Regions of remarkable biological productivity and high accessibility- Costal and Marine Ecosystems

Biba Jasmine*

Earth's ecosystems and its peoples are bound together in a grand and complex symbiosis. We depend on ecosystems to sustain us, but the continued health of ecosystems depends, in turn, on our use and care. Ecosystems are the productive engines of the planet, providing us with everything from the water we drink to the food we eat and the fiber we use for clothing, paper, or lumber. Yet, nearly every measure we use to assess the health of ecosystems tells us we are drawing on them more than ever and degrading them, in some cases at an accelerating pace.

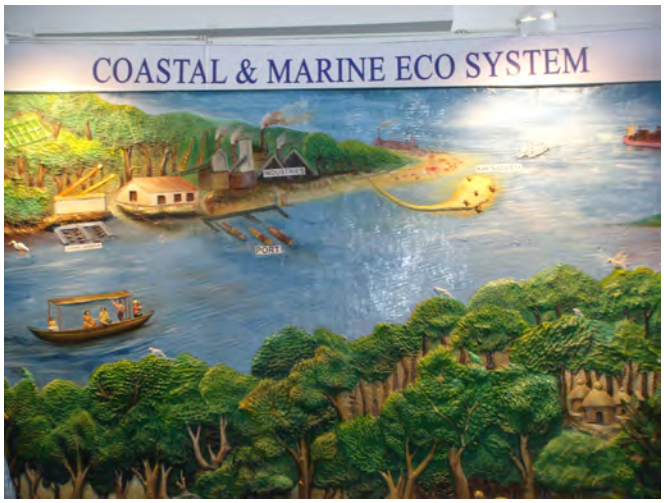
Our knowledge of ecosystems has increased dramatically in recent decades, but it has not kept pace with our ability to alter them. Economic development and human well-being will depend in large part on our ability to manage ecosystems more sustainably. We must learn to evaluate our decisions on land and resource use in terms of how they affect the capacity of ecosystems to sustain life — not only human life, but also the health and productive potential of plants, animals, and natural systems.

Marine Biodiversity

The 193 Parties to the CBD agreed to classify a diverse list of marine areas, some renowned for containing 'hidden treasures' of the plant and animal world, as ecologically or biologically significant.

As Approximately 70 percent of the Earth's surface is covered by water, and most of that is marine. Like all biological systems, the oceans are experiencing an ecologically and evolutionarily unprecedented series of stresses, many of which are changing the structure and organization of marine communities. Because humans rely on the oceans for food, mineral resources, and recreation, and because marine life offers potential future benefits to society, such as in the area of biomedical products, it is critical to develop conservation and management strategies that facilitate the long-term sustained use of the sea by humans while minimizing impacts on nature.

Yet to be determined is the ultimate impact of a growing human population on marine biota—from the smallest plankton to the largest whales, living on the bottom or in suspension, at depths ranging from the highest intertidal shores to the gulf. Just like any natural ecosystem, marine ecosystem needs a fundamental change in the approach by which biodiversity is measured and studied in the ocean by emphasizing integrated regional-scale research strategies within an environmentally relevant and socially responsible framework. The new and recent



Mother nature -Mangrove garden

technological and conceptual advances within the ecological, molecular, and oceanographic sciences make the task a little easier. A major challenge that lies with the scientific community is to find ways to improve prophecy of the effects of the human

***Nehru-Fulbright Scholar, Sustainable Development and Conservation Biology, University of Maryland, College Park, USA. Email: bibajasmine@gmail.com**

population on the diversity of life in the sea, in order to preserve biodiversity and improve conservation and management plans.

Threats to marine biodiversity

Threats to the environment that may not seem to directly affect marine biodiversity can have serious affects as well. For instance, global warming can change marine habitats before organisms have a chance to adapt. Sixty percent of the great coral reef has been bleached white because of increased global temperatures (Glausiusz, Josie). The drastic effect these threats have on marine biodiversity is very frightening. This must be seen as a major problem and changes have to be made in order to preserve marine biodiversity.

The most apparent threat to marine biodiversity is from ***Unsustainable exploitation of natural resources.*** Unregulated fishing is depleting stocks of fish, prawns and other marine species around the world. Not only does this result in the wiping out of fish populations, it results in the loss of jobs. As one species stocks become uneconomic so fishing targets another species and so on, with increasing effort for a lower return; followed by ***Habitat loss***. Increasing pressure on land for development also leads to loss of coastal habitats. Swamps, marshes and mangroves are drained and cleared to provide land for housing, tourism and industrial development. Paradoxically, increasing development changes the living environment making coastal regions less attractive.

