UNIT 7 EXTINCTION OF BIODIVERSITY

Structure

7.0 INTRODUCTION

Variability among living organisms from all sources including, inter alia, terrestrial, marine, aquatic ecosystems and ecological complexes of which they are a part, this includes diversity within the species, between the species of an ecosystem. Biodiversity is not distributed evenly on earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity tends to be highest along coasts in the Western Pacific, where sea surface is highest, and in the mid-latitudinal band in all oceans. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

7.1 OBJECTIVES

After completing this unit you will be able to:

- Describe types of extinction and extinction of Species;
- Explain IUCN threatened Categories and Sixth Extinction/Biological Crisis;
- Explain rates of extinction in aquatic, terrestrial and island environments.

7.2 TYPES OF EXTINCTION

Bio diversity loss or extinction of species (Human, plant or animal) is one of the world's most critical conditions which have to be given quick attention with loss of many species in a habitat. The local reduction or loss of species can be temporary or permanent, depending on whether the environmental degradation that leads to loss is reversible through ecological restoration/ ecological resilience or it may be permanent.

Two general types of extinction:

- Background extinction which is typically continuous and low-level species extinction exists on earth which can be caused by environmental factors (climate change) or biological factors (predation or competition).
- Mass extinction is loss of numerous species in a relatively short period of geological time. It can last for millions of years, but this is still considered short in terms of evolutionary time when we consider the earth is ~4.6 billion years old. Mass extinctions can also be caused by environmental or biological factors.

Both of these are considered deterministic extinctions where there is some major change that the species cannot make suitable with surroundings in time. Another sort of extinction is called stochastic which happens from normal and yet random changes in the environment. Such changes don't usually destroy a population but thin it out. As we are faced today with more and more small populations we will see stochastic extinction eventually leading to deterministic extinction.

Through evolution, species arise through the process of speciation and new varieties of organisms arise and thrive when they are able to find and exploit an ecological niche and species become extinct when they are no longer able to survive in changing conditions or against superior competition. A typical species becomes extinct within 10 million years of its first appearance, although some species, called living fossils survive with virtually no morphological change for hundreds of millions of years.

Major factors for biotic stress and the ensuing accelerating loss rate are, amongst other stress

Habitat loss and degradation :

Land use intensification (and ensuing land loss/habitat loss)

3. Climate change through heat stress and drought stress.

Excessive nutrient load and other forms of pollution.

Over-exploitation and unsustainable use (e.g. unsustainable fishing methods) we are currently using 25% more natural resources than the planet.

Invasive alien species that effectively compete for a niche, replacing indigenous species

