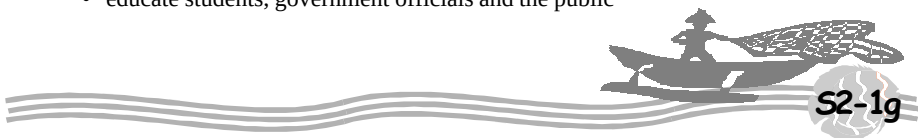
- an essential protein source
- lobsters and fish for the restaurant
- trade and export market
- souvenirs and ornamental products
- building materials
- tourism
- diving and snorkelling
- a potential source of medicines
- shoreline protection against storms

Unfortunately the future of coral reefs is in jeopardy. Unlike the easily observed rainforest destruction, however, damage to reefs, because it is largely hidden beneath the sea, is difficult to monitor. Natural events, such as storms and predator infestations, have some impact, but human activities, even those carried out far away from reefs, may have even more serious consequences. Some of the biggest threats are over-fishing and destructive fishing methods; coastal development, logging and agriculture; sewage, fertilizer run-off and other forms of pollution; and poorly managed boating, diving and other recreational activities.

What can you do to help?

Scientists can:

- assess reef health and changes in condition
- evaluate human impacts and study reef recovery
- educate students, government officials and the public





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- help with training courses and public awareness programs
- advise on reef management

Governments can:

- identify issues related to the use of coastal resources
- adopt and implement policies and development programs consistent with sound coastal management
- enact and enforce laws promoting proper and sustainable use and management of reefs
- provide training for local government staff in the protection and management of reefs
- allocate funding for reef conservation projects

Conservation organisations, aquariums, museums and schools can:

- establish and support reef conservation projects
- set up reef awareness campaigns and mount exhibits on reef conservation
- develop courses and school curricula
- produce and distribute slide shows, video tapes, brochures and other educational materials
- raise funds for the protection and management of reefs
- develop and advocate sound policies for reef conservation

Hotels, airline companies, dive operators and the tourism industry can:

- ensure that their operations do not damage reefs
- take care not to pollute reefs with sewage and sediment from construction
- organize reef etiquette and conservation courses for dive operators, divers and tourists
- offer and take part in education and public awareness programs
- sponsor and donate a share of profits to reef management and education activities
- participate in reef management programmes and marine park activities

Local communities, holiday makers, divers, and you as individuals, can:

- participate in programs to survey and monitor reefs and their uses
- participate in or support reef management programs, such as marine parks
- practice good reef etiquette while diving, snorkeling and boating
- contribute to or organize fund-raising activities
- help to promote awareness of the importance of reefs

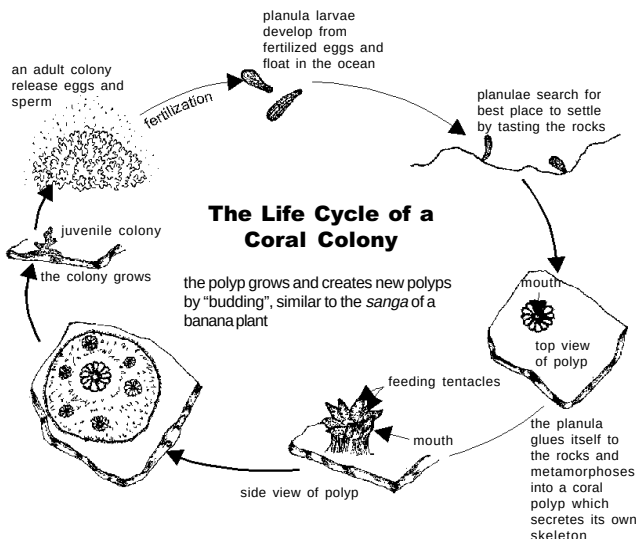
FACTS AND FIGURES

- The Philippines is estimated to have 27,000 km² of coral reefs. In 1991 about 70 percent of these reefs were considered to be in poor or fair condition, and only 5 percent were in excellent condition



