ADDRESSING THE PROBLEM OF THREAT TO BIODIVERSITY IN THE ECOSYSTEM THROUGH CONSERVATION OF ENDANGERED SPECIES

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Abstract

Endangered species are plant/animal species in immediate danger of becoming extinct. There are four direct consequences of species extinction: loss of species as a biological entity, destabilization of an ecosystem, endangerment of other species, and loss of irreplaceable genetic material. Studies have implicated certain human activities in this ecological malady. These include tropical deforestation, coral loss, other habitat destruction, overexploitation of species, introduction of alien species into ecosystems and pollution (such as soil contamination and greenhouse gases). This paper, therefore, reviews the circumstances threatening biodiversity in the ecosystem, and emphatically highlights some candidate species officially listed as endangered. It is expected that with the concerted effort of government, educators at all levels, as well as other stakeholders, preservation of all species of wildlife would be possible.

Introduction

An endangered species is a population of organisms (usually a taxonomic species), which because it is either (a) few in number, or (b) threatened by changing environmental or predation parameters, is at risk of becoming extinct (Wilcove, 1998). A 'threatened species', on the other hand, is any species which is likely to become an endangered species within the foreseeable future; while an 'extinct species' is one that is no longer living (Molles, 1999). The passenger pigeon, the dodo, the dinosaur, and the Stegosaurus are examples of extinct species. These animals no longer exist on Earth. Flather (1998) defined vulnerable species as a species particularly at risk because of low or declining numbers or small range, but not a threatened species.

Many countries have laws offering special protection to these species or their habitats: for 'example, forbidding hunting, restricting land development or creating preserves. Only a few of the many endangered species actually make it to the lists and obtain legal protection. Many more species become extinct, or potentially will become extinct, without gaining public notice

According to Harwell (1997), a declining species, in the USA, has to be added to the official list of endangered species before it receives any federal protection. But just getting enlisted can be the hardest part. The fish and wildlife service maintains a current list of endangered species on line. Any person may petition the government to list a species as either endangered or threatened. Unfortunately many species sit on the candidate list for years and years owing to adverse political pressure or funding constraints. In this regard, this paper reviews the circumstances that threaten biodiversity within the ecosystem, ' while emphatically highlighting some candidate species officially listed as endangered.

The Problem of Species Extinction

Studies indicate that more than one-half million species exist on the earth today. However, recent estimated state that, at least, 20 times this number inhabited the planet (Cunnngham and Saigo, 1997). In the USA, 735 species of plants and 496 species of animals are listed as endangered or threatened (Wilcove, 1998). Tangley (1999), estimated that there are more than 1,000 animal species endangered worldwide, with more than 3,500 protected areas

in existence. These areas include parks, wildlife refuges and other reserves. They cover a total of nearly 2 million square miles (5 million square Km), or 30% of our total land area.

The greatest factor of concern is the rate at which species are becoming extinct within the last 150 years. While species have evolved and become extinct on a regular basis for the last several hundred million years, the number of species becoming extinct since the Industrial Revolution has no precedent in biological history. If this rate of extinction continues, or accelerates as now seems to be the case, the number of species becoming extinct in the next decade could number in the million (Flather, 1998). While most people readily relate to endangerment of large mammals or birdlife, some of the greatest ecological issues are the threats to stability of whole ecosystems if key species vanish at any level of the food chain.

According to Alper (1998), species extinction in the ultimate concern, but there are four direct consequences of species extinction to be considered: loss of species as a biological entity, destabilization of an ecosystem, endangerment of other species, and loss of irreplaceable genetic material and associated biochemicals.

Chapin (1998), identified the loss of a species in and of itself as an important factor, both as diminution of the enjoyment of nature, and as a moral issue for those who believe humans are stewards of the natural environment. Destabilization is a well understood outcome, when an element of food or predation is removed from an ecosystem (Harwell, 1997). Examples abound that other species are in turn affected, such that populations increases or declines are forthcoming in these secondary species. Drastic change or an unstable spiral can ensure, until other species are lost and the ecosystem structure is changed markedly and irreversibly.