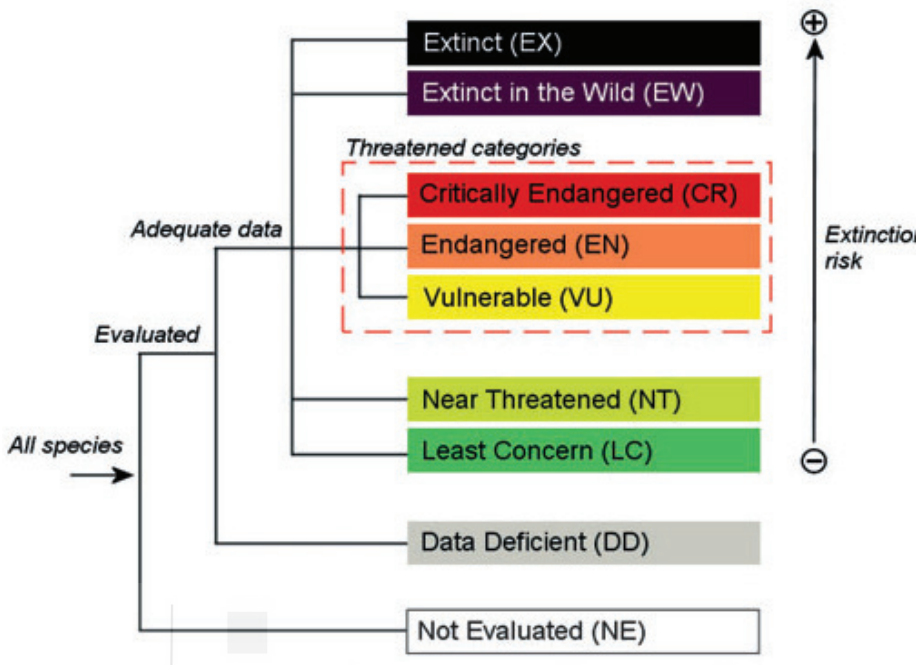
7.3 IUCN THREATENED CATEGORIES

The IUCN Red List is not limited to just providing a threat categorization. For an increasing number of species, may be they are threatened or not, it now provides extensive information covering taxonomy (classification of species), conservation status, geographic distribution, habitat requirements, biology, threats, population, utilization, and conservation actions. Spatial distribution maps are also becoming available for an increasing number of species (almost 20,000 species on The 2008 IUCN Red List have maps). All this information allows scientists to undertake detailed analyses of biodiversity across the globe. In addition, three categories that are Critically Endangered (CR), Endangered (EN), and Vulnerable (VU) are contained within broader notion of "threatened".

The general term threatened is used to refer to a species considered to belong to any one of following categories. The main IUCN threat categories currently used are:

1. **Extinct (Ex)**: Species which are not definitely found in the wild during past 50 Years.
2. **Endangered (E)**: Taxa which are in verge of extinction and whose survival is unlikely if the casual factors continue to operate. Also included are taxa that many now be extinct although they have been seen in the wild in past 50 years.
3. **Vulnerable (V)**: Taxa believed likely to move into the Endangered category in the near future, if the casual factors continue operating. Included are taxa which are decreasing because of overexploitation, extensive destruction of habitat or other environmental disturbance, taxa still with abundant population but are under threat from severe adverse factors throughout their range, taxa with population that have been seriously depleted and whose ultimate security has not been assumed.
4. **Rare (R):** Taxa with small population in the whole world that are not endangered or vulnerable at present but are at risk.
5. **Indeterminate (I):** Taxa known to be Endangered, Vulnerable or Rare but where sufficient information is not available to allot it to appropriate category out of these three categories.
6. **Insufficiency Known (K) or Data Deficient (DD)**: Taxa that are suspected but not definitely known to belong to any of the above categories because of lack of information.

The same definitions have been applied to plants, although they have often been interpreted in a significantly different manner, mainly because of biological difference between animals and plants. The IUCN Red List brings into focus the ongoing decline of Earth's biodiversity and the influence humans have on life on the planet. It provides a globally accepted standard with which to measure the conservation status of species over time.(*Walsh JR1 atal.,2016)*



From the field to the IUCN Red List:

All species assessments are based on data currently available for the species (or subspecies, population) across its entire global range. Assessors take full account of past and present literature (published and grey) and other reliable sources of information relating to the species. For subspecies, variety or sub population assessments, a species-level assessment is also carried out.

Red as a 'Wake up' Call?

Biological diversity goes beyond species and encompasses ecosystems and genes. However, species remain the well identified building blocks of biodiversity, and they are easily understood by the public and policy makers alike. By enhancing knowledge on the state of biodiversity, explaining complex species conservation issues, and highlighting species at risk, The IUCN Red List is attracting increasing attention to the important role that species play if ecosystems are to function properly. The Red List also provides a solid factual basis when drafting funding proposals which seek support for meaningful conservation work. The IUCN Red List data also highlight general overarching threatening processes, such as emerging threats like climate change.

Guidelines for data use

The IUCN Red List is not intended to be used alone as a system for setting conservation priorities. Red List assessments simply measure the relative extinction risk faced by species, subspecies, or subpopulations.