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- Good to excellent coral reefs can produce 20 tons or more of fish and other edible products per km² per year; once destroyed, they produce less than 4 tons per km² per year. The sustainable catch from a good reef over 10 years is about 200 tons of fish while that from a destroyed reef is only 72 tons
- Sedimentation, overfishing, and destructive fishing are the three most common factors significantly affecting coral reefs
- The net present value over 25 years (at 10 percent discount rate) of benefits from blast fishing to individuals is only US\$14,600. The loss of tourism potential, on the other hand, can amount to more than US\$400,000, while that of shoreline protection is about US\$190,000. Foregone fishery income can be as much as US\$108,000
- Overfishing of small pelagic and demersal fishes is resulting in loss in catch of more than US\$400 million per year; fishing effort 2 to 3 times that required for optimal effort to produce a “sustainable yield” is the primary cause of this loss
- These large losses will become more obvious as coral reefs become increasingly degraded and we begin to pay to make the reparations required to recover the health and quality of these precious resources. The unfortunate reality is that reparation and recovery operations are extremely expensive, and they may not bring back the original resource lost in its natural and most productive form.



Corals are animals; each colony is composed of thousands of tiny individuals called polyps. The polyps secrete the coral skeleton and are only found on a thin outer layer of the colony. Inside the polyps are many single-celled algae which help the polyp secrete its skeleton. This is why corals need fresh seawater, sunlight, and warm temperatures to grow several centimeters per year, depending on the species. It may take 10-50 years for a coral reef to recover from damage, such as that caused by dynamite. Some reefs do not recover at all.





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10% of the world's reefs have already been seriously degraded and a much greater percentage is threatened, particularly in areas adjacent to human populations. If this decline continues, there could be a significant loss of the world's reefs and their resources during the next century.

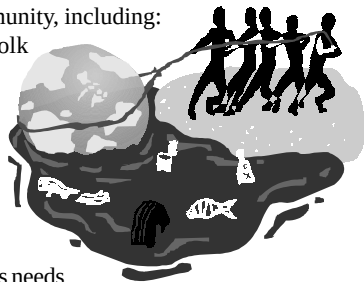


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Promoting Leadership For Sustainable Coastal Resource Management

Promoting sustainable use of coastal resources in the Philippines is a battle that can only be won through strong leadership from within the community. Past experience shows that an essential element of successful coastal resource management is active participation by the entire community, including:

- day-to-day resource users such as fisherfolk
- local government
- national government
- non-governmental organizations
- academe
- private sector
- other stakeholders



Like any cooperative undertaking, the CRM process needs strong leaders, leaders who must necessarily come from within the coastal communities themselves. CRMP addresses this need through its Coastal Resource Leadership Challenge (CRLC) training component, which seeks to identify, cultivate and promote leaders for the implementation of current and future CRM programs. This component includes training modules designed to help participants define shared goals and vision, and to motivate them to lead others in working towards these goals and vision.

The CRLC focuses on five fundamental leadership practices:

1. **Challenge the process.** Search for answers to the open access problem, stop environmentally destructive practices.
2. **Inspire a shared vision.** Enlist all stakeholders to share a common vision of sustainable use of coastal resources.
3. **Enable others to act.** Foster collaboration in planning and implementing coastal resource management.
4. **Model the way.** Set an example by taking action in coastal resource management.
5. **Encourage the heart.** Recognize the hard work of others and spread successes to other coastal communities.

Adapted from Kouzes and Posner 1995





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I LOVE THE OCEAN

A Movement for Sustainable Seas

You appreciate the beauty and wonders of the sea. You realize its importance in our lives. You see mangroves being clear-cut, coral reefs being blasted, seagrass beds destroyed under the onslaught of silt, dynamite, cyanide and trawlers. It worries you. You care and want to do something. But what can one person do in the face of such a big, widespread problem?

Take heart: You are not alone. Thousands of other people care as much as you do and want to help. Many of them are now part of what we call "I Love the Ocean," a movement that grew out of the desire of individuals like you to contribute to efforts to reverse the decline of our precious ocean resources.

The "I Love the Ocean" movement is an organized action to bring back the sustainability of our seas. It provides organizations (public as well as private) and ordinary folk alike the opportunity to individually express their concern about ocean issues and collectively do something to help save our seas. "I Love the Ocean" involves a membership campaign and public education and community mobilization activities designed to increase public awareness of coastal management issues, instill in Filipinos pride in our country's natural resources and in ongoing efforts to protect these resources, and move them to action in support of the ocean's cause.

JOIN US!

I ♥ the Ocean
MOVEMENT

"an organized action for sustainable seas"

**HELP US MAKE IT
HAPPEN.**

The movement's symbol is the blue heart. It is our way of celebrating our country's rich maritime heritage, a sign expressing our fellowship with everyone who loves the sea. It is also a call to action, one that says, "Our seas and coastal areas need your help!"