The panel in the COP-11 meet for the Costal and marine conservation, highlighted one of major issue that leads to the unsustainable degradation; and that is what they called '***Environmental degradation'***. Human activities affect the environment in many ways from changes to the atmosphere and potentially the climate to directly polluting local habitats. In coastal zones several activities pose threats to the marine biodiversity. Activities related to domestic and industrial waste disposal, waste from aquaculture, exploitation of minerals and accidents related to oil exploration and transportation can reduce local marine biodiversity and alter coastal habitats. Unregulated Tourism also poses pressure on varied marine elements.

Increasing CO_2 levels also affecting marine diversity

In one of the paper titled 'Addressing biodiversity loss in a changing climate: the importance of coastal marine ecosystem-based regulatory policy in the euro-mediterranean, united states, and California by Michael Vincent McGinnis (http://igov.berkeley.edu/sites/default/files/mcginnis.pdf) clearly mentions that how rising CO_2 levels in atmosphere are causing deterioration of the marine ecosystem by adversely affecting the reproduction, metabolism and growth of several species of invertebrates and coastal marine ecosystems. It also explains how climate change will accelerate the existing pressures to biodiversity, such as natural ocean climate, habitat degradation, overexploitation of resources, such as fisheries, and the significant impacts of the introduction of non-native invasive species on coastal marine species. Synergies among extinction drivers under global climate change that reflect the cumulative impacts of the multiple-use of coastal marine resources and anthropogenic climate disturbance, is also well explained in the document.

Mangrove- anchor the edges of the world

Mangroves are found between the latitudes of 32ºN and 38ºS of the globe and also in the mouths of estuaries and in intertidal areas. Approximately 1/4th of the world's tropical coastline comprise mangrove ecosystems which are estimated to extend along an area of between 167,000 and 181,000km^2, in 112 countries. Forty percent of mangroves occur in South and Southeast Asia regions and the single largest area of mangroves in the world lies in Bangladesh, in the Sunderbans, extending over 600,000ha. Mangroves anchor the edges of the world. They make up one of the world's most unique ecosystems because they thrive where no other trees can survive – in the transition zone between the ocean and land. They are also among the world's most productive ecosystems supporting a wide array of living resources that protect the coastal zone, thus helping in improving socio-economic conditions of the coastal communities and protecting the coastal/marine environment. They are also one of the most productive ecosystems, which can efficiently fertilize the sea, potentially protect the coastal zone and vitally serve as a breeding, feeding and nursery ground for fin/shell fish species.

Mangrove forests- the most productive and valuable ecosystems on earth

Mangrove forest ecosystems fulfill a number of important functions and provide a wide range of services at the local and national levels. There is immense economic value of the diverse functions they provide such as shoreline protection, nursery habitats and carbon storage. Around 3.2 billion people occupy a coastal strip of 200 kilometers wide, which represents only 10 per cent of the earth's land surface. According to Giri *et al.* (2010), mangroves globally encompass an area of only 137,760 km^2. Approximately 75 per cent of mangroves are concentrated in just 15 countries and barely 7 per cent of these lie in protected areas.

Mangroves not only provide a broad array of goods and services to the local community but also play an important role in-on-and offshore fishery, providing juvenile fish with nursery habitats and shelter. They

are also a source of timber and fuel wood for the locals. Recreational activities in mangroves are also part of services. Ecotourism is becoming increasingly important and mangroves offer a clear synopsis of the functions and links between marine ecosystems and therefore attract "green-minded" tourists. Alternative uses include apiculture (beekeeping) and aquaculture (fish breeding ponds). Bees use nectar from the mangrove flowers to produce honey while juvenile fish from the mangroves are used for breeding in commercial fish ponds. These benefits show the high dependence of local communities on mangroves for their well-being.

According to the press release on **Mangroves among world's most valuable ecosystems, 2010**

"Mangrove forests are the ultimate illustration of why humans need nature," says Dr. Mark Spalding, lead author of the World Mangrove Atlas. In place after place the book details the extraordinary synergies between people and forests. The trees provide hard, rot-resistant timber and make some of the best charcoal in the world. The waters around mangroves foster some of the greatest productivity of fish and shellfish in any coastal waters. What's more, mangrove forests help prevent erosion and mitigate natural hazards from cyclones to tsunamis – these are natural coastal defenses whose importance will only grow as sea level rise becomes a reality around the world.

CoP-11 at Hyderabad, India also flagged the concerns over the protection of marine biodiversity.