7. 4 SIXTH EXTINCTION/BIOLOGICAL CRISIS

Sixth extinction also referred as **Holocene extinction or Anthropocene extinction**. The Holocene extinction is possibly the sixth mass extinct event, There is no general agreement on where the Holocene, or anthropogenic, extinction begins, and the Quaternary extinction event, which includes climate change resulting in the end of the last ice age, ends, or if they should be considered separate events at all (Baillie *et al*., 2018) Some have suggested that anthropogenic extinctions may have begun as early as when the first modern humans spread out of Africa between 200,000 and 100,000 years ago; This is supported by rapid megafauna extinction following recent human colonization in Australia, New Zealand and Madagascar, as might be expected when any large, adaptable predator (invasive species) moves into a new ecosystem. In many cases, it is suggested that even minimal hunting pressure was enough to wipe out large fauna, particularly on geographically isolated islands. Only during the most recent parts of the extinction have plants also suffered large losses. The Holocene extinction includes the disappearance of large land animals known as megafauna, starting at the end of the last Ice Age. Megafauna outside of the African continent, which did not evolve alongside humans, proved highly sensitive to the introduction of new predation, and many died out shortly after early humans began spreading and hunting across the Earth.

Anthropocene:

The abundance of species extinctions considered anthropogenic, or due to human activity, have sometimes (especially when referring to hypothesized future events) been collectively called the "Anthropocene extinction". "Anthropocene" is a term introduced in 2000. Some now postulate that a new geological epoch has begun, with the most abrupt and widespread extinction of species since the Cretaceous–Paleogene extinction event 66 million years ago. Habitat destruction by humans, including oceanic devastation, such as through overfishing and contamination; and the modification and destruction of vast tracts of land and river systems around the world to meet solely human-centered ends (with 13 percent of Earth's ice-free land surface now used as row-crop agricultural sites, 26 percent used as pastures, and 4 percent urban-industrial areas), thus replacing the original local ecosystems. Recent investigations about hunter-gatherer landscape burning has a major implication for the current debate about the timing of the Anthropocene and the role that humans may have played in the production of greenhouse gases prior to the Industrial Revolution. Human civilization flourished in accordance to the efficiency and intensity of prevailing subsistence systems. Local communities that acquire more subsistence strategies increased in number to combat competitive pressures of land utilization. Therefore, the Holocene developed competition on the basis of agriculture. The growth of agriculture has then introduced newer means of climate change, pollution, and ecological development.

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centered ends (with 13 percent of Earth's ice-free land surface now used as row-crop agricultural sites, 26 percent used as pastures, and 4 percent urban-industrial areas), thus replacing the original local ecosystems. Other, related human causes of the extinction event include deforestation, hunting, pollution. the introduction in various regions of non-native species, and the widespread transmission of infectious diseases spread through livestock and crops. Recent investigations about hunter-gatherer landscape burning has a major implication for the current debate about the timing of the Anthropocene and the role that humans may have played in the production of greenhouse gases prior to the Industrial Revolution. Studies on early hunter-gatherers raises questions about the current use of population size or density as a proxy for the amount of land clearance and anthropogenic burning that took place in pre-industrial times. Scientists have questioned the correlation between population size and early territorial alterations.

While a number of human-derived factors are recognized as potentially contributing to rising atmospheric concentrations of CH_4 (methane) and CO_2 (carbon dioxide), deforestation and territorial clearance practices associated with agricultural development may be contributing most to these concentrations globally. Scientists that are employing a variance of archaeological and paleoecological data argue that the processes contributing to substantial human modification of the environment spanned many thousands of years ago on a global scale and thus, not originating as early as the

7.5 RATE OF EXTINCTION

The current rate of global diversity loss is estimated to be 100 to 1000 times higher than the (naturally occurring) back ground extinction rate and expected to still grow in the upcoming years.

Our constitution enshrines the concept of environment protection. It has laid an important trail in the section on Directive Principles of State Policy by assigning the duties for the states and all citizens through article 48 A, and Article 51-A. A principal function of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is to "perform regular and timely assessments of knowledge on biodiversity." In December 2013, its second plenary session approved a program to begin a global assessment in 2015. The Convention on Biological Diversity (CBD) and five other biodiversity-related conventions have adopted IPBES as their science-policy interface, so these assessments will be important in evaluating progress toward the CBD's Aichi Targets of the Strategic Plan for Biodiversity 2011-2020. Much depends on where species are, because different biomes contain different numbers of species of different susceptibilities. Biomes also suffer different levels of damage and have unequal levels of protection. How extinction rates will change depends on how and where threats expand and whether greater protection counters them.