Like a true movement, "I Love the Ocean" is managed and will be sustained by its members. During the 1998 International Year of the Ocean, the movement's launching year, activities will be spearheaded by the Coastal Resource Management Project (CRMP), a technical assistance project implemented by the Department of Environment and Natural Resources and supported by the United States Agency for International Development.

Join us! Together we can make a difference.



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National Protected Seascapes and Parks

What are protected seascapes and parks?

Protected seascapes and parks are coastal and marine areas set aside by reason of their unique physical and biological significance, managed to enhance biological diversity, and protected against destructive human exploitation. (*National Integrated Protected Areas System Act of 1992*)

What does it take to have a site declared a protected seascapes?

The following major steps must be undertaken before a site can be declared a protected area under NIPAS: occupants survey, ethnographic study, resource profiling, land use planning, and other background studies. These five major steps include the following activities: compilation of maps and technical description of protected areas, initial screening, public notification, initial consultation, census and registration of protected area occupants, resources profiling, preparation of initial protected area plan, public hearing, regional review recommendation, national review, presidential proclamation, congressional action, and boundary delineation.

The Department of Environment and Natural Resources (DENR) has the responsibility for conducting studies to determine the suitability or non-suitability of an area for inclusion in NIPAS. Upon recommendation of DENR, Congress will, by legislative action, declare an area protected under NIPAS, or remove its status as a protected area as the case may be.

Who is responsible for the operation of NIPAS?

The DENR through its Secretary is given the authority to control and administer the entire operation of NIPAS. Every region must form a Protected Areas and Wildlife Division (PAWD) under the direct supervision of the Regional Technical Director. The PAWD's main function is to manage a protected area. Decision-making regarding on-site protected area management is the responsibility of the Protected Area Management Board (PAMB), which is composed of the Regional Executive Director as chairman, and representatives from the autonomous regional government, municipal government, barangay covering the protected area, the indigenous cultural communities, other government units involved in protected area management, and NGOs or local government organizations. To oversee operations in the protected area, the Board will have an Executive Committee composed of the Regional Technical Director and six of its members representing the local government, concerned NGOs and indigenous cultural communities.

The law stresses local participation, stating, "Local communities shall be heavily involved in policy formulation, planning and management."

Why are protected seascapes important?

Protected seascapes serve as replenishment areas for fish and other marine animals, allowing them to breed and reproduce, and renew their species. These areas include zones that are off-limits to fishing and other methods of extraction of resources, so



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marine life, left undisturbed, is able to attain its full growth potential. There are different types of marine protected areas. Among these, those covering coral reefs are becoming more common, not surprising considering the extensive coral reef area of the Philippines. Studies have shown that, if 25 percent of a coral reef area is protected and the rest harvested only using non-destructive methods, the coral reefs will remain healthy and productive for a long time, if not forever. This makes marine protected areas natural candidates for ecotourism development.

The Philippines has a total of 12 protected seascapes and parks covering more than 1,000,000 hectares. Some marine areas carry special regional and global status, among them, Tubbataha Reef National Marine Park (World Heritage Site), Olango Island Wildlife Sanctuary (Wetland of Significant Importance as Waterfowl Habitat, a Ramsar Site), and Turtle Islands Heritage Protected Area (World's First Transfrontier Protected Area for Sea Turtles).

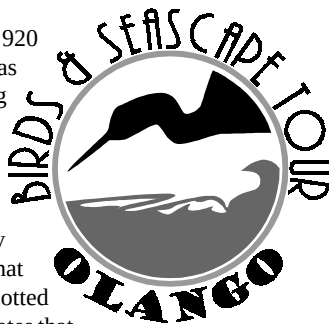
Take the East Asian Migratory Flyway to Olango Island Wildlife Sanctuary

Location: The Olango Wildlife Sanctuary lies on the southern shore of Olango Island six miles off the east coast of Mactan, Cebu. It was declared a protected area on May 14, 1992 by virtue of a proclamation of President Corazon Aquino.