The world's governments not only agreed to increase funding in support of actions to halt the rate of loss of biodiversity at the eleventh meeting of the Conference of the Parties to the United Nations Convention on Biological Diversity, which ended in October but also laid special emphasis on crafting environmentally responsible and socially relevant basic research program on the causes and consequences of changes in marine biological diversity.

In the CoP-11 meet, United Nations Under-Secretary-General and UN Environment Programme Executive Director, Achim Steiner, said, 'It is good to see that the CBD signatories has sent a clear signal in delivering additional commitments underlining the fact that biodiversity and ecosystems are a development priority and central to a transition to an inclusive Green Economy'. He also laid stress on increasing funding to support efforts in developing states towards meeting the Aichi Biodiversity Targets. To meet the Aichi Biodiversity Target of ensuring that 10 per cent of marine areas are protected by 2020, says the UNEP report, an additional 8 million square kilometers of marine and coastal areas would need to be recognized as protected - an area just over the size of Australia.

The insignia of marine biodiversity were quite flagrant at the CoP-11. Two expositions that stole the show were depicting marine and costal biodiversity significance. Marine biodiversity is essential to the survival of all life and the public need to be made aware of this. This was the sole idea of the display. It was open for the general public, school children, college students and likeminded people. Life in the ocean is declining rapidly and we have little time left to halt the process. After looking at the displayed mangrove garden, my attitudes toward marine biodiversity changed drastically; I felt as if a cloud of ignorance had been lifted from me. While writing this article I experienced that very change in myself. Enhance understanding of the fundamental processes responsible for the creation, maintenance, and regulation of marine biodiversity and for changes due to anthropogenic effects, is needed. A little education can do much in changing the views of the nations.

Mother Nature and the Mangrove Garden

The Deutshe Gesellshaft fur Internationale Zusammenarbeit (GIZ), is a non-profit cooperation enterprise for sustainable development and operates in more than 130 countries worldwide. Most of the activities are commissioned by the German Government. Dr. Berthold Seibert, Project Director of GIZ together with GIZ-BCCP Consultant Yvette Co, started to think of creating marine Gigantes. Recognizing the vital role of the youth in the conservation of biodiversity, GIZ and the ASEAN Centre for Biodiversity (ACB) through the Biodiversity and Climate Change Project (BCCP) set up the stage for mangrove garden. The Biodiversity and Climate Change Project by the ASEAN Centre for Biodiversity

Mother Nature-Prepared by Yvette Beatrice Co, Consultant at GIZ

(ACB), aims at strengthening the range of services in the area of biodiversity and its relevance for sustainable development and climate change. It also helps benefit the vulnerable population, who depend on the ecosystem and biodiversity resources for their subsistence.

Mother Nature and the Mangrove Garden was a circular 16-square-meter setup of giant papier-mâché human, marine plant and animal sculptures delicately crafted by a team of artisans from Paete, Laguna, under the helm of BCCP consultant Yvette Co. Its aim was to encourage people to take on the responsibility of conserving what Mother Nature has provided us.

A closer and observant look at the Mother Nature exhibit will help understand the timeline of marine biodiversity from being pristine to its present sad and dreadful conditions. Going around the mangrove forest, seen as a circular timeline, one saw the time when the mangroves were still untouched, where biodiversity abounds with beehives, monkeys, birds, small animals, crustaceans, and a very healthy ocean around. Soon after, the mangrove forest becomes denuded as people over harvest its benefits. There is illegal logging, tan barking, unplanned conversion into mariculture ponds (shrimp ponds), trash, and all other threats being done to this ecosystem. Symbolically, the exhibit showed a Greedy human being, taking away the last mangrove tree, having all the living species in its 'skin pockets'. This shrimp eating man, also symbolized that people create too many shrimp ponds without considering that mangrove forests are the best bet to mitigate climate change, because it's soil traps carbon more than any other resources. The exhibit pie moves on to show the Go4BioDev's message for the future - that the scientists, environmentalists, and everyone concerned about the planet's future, will cooperate with each other in order to live sustainably. Thus Mother nature, looks favorable toward this scene, where both man and nature take care of each other. This sharp and subtle concept was created by Dr. Sheila Vergara (ACB), Dr. Berthold Seibert (GIZ), and designed by Yvette Co.

Go4BioDiv

Another exhibit that highlighted the importance of costal biodiversity conservation was- Go4BioDiv Exhibition. Group of 35 messengers from across the globe, exhibited in their own way, the importance of marine and costal biodiversity. As it is the young people who will have to bear the consequences of our present behavior and lack of commitment - and it is they who are the most enthusiastic about nature conservation. Therefore their concerns and aspirations should play an important role in international decision-making today. They put forth with their peers - in a very creative way – their conservation experiences and shared it with the wider public.