Taxa that are the best known to science may have their conservation status assessed first, such as mammals and birds. These taxa are generally larger in body size than, and contribute only 1% of, all species on Earth.

7.5.1 EXTINCTION RATE IN AQUATIC ENVIRONMENTS

Fishes are appropriate indicators of trends in aquatic biodiversity because their enormous variety reflects a wide range of environmental conditions. Fish also have a major impact on the distribution and abundance of other organisms in waters they inhabit. Examination of trends in freshwater fish faunas from different parts of the world indicate that most faunas are in serious decline and in need of immediate protection. Species most likely to be threatened with immediate extinction are either specialized for life in large rivers or are endemic species with very small distributions. Evidence for serious declines in marine fishes is limited largely to estuarine fishes, reflecting their dependence on freshwater inflows, or to fishes in inland seas. The proximate causes offish species' decline can be divided into five broad categories: (1) competition for water, (2) habitat alteration, (3) pollution, (4) introduction of exotic species, and (5) commercial exploitation Doughty, (C. E. etal.,2010)

The ocean constitutes over 90% of the habitable space on the planet. The ocean has a much higher phylogenetic diversity: 30% of phyla are exclusively marine, whereas only one phylum is exclusively terrestrial. By the year 2100, without significant changes, more than half of the world's marine species may stand on the brink of extinction. Today 60% of the world's major marine ecosystems that underpin livelihoods have been degraded or are being used unsustainably. Marine Protected Areas (MPAs) are essential to conserve the biodiversity of the oceans and to maintain productivity, especially of fish stocks. World Heritage marine sites represent in surface area one third of all marine protected areas. Approximately 12% of the land area is protected, compared to roughly 1% of the World Ocean and adjacent seas. Tiny phytoplankton provides 50% of the oxygen on earth and form the basis of the ocean food chain up to fish and marine mammals, and ultimately human consumption. Ocean acidification may threaten plankton, which is key to the survival of larger fish. If the concentration of atmospheric CO2 continues to increase at the current rate, the ocean will become corrosive to the shells of many marine organisms by the end of this century. How or if marine organisms may adapt is not known. Ocean acidification may render most regions of the ocean inhospitable to coral reefs, affecting tourism, food security, shoreline protection, and biodiversity. Coral reefs are the nurseries of the oceans, they are biodiversity hot spots. On some tropical coral reefs, for example, there can be 1,000 species per m^2. Today, fisheries provide over 15 percent of the dietary intake of animal protein. Commercial overexploitation of the world's fish stocks is so severe that it has been estimated that up to 13 percent of global fisheries have 'collapsed.' Agricultural practices, coastal tourism, port and harbor developments, damming of rivers, urban development and construction, mining, fisheries, aquaculture, and manufacturing, among others, are all sources of marine pollution threatening coastal and marine habitats. Excessive nutrients from sewage outfalls and agricultural runoff have contributed to the number of low oxygen (hypoxic) areas known as dead zones, where most marine life cannot survive, resulting in the collapse of some ecosystems. There are now close to 500 dead zones covering more than 245,000 km^2 globally, equivalent to the surface of the United Kingdom. Coastal systems such as such as mangroves, salt marshes and sea-grass meadows have the ability to absorb, or sequester,

carbon at rates up to 50 times those of the same area of tropical forest. Total carbon deposits in these coastal systems may be up to five times the carbon stored in tropical forests. Between 1980 and 2005, 35,000 square kilometers of mangroves were removed globally. Between 30 and 35 percent of the global extent of critical marine habitats such as sea-grasses, mangroves and coral reefs are estimated to have been destroyed. Technological change and the emergence of new economic opportunities such as deep sea mining, more intensive fishing, and deeper oil and gas drilling increase risks to areas that historically were not under threat. Further research and collective action is needed to mitigate the underlying causes of the loss of biodiversity