Unique features: Sandflats and mudflats covering 920 hectares, mangroves and seagrass beds that serve as refueling station and wintering ground for birds using the East Asian Migratory Flyway. Twice a year, from August to November when the birds stop over on their flight from Siberia's harsh winter and from February to May on their journey home, Olango is a birders' paradise. Nearly 50 migratory bird species, more than half of the 77 bird species that use the East Asian Migratory Flyway, have been spotted here, feeding on the numerous varieties of invertebrates that thrive in the area, or roosting in the lush mangroves. These include terns, plovers, sandpipers, the endangered Asian Dowitcher (*Limnodromus semipalmatus*) and egrets, including the endangered Chinese Egret (*Egretta eulophotes*). Olango is a Ramsar Site (Wetland of International Importance Especially as Waterfowl Habitat), an important leg of the East Asian Migratory Flyway, by all accounts one of the most important shorebird and waterfowl flyways in the world.

Like most wetlands, the Olango Wetland is a nursery and breeding ground of commercially important fishes. Shrimp and fish fry abound in the area, providing a productive and renewable resource for fisheries around Olango island.

Best time to visit: High tide is the best time to go to the island. A stay of at least three hours is recommended – this will give you enough time to observe different species of birds. The best months are September-November (peak months of the





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southern migration) and February-April (peak months of the northern migration). If you wish to see the birds foraging on the intertidal flats, catch the low tide. If you wish to view the birds roosting in large concentration, be there just before a 1.2-1.4 m tide. At higher tide levels, the birds roost in the mangroves.

Environmental issues: The sanctuary itself is managed and protected well but, around Olango, illegal and destructive fishing is common. Many residents of Olango depend on the gathering and sale of aquarium fish as a main source of income. The use of cyanide and dynamite still occurs around the island. The government and various NGOs are working with the community to address these issues.

A Tour With A Cause

One of the best ways to get to the sanctuary is via a route that takes you around the pleasant seascape of the southern islets of Olango, through a “Mangrove Tunnel,” and deep into the territory of Olango’s winged visitors. This route is open to those taking the Olango Birds and Seascape Tour, a special group tour (6-10 people) conceived by the Coastal Resource Management Project as a way to develop the ecotourism potential of Olango and encourage residents to give up their destructive fishing practices, which have already severely damaged the area’s coastal resources. Take this route, discover a whole new way of appreciating nature, and do a good turn for the environment besides.

The tour starts at either the Shangri-La Mactan Island Dock Area or Maribago, where a boat awaits you and your party (if you’re lucky, with a ukulele-playing boatman on board). From here, it takes you across the Hilutungan Channel to the southern side of Olango, where the boat will circle five charming islets (Sulpa, Hilutungan, Nalusuan, Cauhagan, and Pangan-an) before docking at Sabang at the northeastern side of the Olango Island Wildlife Sanctuary.

See the clam gatherers of Sulpa. Watch Hilutungan’s “sea farmers” maneuver their boats as they tend to their seaweed gardens. Listen closely as your guide tells you about Olango’s “dark side”: cyanide fishing, dynamite fishing and a host of other environmental issues simmering beneath the island’s serene, minimalist surroundings. Meet the young boat paddlers of Sabang and see the glimmer of hope in their eyes; these young people, along with the womenfolk in the community, are working together to protect the sea and help care for the bird sanctuary, spread environmental awareness, and start sustainable livelihood alternatives for fishers and shell gatherers. Then bask in the soothing quiet of the Mangrove Tunnel. This is one place where you can actually hear the sound of silence, where even your own voice seems overly loud.

And the birds? They’re everywhere – feeding and napping at the tidal flats, or roosting in the lush mangrove. Even if you don’t see them, you can hear them, cheery chirps and whistles that tell you they’re somewhere nearby, and remind you that you are, indeed, in the bosom of a birds’ haven.





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Bernard Hill, a tour manager from Australia, has only one thing to say about the experience: "Of all the tours I've joined in Cebu, this is the best one yet!" – *The community of Sabang runs about three tours a week during the birdwatching seasons (late August to November and February to May). Introductory rates are P1,500 per person for Philippine residents and \$50 per person for foreign visitors; rates include meals and transport costs for the entire leg of the tour between Maribago or Shangri-La and Olango. The tour requires a minimum of 6 and a maximum of 10 participants. The itinerary described above may change depending on the tide level. Night camps can also be arranged. Proceeds from the tours go to a special fund for the protection of the Olango Island Wildlife Sanctuary and the development of livelihood alternatives for the community of Sabang. For details, contact: Coastal Resource Management Project, 5/F CIFIC Towers, North Reclamation Area, cor. Humabon and J. Luna Sts, North Reclamation Area, Cebu City 6000, Philippines. Tel. (63 32) 232 1821 to 22; Fax (63 32) 232 1825. E-mail: prccebu@usc.edu.ph. (This article also appears in the July 1998 issue of Sun*Star Horizons).*

A World Heritage Site: Tubbataha Reef National Marine Park

Location: Tubbataha Reefs consists of two coral atolls located right in the center of the Sulu Sea, about 150 km southeast of Puerto Princesa City in Palawan. The pair of atolls are separated by an 8-km wide channel and stretches over an area 33,200 hectares within the jurisdiction of Cagayancillo, an island municipality 80 km northwest of the reefs. The larger north reef is about 16 km long and 4.5 km wide, while the south reef is about 5 km long and 3 km wide.