The fourth outcome is more subtle, but perhaps the most important point for mankind to grasp. Each species carries unique genetic material in its DNA, and in its chemical factory responding to these genetic instructions (Primack, 1998). For example, in the valleys of central China, a fernlike weed called sweet wormwood grows. This plant is the source of artemisinin, a drug that is nearly 100% effective against malaria (Rice, 1997). If this plant were lost to extinction, then the ability to control malaria, even today a potent killer, would diminish. There are countless other examples of chemicals unique to a certain species, whose only source is the species whose genetic factory makes that given substance. The number of more chemicals that have not yet been discovered and could vanish from the planet when further species become extinct cannot be determined, but it is a highly debated and influential point.

Though extinction can be a natural effect of the process of natural selection, the current extinction crisis is not related to that process (Cox, 1997). At the present, the Earth has fallen from a peak of biodiversity, and is undergoing the Holocene mass extinction period (Mader, 2001). Molles (1999), stated that, though these periods have occurred before without human intervention, the current extinction period is unique. Previous periods were triggered by physical causes, such as meteorite collision and volcanic eruption, all leading to climate change (Cunningham and Saigo, 1997). The current extinction period is being caused by humans and began appropriately 100,000 years ago with the diaspora of humans to different parts of the world. By entering new ecosystems which had never experienced the human presence, humans disrupted the ecological balance by hunting and also possibly bringing disease. From this time up to approximately 10,000 years ago is known as 'phase one' of the sixth extinction period (Wilson, 1992).

Phase two of the period began approximately 10,000 years ago with the birth of agriculture (Rice, 1997). With the birth of agriculture, humans did not have to rely on interaction with other species for survival and so could begin to domesticate them; and they also did not have to adhere to the limitations of the

ecosystem's carrying capacity. Thus, humans became the first species lo be able to live outside local ecosystem (Alper, 1998). With the ability to live outside of a local ecosystem, humans have been free to breach the carrying capacity of areas and overpopulate, putting ever more stress on the environment with destructive activities necessary for more population growth. Today, those activities include tropical deforestation, coral loss, other habitat destruction, overexploitation of species, introduction of alien species into ecosystems and pollution (such as soil contamination and greenhouse gases) (Flather, 1998). Among the various causes of pollution (acid rain, eutrophication, ozone depletion), global warming is expected cause the most instances of extinction

Conservation Status

The conservation status is an indicator of the likelihood of thai endangered species continuing to survive. Many factors are taken into account when assessing the conservation status of a species; not simply the number remaining, but the overall increase or decrease in the population over time, breeding success rates, known threats, and so on (Cox, 1997). In many areas this is referred to as a red-listed species.

The best-known worldwide conservation status listing is the International Union for Conservation of Nature (IUCN). Red list (Tangley,1999), but many more specialized lists exist. The following lists are examples of endangered species. It is important to stress that the following lists are a minute fraction of the total endangered species (Kaiser, 1998). It is also worth noting that the number of species becoming extinct each year is many times as large as the number of species classified as endangered (Flather, 1998). This fact arises from the extensive and slow review process for listing new species as endangered. It also arises from the number of yearly extinctions, often for species about which little documentation exists.

Endangered Mammals

Table 1 A: list of a very small Fraction of known Endangered Mammals

Asian elephant *(Elephax maxinnis)*	Banteng *(Bos javanicus*
Aye-aye *(daubentonia madagascariensis^)*	Bonobo *(Pan Paniscus)*
Bighorn sheep *(ovis Canadensis)*	Red wolf fOaHi.? *ntftix)*
Eastern gorilla *(gorilla beringei)*	Gray bat *(Myoti.s ghsescens*
Blue whale *(Balaenoptera musculus)*	Island fox *(Urocynn littoralis)*
Black rhinoceros *(Diceros bicornis)*	Leopard *(Panthera pardtts)*
Ba lack- footed *ferret (Mustela ni qripes*	Kouprey (Bos sauveli)
Sei Whale *(Balaenoptera boreal is)*	Red panda *(A'durus fulgens)*
Bornean orangutan *(Pongo (pvgmaetts)*	Sea otter *(Enhydra htttris)*
Common chimpanzee *(Pan troglodytes)*	Indri *(Indri indri)*
Tin whale *(Bolaenoptera physahis)*	Iberian *(lynx pardinus)*
Forest elephant *(loxodonta cyclotis)*	Bonobo *(Pan paniscm)*
Javan rhinoceros *(Rhinoceros sandaicus}*	Fossa *(Cryptoprocta ferox)*
Proboscis monkey (Nasaiis larval us)	Snow leopard *(Uncia uncici)*