7.5.2 EXTINCTION RATE IN TERRESTRIAL ENVIRONMENT

The current massive degradation of habitat and extinction of many of the Earth's biota is unprecedented and is taking place on a catastrophically short timescale. Based on extinction rates estimated to be thousands of times the background rate, figures approaching 30% extermination of all species by the mid of 21st century are not unrealistic, an event comparable to some of the catastrophic mass extinction events of the past. The current rate of rainforest destruction poses a profound threat to species diversity. Likewise, the degradation of the marine ecosystems is directly evident through the denudation of species that were once dominant and integral to such ecosystems. If the current global extinction event is of the magnitude that seems to be well indicated by the data at hand, then its effects will fundamentally reset the future evolution of the planet's biota. Terrestrial ecosystems are in great danger. As already described the threats to species today are extremely complex and difficult to quantify. However, because of the importance of predictions in conservation and policy, modelling extinction risk has become a part of the toolkit of ecologists. A wide array of data and methods are applied. However, the key aspect of a model of extinction risk is the population size and the area and the rate with which those parameters are likely to change with projected climate change. Extinction risk models often use climate and environmental projections (temperature drought) from the different emission scenarios. Forecasts of extinction often cause great alarm.

Birds

Bird populations around the world face a series of profound threats. Climate change and associated modification of the landscape is playing a major role in isolating bird populations and may play a huge role in the future. Development and conversion of agricultural land and forest to urban areas are literally isolating bird populations on "islands", making them vulnerable to extinction. This is increasingly significant as the largest threat to birds today is not related to climate, but caused by humans and domestic animals.

Habitat Destruction:

For many reason like deforestation for agricultural purposes, habitat of birds are in assault. Humans are clearing areas of forest at unprecedented rates for agriculture and urbanization. Urban sprawl is eating up forest and grasslands.

Both of these activities are eradicating sensitive area specific as well as migratory bird habitats and threatening populations. Not all habitat change is bad for birds; there are some cases where clearing has been advantageous for bird species. However, more often than not habitat loss causes a fragmented bird population that can begin the downward spiral towards extinction. The grey coloured Dodo Bird was approximately 3 feet tall, had a long hooked bill, yellow legs and a tuft of curly feathers high on its tail (all known from drawings). It lived in New Zealand, Mauritius and Micronesia and was thriving when humans arrived in the 17th century, along with a brood of domestic animals. The Dodo was not accustomed to these new comers and because it was unable to fly, it became a very vulnerable prey. Accounts indicate that pigs, in particular, ate the bird and its eggs and that humans cut down its forest habitat. The Dodo was completely extinct within decades of human's arrival.

The Case of the Golden Toad

Periodic drought is an integral part of climate change even in the lush rainforests of the world. One of the most diverse amphibian habitats known is in the Monteverde Cloud Forest in Costa Rica. This is an area which, until recently, had a high amphibian species diversity, including species that are endemic to the region. Periodic drought in Monteverde related to the ENSO cycle, and reduction in the area of moist clouds to higher elevations, has put pressure on the amphibian habitat. These dry conditions limit the reproduction of amphibians in bodies of water and thus species are forced to shift their habitats to moister higher elevations. In many cases, these higher habitats are already occupied by other species. Drought may have caused dehydration; alternatively, it may have made frogs susceptible to a pathogen. Monteverde has lost 40% of its frog and toad species since 1987, including the famous Golden Toad. The Golden Toad which was endemic to Monteverde is one of the surest identified victims of extinction. In 1987, 1500 individuals were observed in breeding pools, however, the spring was dry and few tadpoles developed. The following year, only one Golden Toad was observed in the same location and the last sighting occurred in 1989. The species is now officially extinct. Drought appears to be the trigger of the Golden Toad extinction, but it did not cause it.

7.5.3 RATE OF EXTINCTION IN ISLAND ENVIRONMENT

Vulnerability, extinction, conservation: The biodiversity crisis is nowhere more apparent and in need of urgent attention than on islands. Approximately 90% of all bird extinctions during historic times have occurred on islands. More species of Polynesian land birds appear to have gone extinct due to human agencies than survive today, and the survivors have greatly reduced ranges (Vitousek, P. M.etal 1988). Among the historically known, indigenous plants of Hawaii, 10% are extinct and almost 40% threatened (Olson, S. L.*et al*., 1991). Land snails are perhaps the most vulnerable members of insular biotas, and the four relict families discussed above are at the greatest risk. Most of the 331 described species of Amastridae, a family endemic to the Hawaiian group, are extinct, with only a handful of acies of this primarily ground-dwelling family surviving.