Their presence at the CoP-11 not only conveyed the message of saving, the critical biodiversity underneath, to the policy managers but also helped the general public/visitors understand the existence of the most diverse and distinctive world of marine life. They shared their thoughts, vision and conceptions, in all possible ways to reach the hearts and minds of the world. Their expertise coupled with more than a week long training at the Sundarbans, which is India's iconic and unique marine World Heritage site, provided credible real-life examples to draw on in the elaboration of conceptual guidelines, technical publications and policy frameworks regarding the costal and marine biodiversity protection.

Magnificent coral at Go4biodiv stall

Initiatives needed for saving dwindling marine biodiversity

What we need is a well-defined set of biodiversity research in several different types of regional-scale marine ecosystems. Such studies will permit meaningful comparisons across different habitats of the causes and consequences of changes in biodiversity due to human activities. This outline would require significant advances in taxonomic expertise for identifying marine organisms and documenting their distributions, in knowledge of local

and regional natural patterns of biodiversity, and in understanding of the processes that create and maintain these patterns in space and time. It could also provide long-awaited, much-needed, and exciting opportunities to develop the interface between taxonomy and ecology and between the ecological and oceanographic sciences.

These initiatives into marine diversity conservation would:
• Enhance understanding of the fundamental processes responsible for the creation, maintenance, and regulation of marine biodiversity and for changes due to anthropogenic effects.
• Stimulate the development of new techniques for studying linkages between local (ecological) and regional (oceanographic) processes.
• Dramatically improve knowledge of the magnitude and distribution of the diversity of animals, plants, and microbes in the marine environment.
• Stimulate the field of marine taxonomy and systematics, particularly the incorporation of molecular techniques for species identification and population differentiation.
• Lead to the long-term, sustained use of the oceans and marine organisms for food, mineral resources, biomedical products, recreation, and other aesthetic and economic gains.
• Provide valuable information for policymakers regarding the preservation and conservation of marine life in the face of rapidly expanding threats from human activities.

These initiatives, if embarked on, would solve several rationales:
It would create an environmentally responsible and socially relevant basic research line up on the causes and consequences of changes in marine biological diversity due to effects of human activities; the well-defined research might also help address concurrently related issues in several different regional-scale systems.

Creating partnership between the ecological and oceanographic sciences, both conceptually and methodologically, for explaining biodiversity patterns, processes, and consequences may also be achieved. The ultimate goal of improving predictions regarding future effects of human activities on marine biodiversity, thus facilitating use of the sea for societal needs while minimizing impacts on nature, can also be anticipated.

Thoughts to be taken into account from the forum of CoP-11 and 12, and not forget it as 'just another event'
'Coastal Biodiversity conservation must be a participatory process, with the support of various stakeholders including the general public', rightly pointed by Dr. Balakrishna Pisupati (Chairman) National Biodiversity Authority, India, spoke volumes.

My personal deductions from the discussions held at CoP-11, regarding the conservation and protection of costal and marine biodiversity are; a truly comprehensive and integrated assessment of global ecosystems that goes well beyond our pilot analysis is necessary to meet information needs and to catalyze regional and local assessments. It's high time, representatives from national and international scientific and political bodies begin to explore the merits of, and recommend the structure for, assessment models dealing with marine biodiversity. The forum concluded on a significant notion; that an international scientific assessment of the present and likely future condition of the world's marine ecosystems was both feasible and urgently needed. They urged local, national, and international institutions to support the effort as stakeholders, users, and sources of expertise. If concluded successfully, the discussions at CoP-11 will generate new information, integrate current knowledge, develop methodological tools, and increase public understanding.

However the issue was given due important at Conference of the Parties in Pyeongchang, South Korea, 2014. On the impacts of ocean acidification on marine and coastal biodiversity, the COP, *inter alia*: requested the Secretariat to collaborate with the UN Educational, Scientific and Cultural Organization - Intergovernmental Oceanographic Commission and others, including ILCs, to raise awareness of the key findings on the impacts of ocean acidification on marine biodiversity and facilitate the incorporation of these findings into relevant national strategies and action plans concerning conservation and sustainable use of marine and coastal biodiversity, as well as develop research and monitoring programmes at global, regional and national levels.

The challenge for the 21st century is to understand the vulnerabilities and resilience of ecosystems, so that we can find ways to reconcile the demands of human development with the tolerances of nature. However in the United Nations Conference on Sustainable Development, in Rio de Janeiro, the urgent need to convert desires into actions was pointed out; if the needs of a booming global population are to be met. The managers also expressed their concerns to urgency of decisive and defining action now rather than in a few years.