Unique features: The name Tubbataha comes from two Samal words and means a long reef exposed at low tide. It is the largest coral reef and the first national marine park in the Philippines. It is also the first natural World Heritage Site in the country.

The reefs harbor a diversity of marine life equal to or greater than any such area in the world. In one survey alone, 46 coral genera and more than 300 coral species, and at least 40 families and 379 species of fish were recorded. Large marine life such as manta rays, sea turtles, sharks, tuna, dolphins and jackfish are often seen on or near the reefs.

Environmental Issues. Despite their remoteness, the Tubbataha Reefs and their amazing underwater gardens and diverse wildlife are not free from intrusion and destruction. In early 1989, a seaweed farm was set up on Bird Islet and used the surrounding reef flats as production areas. This illegal farming activity was removed in 1991 through the joint effort of the Department of Environment and Natural Resources, the province of Palawan, the Philippine Coast Guard and Tubbataha Foundation. Illegal fishing using dynamite, sodium cyanide and other destructive methods were rampant in the 1980's but are now being brought under control by

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the active presence of the Philippine Navy in the Park. Anchor damage, inadvertent coral breakage by careless and inexperienced divers, collection of marine life and sports fishing have also contributed to the deterioration of these jewels in the Sulu Sea but are being addressed by management.

A Valuable Resource. If managed sustainably with complete maintenance of the reef habitat, Tubbataha Reefs can provide very significant ecological, economic and heritage benefits for our country. These benefits include:

- Planktonic larvae from spawning fish and invertebrate animals are very prolific in Tubbataha and serve as a primary source of recruitment for coral reefs surrounding the Sulu Sea. These larvae supply many times more fish life outside of the Marine Park to other Sulu Sea coral reefs than marine life that resides on the Tubbataha Reefs.
- Kept healthy and diverse, Tubbataha can contribute 20-35 tons of fish and other marine products per sq km per year.
- Tourism in Tubbataha is increasing yearly and contributes to the local and national economy.
- The biodiversity represented in Tubbataha compares favorably with the richest and most abundant marine areas in the tropical world. The preservation of this biodiversity contributes immensely to the long-term maintenance of the marine species and their genetic diversity in this part of the world.
- As a World Heritage Site, the Tubbataha Reefs are valued by people everywhere who know that they exist and are being maintained for the enjoyment of present and future generations.

Conservation efforts. The Tubbataha Reefs and surrounding waters, an area covering 33,200 hectares, were declared a National Marine Park by virtue of Proclamation No. 306 issued on August 1, 1988. On December 11, 1993, the United Nations Educational, Scientific and Cultural Organization (UNESCO) designated the reefs as a World Heritage Site.

On July 20, 1995, President Fidel V. Ramos issued a memorandum circular creating the Task Force for the Tubbataha Reef National Marine Park composed of representatives from different sectors. The group has developed an action plan to reverse environmental degradation in Tubbataha and started sustained patrol operations.

How You Can Help: Only non-exploitative activities are permitted in the park. All park visitors and boat crews are requested to help in the conservation of Tubbataha by observing the following rules:

- Enjoy viewing the colorful reefs, but do not touch them or stand on them as this can damage the fragile ecosystem.
- Do not land on the park's two islets to avoid disturbing the birds.
- Do not harm or collect fish, coral or any other inhabitant of the reef (whether alive or dead)





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- Prevent any kind of vandalism which can harm the plants and animals in the park or deface park structures, signs or mooring buoys.
- Do not dispose of any material either in the sea or on land as it can suffocate corals, harm wildlife and pollute the water.
- Encourage friends and family to support all practical conservation measures and discourage activities such as spear fishing.
- Take only memories and photographs from the park.
- Make donations for park conservation through the representative of the Dive Operators of the Philippines on board your dive boat.