7.6 LOCAL EXTINCTION

Local extinction or **extirpation** is the condition of a species (or other taxon) that ceases to exist in the chosen geographic area of study, though it still exists elsewhere. Local extinctions are contrasted with global extinctions.

Local extinctions may be followed by a replacement of the species taken from other locations; wolf reintroduction is an example of this. Local extinctions mark a change in the ecology of an area. The area of study chosen may reflect a natural subpopulation, political boundaries, or both. The Cetacean Specialist Group of the IUCN has assessed the threat of a local extinction of the Black Sea stock of Harbour Porpoise (*Phocoena phocoena*) that touches six different countries. Many crocodilian species have experienced localized extinction, particularly the saltwater crocodile (*Crocodylus porosus*), which has been extirpated from Vietnam, Thailand, Java, and many other areas.

IUCN Stock assessment and sub population:

While the World Conservation Union (IUCN) mostly only categorizes whole species or subspecies, assessing the global risk of extinction, in some cases it also assesses the risks to stocks and populations, especially to preserve genetic diversity. In all, 119 stocks or subpopulations across 69 species have been assessed by the IUCN in 2006 (Holsinger, etal.,2006)

Examples of stocks and populations assessed by the IUCN for the threat of local extinction:

Marsh deer (three subpopulations assessed)

Blue whale, North Pacific stock and North Atlantic stock.

Bowhead whale, *Balaena mysticetus* (five subpopulations assessed), from Critically Endangered to LR/cd

Lake sturgeon, *Acipenser fulvescens*, Mississippi & Missouri Basins subpopulation assessed as Vulnerable

Wild common carp, *Cyprinus carpio* (River Danube subpopulation)

Black-flanked rock-wallaby *Petrogale lateralis* (MacDonnell Ranges subpopulation and Western Kimberly subpopulation)

The IUCN also lists countries where assessed species, subspecies or subpopulations are found, and from which countries they have been extirpated or reintroduced. The IUCN has only three entries for subpopulations that have become extinct the Aral Sea stock of Ship sturgeon (*Acipenser nudiventris*); the Adriatic Sea stock of Beluga (*Huso huso*); and the Mexican subpopulation of Wolf (*Canis lupus*), which is extinct in the wild. No plant or fungi subpopulations have been assessed by the IUCN.

It is important to remember that many mammal, bird, reptile, amphibian and fish species are more than ever on the verge of becoming extinct today, within our lifetimes, both in India and abroad. In India, one bird and 3 mammals have become emblematic of this crisis. These include the Great Indian Bustard (*Ardeotis nigriceps*), the Hangul (*Cervus canadensis hanglu*), the Sangai (*Rucervus eldii eldii*) and the Dugong (*Dugong dugon*).

Most Critically Endangered Animals in India

NAME	LATEST NUMBERS	RANGE
Hangul	182	Dachigam N.P
Great Indian Bustard	Less than 150	Rajasthan, Gujarat, Deccan states
Sangai	Less than 200	Keibul Lamjao N. P
Dugong	Less than 200	Gulf of Kutch, Gulf of Mannar

Source: Media reports and agencies

The Great Indian Bustard, a large bird and the very symbol of India's grasslands, was once in the offing for the position of India's National Bird. Unfortunately, because its name rhymed with prominent English swears word, the Bustard could not make it. Two deer species in far ends of the country also are on the verge of being extirpated: The Hangul of the Kashmir Valley and the Sangai of Manipur.

The most extensive coral bleaching event from 2014 to 2017 affected reefs across the world, including the Great Barrier Reef in Australia where the damage was intense; and also those found along the east coast of Africa; where the intensity of destruction was slightly less. If bleaching continues for an extended period of time, corals eventually die. Coral bleaching and mortality exacerbated by climate change are one of the biggest threats to oceanic biodiversity. Coral reefs, which are mostly found in shallow oceans along the coastline, provide the perfect place for marine life to thrive, especially colorful fish. The first-ever recorded coral bleaching took place in 1998. That year the El Niño Southern Oscillation, which occurs every three to seven years in the Western Pacific Ocean, caused massive bleaching of corals along the east African coast. Due to this, almost 20 per cent of corals were lost in the region. The fallout of bleaching and coral death is an increase in the growth of fleshy macro algae in

reefs. The algae do not allow corals to revive by taking up their space.

