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MARINE POLLUTION: A NEW CHALLENGE FOR SAVING PLANET EARTH

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Global marine pollution is posing serious threat to wide diversity of marine life. One of the foremost concern has been the impact of global warming and climate change that has direct impact on the sea level rise threatening the virtual existence of many island nations in the Pacific, Atlantic and the Indian oceans like Solomon Islands, Marshall Islands, Fuji, Vanuatu, Madagascar, Seychelles, Maldives, Sri Lanka, Guam to mention only a handful names. Several low lying areas around coastal zones with heavy human settlements like parts of coastal Bangladesh, India, Indonesia, Thailand, the Philippines etc are particularly vulnerable to sea level changes that could result in unprecedented human saga if tragedy strikes.

The frequency and density of traffic movement across major global seas and oceans are also particularly worrisome. With increase of marine trade and commerce around the globe ocean liners carrying huge volumes of crude oil and other export and import products are running from one port to another to boost global trade. Unfortunate accidents on these high traffic marine corridors have also increased significantly resulting in accidental dumping of crude oil and other toxic chemicals into the oceans disrupting and damaging marine ecosystems and environment drastically with irreparable long term damages pushing many marine vertebrates and invertebrates towards extinction. Oil spills have been one of the most common causes of major marine disasters around the planet.

Furthermore, the geopolitical tensions between major global powers have also increased several folds over the past four decades. As a consequence, increased traffic off naval forces as well as marine security groups has further increased the volume of marine traffic. The fear of insurgents and pirates attacking commercial ocean going vehicles have increased patrolling in all the major ocean's commercial routes increasing the level of pollution in the water through leakage as well as dumping of solid and liquid waste. The increased numbers of ocean cruisers for

tourists to enjoy life in the seas and oceans have been another culprit in destroying sensitive marine ecosystems by over crowding. This has also increased load of toxic chemicals and harmful pathogens in the marine water jeopardizing marine ecosystems.

Another important aspect of marine pollution has been a huge amount of plastics and related plastic products being increasingly found in different marine ecosystems around the globe. They have even moved into complex marine food chains and food webs making marine life vulnerable to serious, long term environmental consequences. No seas and oceans around the globe is free of plastic pollution and the oceanic currents have been carrying plastics from one region to another making situation worse by stimulating pollution in sensitive marine sanctuaries and habitats. Numerous reports of death of unfortunate marine mammals by choking due to accidental consumption of such floating plastic wastes have been heart breaking. Floating plastic wastes have also been known to introduce unwanted pathogens, exotic pests and parasites into sensitive marine ecosystems.

Extensive use of agricultural chemicals in our agricultural fields for securing high crop productivity has also been directly and indirectly impacting the seas and oceans. The excess chemicals used in the agricultural fields are being washed away both by irrigation water as well as rain into a adjoining rivers and streams. This in turn carries them downstream into vast open oceans as a natural geologic process. However, the impact has been dramatic and traces of various toxic agricultural chemicals have been detected in the ocean; that has negatively impacted several sensitive marine ecosystems and marine biodiversity negatively.

With the unprecedented increase in global human population, there is been a high demand for seafood and seafood based products to sustain these populations. As a consequence several married mammals as well as fishes and reptiles are facing challenges to survive. Over exploitation, overharvesting, over capturing and non-judicious use of marine natural resources has placed serious question marks for many vulnerable and endangered marine species and placed critical, negative anthropogenic pressure on marine biodiversity. Marine mammals like whales, dolphins, porpoises, seals, dugongs, manatees,






walruses, polar bears are all being pushed hard for their bare survival. Several species of marine fishes, reptiles (sea turtles), molluscs, echinoderms, coelenterates, platyhelminths, nemathelminths are showing signs of alarming decline.

The death of non target, bystander species while fishing target commercial species have been reported to be abnormally high! Death of marine mammals, birds and sea turtles getting entangled in fishing net is sad and unacceptable. Collision with fishing vehicles has been another important factor killing spectacular marine life and seriously damaging marine biodiversity. The drag nets used indiscriminately around the planet is damaging sea floor and marine ecosystems evolved over millions of years. In several cases, many countries have been pushed to enact laws to prevent over exploitation of specific species to avoid them becoming extinct. The situation has been turning from bad to worse; and if nothing is done now, we may not be able to save many marine vertebrates and invertebrates, marine biodiversity and marine ecosystems in the not so distant future.