(Source: Tangley, 1999)

Endangered Birds

Table 2: A list of a very small Fraction of known Endangered Birds

Alaotra Grebe *(Tachybaputs ru/olavalus)*	Andean condor *(Vultur zrypluis)*
Balck-capped petrel *(Pterodroma hasitala)*	Amamithrush *(Zoothera major)*
Eskimo Curlew *(Nuwenius borcalis)*	Crested inis *(Nipponia Nippon)*
Hawaiian crow *(corvus hawaiiensis*	(jurney's pitta *(pitta gurnevi)*
Chinese crested tern *(Sterna bernsteinii)*	Kagu *(Ryynochetos jubatus)*
Long-billed vulture *(Gyptis indicus)*	Laysan duck *(Anas lavsanensis)*
Night parrot *(Geopsittacus occidentalis)*	Malso (Macrocephalon maleo)
Socorro mockingbird *(Mimodcs gravsoni)*	Raso skylark *(Alauda razae)*
Puerto Rican parrot	Mauritius fody *(Foiidia*

(Amazona vittata)	*rubra)*
Mauritius parakeet *(psittacula equues)*	Takahe *(porphyrio hockslctteri)*
Okinawa woodpecker(*Sapheopipo noguchii)*	Whooping crane (Grus *Americana)*
Sociable lapwing *(Vanelhis gregarious)*	Spix's macaw *(Cyanopsita spixii)*
Sao Tome' grosbeak *(Neospiza concolor)*	Guam rail *(CalHraUus owstoni)*
Kiwi *Apteryx australis, A. hastii, A. owenii)*	Ridgway's hawk *(buteo ridg\vayi)*

(Source: Wuethrick, 1998)

Endangered Reptiles

Table 2: A list of a very small Fraction of known Endangered Reptiles

Blunt-nosed leopard liozard *(Gmbetia Silus)*
Burmese star tortoise *(Geochelone platynota)*
California walking bird *(Augusta squeamish)*
Coachella valley fringe-toed lizard *(Uina inornata)*
Cuban crocodile *Crocodylus rhombifer)*
Flat black turtle *(Natator depressa)*
Grand skink *(Oligosoma grande)*
Green sea turtle *(Chelonia myda)*
Hawksbill *turi\Q(Ertmochelys imbricata)*
Island night lizard *(Xantusia riversiana)*
Kemp's ridley (Lepidochelys kempii)
St. Croix ground lizard *(Ameiva polops)*
(Source: Mader, 1998)

Endangered Amphibians

Table 3: A list of a very small Fraction of known Endangered Amphibians

Arroyo toad *(Bufo californicus)* Barton springs salamander *(Eurycea sosorum)* Baw baw frog *(Philoria frosti)* California tiger salamander *(Ambystoma californiense)*
Desert slender salamander *(Batrachoseps aridus)*
Fleischmann's glass frog *(Hyalinobatmchium fleischmanni)*
Houston toad *(Bufo houstonensis)* Italian spade-footed toad *(Pelobates fuscus insubricus)*
Mississippi gopher frog *(Ranacapito sevosa)*
Mountain yellow-legged frog *(Rama muscosa)*
Palmate newt *(Triturus Helvetica)*
Santa Cruz long-toed salamander *(Ambystoma macrodactyhun croceum)*
Wyoming toad (Bufo baxteri)
(Source: Bavendam, 1998)

Endangered Fish

Table 4: A list of a Very small fraction of known Endangered Fish

Asian arowana *(Scleropagesformosus)* Bonylail *(Gila elegams)* Chinese paddlefish *(Psephurus gladius)* Coelacanth *(Coelacanthiformes)*
Colorado pikeminnow *(Ptychocheilus lucius)*
Cui-ui *(Chasmistes cujus)* Dwarf pygmy goby *(Pandaka pygmae) Gamhusia eurystoma,* native to Mexico, due to-very limited habitat Humpback chub *(Gila cypha)* Virgin River chub *(Gila seminude)* Source: Safina, 1995)