7.7 VULNERABILITY TO EXTINCTION

Vulnerability is mainly caused by habitat loss or destruction of the species home. Vulnerable habitat or species are monitored and can become increasingly threatened. Some species listed as "vulnerable" may be common in captivity, an example being the military macaw.There are currently 5196 animals and 6789 plants classified as vulnerable, compared with 1998 levels of 2815 and 3222, respectively.(IUCN,2012 version red list)

Although it is well known that species vary in their vulnerability to extinction, the reasons are poorly understood. Theory predicts that long-lived species with 'slow' life histories (small litters, slow growth, late maturation) should be at greater risk than short-lived species with high potential rates of increase. This hypothesis was tested by comparing life-history traits of two species of sympatric, elapid snakes: the endangered broad-headed snake, *Hoplocephalus bungaroides*, and common small-eyed snake, *Cryptophis nigrescens.* From 1992 to 2000 a mark–recapture study of both species was undertaken in Morton National Park, south-eastern Australia, and this information was used to construct transition matrices for each species. The endangered *H. bungaroides* was found to mature late (6 years of age), had a high juvenile (54.7%) and adult (81.6%) survival rate, and a long generation length (10.4 years). In striking contrast, the common *C. nigrescens* matured early (within 3 years), had a lower juvenile (30.4%) and adult (74.4%) survival rate (but higher recruitment rate), and a substantially shorter generation length (5.9 years). Elasticity analyses revealed that *H. bungaroides* was considerably more sensitive to survival past the age of 2 years (68.6%) than *C. nigrescens*(37.4%). These results provide support for the hypothesis that species with slow life histories are more vulnerable to extinction. [30] Extinctions that have occurred in the recent past receive a great deal of attention – for example, the dodo, thylacine or passenger pigeon. But the vast majority of extinctions happened well before the appearance of humans. The fossil record is thus the primary source of data on extinction. When palaeontologists consider fossils in the context of what we know about past environments, a clearer picture of what causes the extinction of species starts to emerge. To date, the likelihood of extinction of a species has been linked to a host of factors. We certainly know that changes in temperature are one important element. Almost every major rise or fall in global temperatures in Earth history has resulted in the extinction of a swath of different organisms. The size of the geographic area a species occupies is also crucial. Species that are broadly distributed are less likely to go extinct than those that occupy a small area or whose habitat is disjointed.

Check Your Progress 1

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of unit

1) What is Local Extinction (Expiration)?

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2) What is Bleaching?

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3) What is vulnerable species?

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7.8 LET US SUMUP

Biodiversity loss is the extinction of species in certain habitat, which is a particular natural environment where particular species are prominent for that environment. Mass extinctions are often linked to dramatic climate changes such as an ice age. There many potential causes but the reasons behind a mass extinction are not fully understood. There are many things that can contribute to mass extinctions including changes in sea levels, continental movement, and geologic events like volcanic eruptions, global warming and cooling, meteor impact etc., Thousands of new species each year and even by the most conservative estimates, thousands become extinct each year. Our constitution enshrines the concept of environment protection. It has laid an important trail in the section in Directive Principles of State Policy by assigning the duties for the states and all citizens through article 48 A and Article 51 – A.

The developed countries are looking for a sustainable supply of biological resources from the developing countries and easy access to them as well. The developing countries lacking the technology to exploit their resources are inviting the developed countries to do so. This has resulted in the developed nations channelling out the benefits of these natural resources.

So many projects started to conserve like

Project Tiger:

Project Tiger was initiated as a Central Sector Scheme in 1973 with 9 tiger reserves located in different habitat types in 9 different states. There are totally 18 Reserves in 13 states. At present tiger Conservation has been viewed in India not only as an effort to save an endangered species but, with equal importance, also as a means of preserving biotypes of sizeable magnitude.