Photo credit: **S. K. Basu**

INTEGRATED HABITAT DEVELOPMENT

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Integrated habitat development is a new concept in which ecosystem development is initiated using nature based measures and/or approaches; catering to multiple species from a sustainable, long term environmental perspective. This is an approach where small ecological habitats are being developed on already existing degraded ecosystem by using simple, economically efficient, low maintenance natural methods and/or approaches in developing complex ecosystem that can grow into a natural environment for local pollinator insects, fishes, amphibians, reptiles, terrestrial and aquatic birds, small mammals and local wildlife over a period of time. Such integrated habitat development could be initiated in unused farmlands, hard to access and unused areas of croplands and farming units, agronomically unsuitable areas, marginal or low quality agricultural lands, along the perimeter of agricultural and non-agriculturally suitable lands, orchards, gardens, lawns, forests, over exploited parts of local forests, woods and areas earmarked for social forestry, and under afforestation or revegetation programs following land disturbances (like landslides, earthquakes, newly land filled areas, added areas belong to cities and towns etc), unused rural and urban areas, gardens and lawns belonging to different municipalities and corporations, unused areas or open spaces of local golf gardens, around water bodies (like dug outs, pools, ponds, irrigation canals, roadside ditches, swamps, bogs, artificial and/or natural lakes and waterfalls, streams, rivulets etc), city and rural parks and gardens, city boulevards, reclamation sites, abandoned industrial and mining sites, power plants etc to mention only a handful.

Hence one could see that the potential of the integrated habitat development is huge and the opportunities with sky as the limit. For example, it is important to conserve freshwater aquatic habitats to preserve the rich local biodiversity and thereby

Fig 1: Pollinator visiting flower for pollen and nectar in an integrated habitat. Photo credit: S. K. Basu

Fig 2: Pollinator insects like bees perform an important ecological service by helping in cross pollination of plants. Photo credit: S. K. Basu

Fig 3: Bird conservation could be an important aspect of integrated habitat development in additional to establishing Pollinator Sanctuaries. Photo credit: S. K. Basu

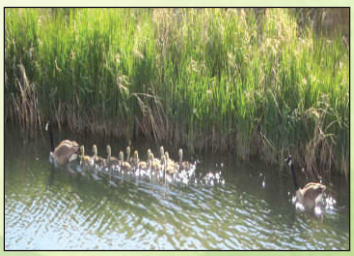

Fig 4: Protected water bodies could help in conservation of both aquatic as well as small terrestrial passerine bird species. Photo credit: S. K. Basu

conserve natural ecosystem and environments associated with it. Such an endeavor is not technologically complex or is either a huge drain on economy and resources if planned and executed judiciously. Simple innovative, nature based approach without sophisticated technological expertise, labor, funding and creative awareness and love and passion for environment can be easily achieved by using a comprehensive multi-tier conservation project such as Multiple Tier Conservation Model (MTCM). A comprehensive but simply nature based integrated aquatic habitat development program can thus be successfully achieved under Multiple Tier Conservation Model (MTCM) that can provide a dynamic conservation program including bees, birds and fishes like Integrated Ecological Habitat Development for Bees, Birds and Fishes (IEHD-BBF). Such a dynamic and innovative model can provide an effective conservation umbrella to number of species (bees, birds and fishes) by transforming natural and/or artificial

Fig 5: In a multi-species conservation program, fishes could be conserved along with insects and birds. Photo credit: S. K. Basu

Fig 6: Integrated habitat development could be beneficial in establishing small ecological units across different agro-ecological zones. Photo credit: S. K. Basu

Fig 7: Establishment of artificial and/or natural ecological habitats would slowly help in protecting local biodiversity. Photo credit: S. K. Basu

Fig 8: Integrated habitat development has commercial potential in promoting tourism and recreational fishery in addition to conservation bringing in cash flow for the local economy. Photo credit: S. K. Basu

Fig 9: Thriving pollinator populations means a secured future for agriculture, forestry and apiculture. Photo credit: S. K. Basu

Fig 10: Looper moth (Autographa sp., Family-Noctuidae, Order-Lepidoptera) foraging on Phacelia flower Photo credit: S. K. Basu

water body with simplistic nature based alternative by protecting multiple trophic levels within a freshwater ecosystem (both natural or artificial).

Developing suitable Pollinator Mixes could be an effective and environment based, cost friendly approach in establishing such ecological units like Pollinator or Bee Sanctuaries. This could be achieved by developing suitable mixes comprising of native wildflowers and wild grasses, annual and/or perennial legumes, Brassica members, warm season and cool season forage grasses, salt or acidity tolerant grass species etc for different agro-climatic or ecological regions based on parameters like their adaptability to specific regions, germination and viability, rapid emergence, quick and successful establishment, competition with local weeds, ability to regenerate, reproduce and continue flowering across different seasons to attract pollinator insects; and other farmer friendly insects to such newly established Bee or Pollinator Sanctuaries. The use of multiple species of plants representing a wide diversity of plant families could contribute towards positive soil health and help in preventing soil erosion, increase the biodiversity of soil flora and fauna, enhance soil nutrient level, help in better aeration and hydration of the soil by active root biomass and also help in soil remediation by removing toxic chemicals from the soil and produce a rich, organic layer sustaining plant growth and the habitat over the years.