Endangered Arthropods

Table 5: a list of a very small Fraction of known Endangered Arthropods

Alabama cave shrimp *(Palaemonias alabamae)*
Delhi sands flower-loving fly *(Rhaphiomidas tenninatus abdominals),* due to severely limited range of habitat and development
Kentucky cave shrimp *(Palae monias ganteri)*
San Bruno elfin butterfly *(Incisalia mossii bayensis),* due to limited range of habitat and development encroachment.
Spruce-fir moss spider *(microhexura montivaga)*
Tasmanian giant freshwater crayfish *(Astacopsis gouldi)*
Tooth cave spider *(Neoleptoneta myopica)*
White-clawed crayfish *(Austropotamobius pallipes)*
(Source: Primack, 1998)

Endangered Plants

About 60% of the 300,000 identified species are endangered due to over collection or destruction of habitat, among other causes. Pollinator decline is also a factor for some

species. The following is a very small fraction of the endangered plants (Rice, 1997).

1. African violet *(Saintpaulia ionantha),* due to forest clearance.
2. Baishanzu fir *(Abies besshanzuensis)* of southeast China, three trees known on an isolated mountain summit.
3. Baker's larkspur *(Delphinium bakeri)* of California, due to very limited habitat.
4. Chilean wine palm *(jubaea chilensis),* due to land clearance.
5. Dawn Redwood *Metasequoia glyptoboides)* though to be extinct until 1941, when a small stand was discovered in China.
6. Hickman's potentilla *(potentilla hickmanii),* though to be extinct until rediscovery in early 1990s.
7. Kaka beak *(Clianthus puniceus)* of New Zealand, due to introduced grazers and competing plants
8. King of the paphs orchid *(Paphiopedilwn roths childianwn)* of Asia, due to overcollection
9. Louisiana quill wort *(Isoetes louisianensis)* of Lousisna, due to very limited habitat
10. Madonna lily *(Lilium candidum)* of Europe, due to overcollection
11. Muiri tree *(primus africana)* of Kenya and neighboring countries, because of harvesting excessively and by improper methods.
12. *Pimts squamata* of southwest China, about 20 trees known.
13. Santa Cruz tarweed *(Holhcarpu macradenia),* of California, due to limited range of habitat and encroachment by man.
14. Tennessee coneflower' *(Echinacea tennesseesis)* and Pyne's ground plum *(Astragalus bibullantus)* of the Nashville Basin of Tennessee, due to limited cedar glade habitat and its destruction by urbanization.
15. Venus flytrap *(Dionaea muscipula)* of North America, due to land clearance and overcollection.

Recommendation

1. Government should strengthen the legislations offering special protection to endangered species, and thus prescribe tougher penalties for violation.
2. There is need for government to increase funding for wildlife conservation parks and preserves, for effective maintenance of these facilities.
3. The Ministry of Education should incorporate the subject of endangered species preservation into school curriculum, as so to inculcate the values of wildlife in the younger generation.
4. Government should equally provide grants to Universities of Agriculture, Colleges of Agriculture and other research instinctive to facilities research toward effective conservation techniques for our endangered species.
5. Finally, teachers at all levels should pay *s* attention to field tripe to zoological/botanical gardens and other wildlife conservation facilities. This will offer the students oppunity to observe and appreciate these plant/animal species in their natural habitats. This will further enhance students understanding 'of the theoretical courses.

Conclusion

The direct valve of biodiversity is the observable services of individual wild species. Wild species are the best source of new medicines to treat human illnesses. Wild species also have agricultural valve. Domesticated plants and animals are derived from wild species; and they are a source of genes for the improvement of their phenotypes. Instead of pesticides, wild species can be used as biological controls, and most flowering plants make use of animal pollinators. Much of our food, particularly fish,

and shellfish, are still caught in the wild. Hardwood trees from natural forests supply us with lumber for various purposes, such as the making of furniture.

The indirect services provided by ecosystems are largely unseen but absolutely necessary to our well-being. These services include the workings of biogeochemical cycles, waste disposal, provision of fresh water, prevention of soil erosion, and regulation of climate. Many people enjoy vacationing in natural settings. Various studies show that more diverse ecosystems function better than less diverse ones. In view of the enormous value of wildlife to humanity, we expect that with the concerted effort of government, educators at all levels, as well as other stakeholders, conservation of our endangered species would be attainable.

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