Crocodile Breeding Project:

The project was started in Orissa and then extended to several other states in April 1975 with UNDP assistance. The main objective was to protect the three endangered species of crocodiles namely - Gavialis gangeticus, Crocodylus palustris and the salt water crocodile, Crocodylus porosus.

Lesser Cats Project:

The project was launched in 1976 with the assistance of WWF in India for conservation of four species of lesser cats e.g. Felis bengalensis Kerr, Felis marmorta Martin, Felis lemruinki Vigors Horsfield and Felis viverrina Bennet, found in Sikkim and Northern part of West Bengal.

The Manipur Brow-antlered Deer Project:

This was launched in 1981 in Manipur to save the brow-antlered deer (Cerevus eldi eldi) which is on the verge of extinction. The habitat includes 35 sq.km. of park and sanctuary. The population of the deer has increased from 18 to 27.

Project Elephant:

It was launched in 1991 to protect the Asiatic elephant which is also a highly endangered species because of large scale poaching.

Key points from the Convention on Biological Diversity

The aim of the Convention on Biological Diversity is 'the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. The convention stipulates that Parties must:

- Develop national strategies for the conservation and sustainable use of biological resources;
- Establish protected areas, restore degraded ecosystems, control alien species, and establish ex-situ conservation facilities;
- Establish training and research programs for the conservation and sustainable use of biodiversity and support such programs in developing countries;
- Promote public education and awareness of the conservation and sustainable use of biodiversity;
- Recognize the right of governments to regulate access to their own genetic resources, and, wherever possible, grant other Parties access to genetic resources for environmentally sound uses;
- Encourage technology and biotechnology transfer particularly to developing countries;
- Establish an information exchange between the parties on all subjects relevant to biodiversity;
- Promote technical and scientific cooperation between parties

(particularly to developing countries) to enable them to implement the convention;

- Ensure that countries that provide genetic resources have access to the benefits arising from them; and
- Provide financial resources to developing countries/parties to enable them to carry out the requirements of the convention.

7.9 KEY WORDS

Biodiversity is being lost at an alarming rate which poses a risk to the provision of ecosystem services.

The Convention of Biological Diversity provides a global legal framework for action on biodiversity It is a key instrument to promote sustainable development and tackle the global loss of biodiversity.

Biodiversity can be measured through the use of quantitative indicators, although no single unified approach exists.

Biodiversity also underpins ecosystem function and the provision of ecosystem services.

The Holocene extinction event is, from a global, biological and geological perspective, more than any other modern development, the most defining thing that's happening around us – defining because it actually changes the fossil record of our shared planet, drawing another line in the sand on Earth's millions of years timescale, and possibly a deep line, listing it as the 'Sixth' of the Earth's Big Extinction Events (a 'mass extinction' being defined as a loss of 75 percent or more of species within a class).

An extinction event, or rather an extinction period, is any time in the history of life on Earth during which the process of dying out of species (which is natural) happens at a faster pace than the evolutionary process of species formation (called speciation) – due to, obviously, deteriorating conditions for life, in general.

- **An ongoing current event in which a large number of living species are threatened with extinction or are going extinct because of environmentally destructive human activities.** The Earth is presently in the midst of a mass extinction event. In the past, there have been five other similar large extinctions. Because of this, the current Anthropocene extinction is often referred to as the sixth extinction or the sixth great mass extinction

7.10 SUGGESTED FURTHER READING/ REFERENCES

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7.11 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

1) Your answer must include the following points

   Extirpation (also known as 'local extinction') describes the situation in which a species or population no longer exists within a certain geographical location. Unlike *extinction*, whereby a species no longer exists anywhere, extirpation means that at least one other *population* of the species still persists in other areas.

2) Bleaching is a process where corals lose their vivid color and turn white. This happens when the zooxanthellae algae, which is in a symbiotic relationship with corals and provide them with food, die due to ocean warming and acidification.

3) A vulnerable species is one which has been categorized by the International Union for Conservation of Nature as likely to become endangered unless the circumstances that are threatening its survival and reproduction improve**.**