For more information about the Tubbataha Reefs, please contact the Provincial Environment and Natural Resources Office, DENR (Protected Areas and Wildlife Sector), Sta. Monica, Puerto Princesa City, Palawan; Tel. (63 48) 433 5638; 433 5639. Or the Office of Palawan Council for Sustainable Development, 3/F Capitol Bldg, Puerto Princesa City, Palawan; Tel. (63 48) 433 2698. (Reprinted from "Tubbataha Reef National Marine Park," published by the Department of Environment and Natural Resources)

Turtle Islands: The First Transfrontier Protected Area For Sea Turtles

Location: The Turtle Islands group of the Philippines and Sabah, Malaysia is located at the southwestern tip of the Philippines, about 1,000 km southwest of Manila and some 40 km north of Sandakan, Sabah, Malaysia in the Sulu Sea. It is composed of nine islands, six belonging to the Philippines and the rest to Malaysia. These islands lie adjacent to the international treaty limits that separate Malaysia from the Philippines.

The islands that comprise the Philippine Turtle Islands are Boaan, Langaan, Lihiman, Great Bakkungan, Taganak and Baguan. Baguan Island is the only currently managed turtle sanctuary in the Philippines.

The Sabah Turtle Islands Park is composed of P. Selingaan, P. Bakkungan Kechil and P. Gulisaan. The Sabah Turtle Islands Park was gazetted on October 1, 1977.

Unique features: Although the nine islands were split into two by the Philippine-Malaysia Treaty Limits, data on tag recoveries by both the Marine Turtle Conservation Project (Philippines) and the Sabah National Parks (Malaysia) indicate that this group of islands is a single, well-defined rookery of green turtles. In order to properly manage and conserve the area, the governments of the Philippines and Malaysia recently forged a bilateral agreement establishing the Turtle Islands Heritage Protected Area (TIHPA), considered as the first transfrontier protected area for marine turtles in the world.

The Turtle Islands is also a natural laboratory where marine turtle scientists can conduct scientific researches on most aspects of the biology and ecology of Green sea turtles year-round. This nesting ground can be an important source of scientific information for updating conservation and management policies for marine



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turtles.

The Philippine-Sabah Turtle Islands and Berau, Indonesia support the only major (more than 1,000 nesters annually) Green sea turtle (*Chelonia mydas*) breeding aggregations in the world. Of the 14 million eggs produced from 1984 to 1992 in eight islands, 72 percent were contributed by the Philippine Turtle Islands, while 28% were laid on the Sabah nesting islands. It is estimated that up to 5,400 nesters lay their eggs every year on these islands. Green sea turtles migrate to feeding grounds throughout the ASEAN region and then migrate back to breed in the Turtle Islands.

Aside from the marine turtles, the area supports a diverse population of diverse marine fauna (corals and fishes) as well as several species of birds. Of all the marine areas surveyed under the Integrated Protected Area System Project, the Turtle Islands exhibited the highest diversity of marine communities.

Environmental Issues. All species of marine turtles found in the ASEAN region are classified endangered. Every year, tens of thousands of Green sea turtles are harvested for food and to supply the stuffing trade particularly in the Philippines and Indonesia. Also, eggs are being harvested *en masse* in the Turtle Islands. As a result, egg production of the Green sea turtle population of the Islands declined by 88 percent over a period of 39 years from 1951 to 1991. Massive long-term harvest of eggs has been identified as one of the major causes of local extinction. Sea turtles exhibit site fixity, that is, they return to the beach where they were born. If the eggs continue to be mass-harvested, the loss of the turtle population in Turtle Islands could become permanent since a particular population could not be replenished by any other population, even of the same species. Within a decade, unless the decline in population is reversed, the annual turtle egg production will become inadequate to feed even the local inhabitants. To ensure future recovery of the population, the turtles' nesting beaches must be managed principally to maximize hatchling production. There is also an urgent need to implement a unified approach in the management of turtles in the area.

The rampant use of illegal forms of fishing such as cyanide and dynamite has caused a decline in fish catch. These highly destructive activities threaten the resource base on which majority of Turtle Islands residents depend for sustenance and employment.