When integrated with freshwater aquatic ecosystem development, local or indigenous fish species could be introduced in accompanying water bodies to further enhance and expand natural ecosystems and environments. Pollinator Sanctuaries established adjacent or around water body thus could slowly integrate over years and develop into a complex ecosystem that will attract pollinator insects (honey bees, indigenous or native bees, moths, butterflies, beetles, flies), non-pollinator insects as well as small birds feeding on such insects and terrestrial birds enjoying nesting, foraging and breeding in such naturally protected integrated habitats. Over time such aquatic habitats rich with both terrestrial and aquatic plants, algae and fungi, aquatic insects, crustaceans, insect and amphibian larvae as well as fishes will also attract aquatic and semi-aquatic birds to such ecological niches rich in biodiversity. In due course of time such land-water integrated artificial or natural habitats will also attract local amphibians and reptiles as well as smaller mammals further providing protection to the local biodiversity. This could successfully transform into multi-layered food chains and complex food webs for the multitude of species surviving in these new ecosystems over and above bees, birds and fishes via the Integrated Ecological Habitat Development for Bees, Birds and Fishes (IEHD-BBF) program.

Photo credit: S. K. Basu

LOVE FOR OUR PETS WHILE PUSHING SPECIES TOWARDS EXTINCTION-A FOOD FOR THOUGHT

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Pets constitute a big part of human life from time immemorial. Since the dawn of human civilization, various kinds of pets have been associated with the human society as honoured and loved companions, religious symbols and rituals, as beasts of burden for agricultural work and for the purpose of transportation, as sources of food, education, entertainment, socio-religious and sociology-economic purposes and for companionship. Pets such as different species of oysters, crabs, sea urchins, starfishes, sea cucumbers, snails, slugs, worms, scorpions, spiders, insects (moths, butterflies, wasps, beetles etc), fishes (both edible and ornamental species), amphibians (frogs, toads, salamanders and newts), reptiles (crocodiles, alligators, caymans, tortoises and turtles, snakes), birds (such as various species and suppose of parrots and parakeets, raptors, ducks, swans, geese, songbirds, pheasants, mynahs, pigeons and doves, finches, sparrows, muniahs along with numerous tropical and subtropical colourful

ornamental species of spectacular form, shapes and plumages) and mammals (both small and big cat species, dogs and wolves, hyenas, bears, rodents, pigs, bats, elephants, camels, alpaca, vicuña, llamas, cows and buffaloes, goats and sheep, horses and donkeys, deer and antelope, zebras, giraffes, apes and monkeys) have been human companion for ages.

Depending on the socio-cultural and sociology-economic aspect the pet species from one part of the country to another or from one corner of this globe to the other varies considerably. While in Arctic Canada, dogs are intimate companion of Inuit communities; reindeer (caribou) herds are the life blood of people living in the Lapland region and Siberia. While different fishes and insects like beetles are a Japanese fascination; wild animals like monkeys, pigs (wild boars) and snakes are constant companions of several Amazonian tribes, while camels are like family members to desert tribes across Sahara, Middle East, parts of India and Pakistan. Similarly horses are a major animal resource that are treated both as pets, draft animals and livestock across Africa, West and Central Asia; elephants form big part of socio-cultural and religious life of South and South East Asia; while lamas, alpaca, vicuña are representative symbol of the traditional Andean socio-economic life. Donkeys, yaks, cows, buffaloes, horses, mithuns, sheep, goats are similarly true representative of the socio-cultural and socio-economic lives of Africa, Asia and Latin America. Thus around the globe we observe how different pet species and their intimately close association with their human companions have historically developed over time. Such relationship between human and animal are time tested and built upon solid friendship and mutual respect for one another.

Hence, the human pet relationship has evolved over historic period and has very deep, significant impact on our lives from agricultural work, animal based transportation, need for food and related animal resources like meat, dairy product, clothing (made from skin, leather, fur, wool, pelt, tails), tools and weapons (made from bones, nails, claws, teeth, hooves, fins, tails), animal fat as energy resources and above all companionship. Modern medical treatment relies greatly on pet therapy for young children, senior citizens, patients suffering from terminal illness, neurological damages, fear, anxiety, depression, poor self esteem, psychological ailments, PTSD etc. However it is important for us to remember that currently we are damaging this deep relationship with the animal world by over exploiting defenceless

To,

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and helpless wild animals as a constant supply line for the rapidly emerging and aggressively expanding global pet industry.

The lucrative pet industry around the globe has been expanding dangerously threatening the virtual existence of several threatened, vulnerable, endangered and critically endangered species due to their relentless harvest from there corresponding wild habitats and fragile ecosystems in a non-sustainable manner. The rate of harvest has been so high that it has lead to population crashes in several species around the globe. Unless we are careful and observant we may loose many of the pet species like rare invertebrates and vertebrates that enlightened our lives for generations. Unless we learn to respect the dynamics of Mother Nature, the intimate relationship with our pets may be lost forever but at least some of the species. We need to think that while we take a species form the nature to adorn our drawing room aquarium or our farm or home garden for our momentary joy we are possibly particular species a step ahead towards sure extinction. We need to be more responsible, aware and educated while looking for buying rare exotic pets from far off countries as we could be certainly contributing towards the demise of a species from our planet. ***Photo credit:*** **S. K. Basu**

APPEAL TO LIFE MEMBERS

NESA Life Members are requested to submit short articles for the NESA e-Newsletter that are consistent with NESA's objectives to improve environment. The articles should focus on topics related to environment and facilitate communication and discussion among researchers, academicians and students. The articles for October edition can be submitted to nesapublications@gmail.com before 20th January, 2019.

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