Conservation efforts. Since 1988, the World Wildlife Fund has been supporting the conservation efforts undertaken by the Pawikan Conservation Project (PCP) in the Turtle Islands. Recently the Kabang Kalikasan ng Pilipinas or KKP (WWF-Philippines) and the Department of Environment and Natural Resources agreed to jointly undertake the Turtle Islands Integrated Conservation and Development project. The project's major components include:

1. Ornamental and live food fish collection as a conservation strategy in the Turtle Islands – This project is a strategy to lessen if not eliminate the



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destruction of reef communities from the use of cyanide and dynamite fishing. The project is organizing fishing communities and training them in non-destructive fishing techniques. It aims to organize the fishing communities into cooperatives and help them identify alternative sources of livelihood.

2. Ecological and environmental studies in Baguan Island Marine Turtle Sanctuary – KKP, in collaboration with PCP, is studying the Baguan Island Marine Turtle Sanctuary, considered the most significant turtle nesting site in TIHPA. The outputs of this project will serve as inputs to the Joint TIHPA Management Plan.
3. Information and education campaigns for the communities in Turtle Islands

How you can help:

- Do not kill sea turtles or harm them in any way.
- Do not use cyanide, dynamite or any other destructive fishing methods.
- Do not take eggs from the turtles' nest.
- Do not eat turtle eggs.
- Do not throw garbage into the sea.
- Do not sell or buy sea turtles (dead or live), turtle eggs or turtle meat, or products made from turtle shell.
- Report to authorities harvesting of turtle eggs or any other illegal activities related to the sea turtles.
- If you chance upon a turtle with a metal tag attached to one of its flippers (those flat legs), take down the following information: a) the number carved on the metal tag, b) the turtle species, c) the date and place where you spotted the turtle. *Do not remove the tag.* This may be from the Pawikan Conservation Project (PCP) or from another country. Report your find to the PCP or to the nearest DENR office.
- If you see a sea turtle *without* a metal tag, inform the DENR or PCP office nearest you so the turtle can be tagged.

For more information on the Turtle Islands Heritage Protected Area and how you can help, contact: Kabang Kalikasan ng Pilipinas, WWF-Philippines, 23-A Maalindog St, UP Village, Dilliman, Quezon City 1101, Philippines. Tel. (63 32) 433 3220 to 22; Fax (63 32) 426 3927; E-mail: kkp@mozcom.com. (Most of the material in this section comes from The Turtle Island Heritage Protected Area, a publication of KKP)

The Long Journey Home



Sea turtles show site fixity, that is, they return to the beach where they were born. Green sea turtles migrate 2,000 kilometers across the Atlantic to lay eggs on Ascension Island. Though awkward on land, they move gracefully in the water, gaining speeds of up to 32 kilometers per hour. The females lays her eggs on the beach, buried in the sand. When the temperature is cool, more males are born; at hotter temperatures, there are more females.

Hatchlings rush down the shore to the sea.





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Dugongs Forever!

Sirenian. The dugong or sea cow (*Dugong dugon*) is a sea vertebrate belonging to a group of animals known as Sirenians because in the olden days, sailors who saw the animals mistook them for mermaids or “sirena.”

Sirenians have evolved from four-legged hooved animals of the early Eocene Epoch, some 53 million years ago. Elephants also evolved from these herbivorous stem animals, making them the closest living relatives of the Dugongs.

Mammal. The Dugong is not a fish; it is a mammal like the whales and dolphins and so must surface from the water in order to breathe. They bear their young and feed them with their milk.

The Dugong is the only remaining survivor of the Family *Dugongidae*. Its nearest relative, the Steller’s sea cow, was discovered in the Bering Sea in 1741 but became extinct less than 30 years after its discovery because of large-scale hunting. Today, the Dugong is the only living sea mammal in the world that lives on seagrass.

Physical features. The Dugong has a massive torpedo-shaped body with a short and indistinct neck. Its flippers are short and its tail similar to that of the whales. Its eyes are small and round. Under water, it looks very much like a masked diver.

The hairs around the Dugong’s snout are well-developed and extremely sensitive to stimuli. Its upper lip is shaped like a horseshoe. Dugongs have teeth, which include a pair of tusks in adult males. But they do not bite and in no way pose any danger to humans.

The young Dugong is about a meter long and weighs 20-35 kg. Its skin is brown, while adults have grayish-bronze hide. The Dugong can grow up to 3 meters long and weigh 400 kg. The skin of the adult is tough and often heavily scarred and sometimes overgrown with barnacles. The bones are very dense, which help them stay at the seabed to feed on seagrass.

Feeding habits. Dugongs are grazers. They spend most of their time feeding, consuming up to 25 kg of seagrass a day. They eat almost the entire plant, including the roots, thus they leave feeding trenches wherever they graze. Because of their odd appearance and feeding habits, these marine mammals are sometimes referred to as sea cows or sea pigs.

Swimming movement. Dugongs swim at a cruising speed of about 5 km per hour. Their slow pace and bulk make them very easy targets of fishers in motorized bancas who hunt them with nets, spears or dynamite.



Whale Acrobats

The humpback whale weighs more than 60 tons, but can burst into the air and do a backward somersault. Some whales can also “spy-hop”, that is, position themselves vertically with their head out of the water.



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These endangered animals are more active during the day. They ride the rising tide and prefer feeding when the water is high. Movements are influenced by temperature changes, monsoon, abundance of seagrass, and man-made disturbances.

Population growth. Dugong births peak when there is an abundance of seagrass. Adults become sexually mature when they are at least nine years old and females can give birth only once every 3-7 years. A single calf is born 13 months after mating. Population growth is so slow that even without exploitation, in ideal conditions, it can reach only as much as 5 percent per year.

The young and its mother produce bird-like chirps believed to be associated with mother and calf bonding. For 18 months, the young feeds on seagrass and suckle milk from its mother.

Dugong habitat. Dugongs can be found in warm tropical and subtropical seas that are sheltered from strong winds and waves, and with lush growths of seagrass. Dense concentrations of these marine mammals can be found in the coastal waters of Australia, Papua New Guinea and Indonesia. In the Philippines, however, a herd of Dugongs has become an extremely rare sight.



Champion Swimmers

Common dolphins are among the fastest swimmers in the ocean, capable of reaching speeds of up to 40 km per hour.



Causes of population decline. Intentional and incidental catches cause the greatest harm to the small dugong population. Dugongs are hunted mainly for their meat, which is said to taste like veal. The skin, hair, entrails, sex organ and bones are also used as aphrodisiacs and various medicines, though there is no scientific basis for these uses.

These defenseless animals are captured with fish nets, dynamite and spears. When caught in nets, they often die from stress and suffocation before the banca reaches land. A good number of these sea mammals accidentally enter fish corrals and end up being mercilessly butchered. Others are stranded in the beach during low tide and die of exposure and dehydration.

Dugongs cannot thrive without seagrass. Siltation from excessive logging has resulted in the destruction of large seagrass areas in the Philippines, contributing further to the decline in Dugong population. Similarly, land development and industrialization often cause destruction of seagrass beds and pollution of the Dugongs' habitat.

Endangered species. The Dugong has been in the International Union for Conservation of Nature list of species vulnerable to extinction. In the Philippines, the Department of Environment and Natural Resources issued in 1991 Administrative Order No. 55, which prohibits the killing, selling, collecting, trading and possession of Dugongs except for scientific research purposes, making the Dugong the first marine mammal protected under Philippine law.

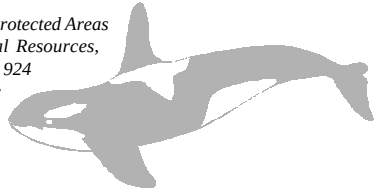




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Present conservation efforts. Studies on the Dugong and attempts to arrest the decline of its population are being undertaken by the Pawikan Conservation Project with support from concerned organizations, including the Kabang Kalikasan ng Pilipinas (WWF-Philippines), Toba Aquarium-Japan, and the Marine Turtle Foundation. Since 1993, 5 out of 8 reported Dugong captures were successfully released in northern Palawan.

For more information, contact: Pawikan Conservation Project, Protected Areas and Wildlife Bureau, Department of Environment and Natural Resources, NAPWNC, Quezon Ave., Quezon City, Philippines. Tel. (63 2) 924 6031 to 35; Fax (63 2) 924 0109. (Extracted from Save the Dugong, a print info material produced by the Pawikan Conservation Project)



Philippine Red List

In addition to the dugong, 18 other marine mammals – that is, whale and dolphin species – are listed in the Philippine Red Data Book. They are: Finless porpoise, Rough-toothed dolphin, Risso's dolphin, Bottlenosed dolphin, Pantropical spotted dolphin, Spinner dolphin, Fraser's dolphin, Pygmy killer whale, Melon-headed whale, Killer whale, Short-finned pilot whale, Blainville's beaked whale, Sperm whale, Pygmy sperm whale, Dwarf sperm whale, Minke whale, Bryde's whale, and Humpback whale. Of these, the Bryde's whale appears to be the most severely affected by fisheries.





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