

# Sustaining Wild Species

*tutorial by Paul Rich*

# Outline

## 1. Why Preserve Wild Species?

economic, medical, scientific, ecological, aesthetic, recreational, ethical reasons

## 2. Current Crisis of Extinction

background vs. mass extinction, endangered & threatened species

## 3. Causes of Depletion & Extinction

root causes, habitat loss, overexploitation, poaching

## 4. Protecting Wild Species

bioinformatics, treaties, laws, Endangered Species Act, refuges, zoos

## 5. Case Studies

migratory birds, fisheries, whales

# 1. Why Preserve Wild Species?

*Why should we work to prevent the premature extinction of wild species?*

- **economic & medical importance:** wild plants & animals provide a huge number of economic products & medicines;
- **scientific & ecological importance:** scientific understanding comes from study of wild species; ecological services include nutrient recycling, watershed value, production of oxygen, moderating climate, & detoxifying toxic substances;
- **aesthetic & recreational importance:** source of beauty, wonder, inspiration, & enjoyment;
- **ethical importance:** some believe that each species has an inherent right to exist.

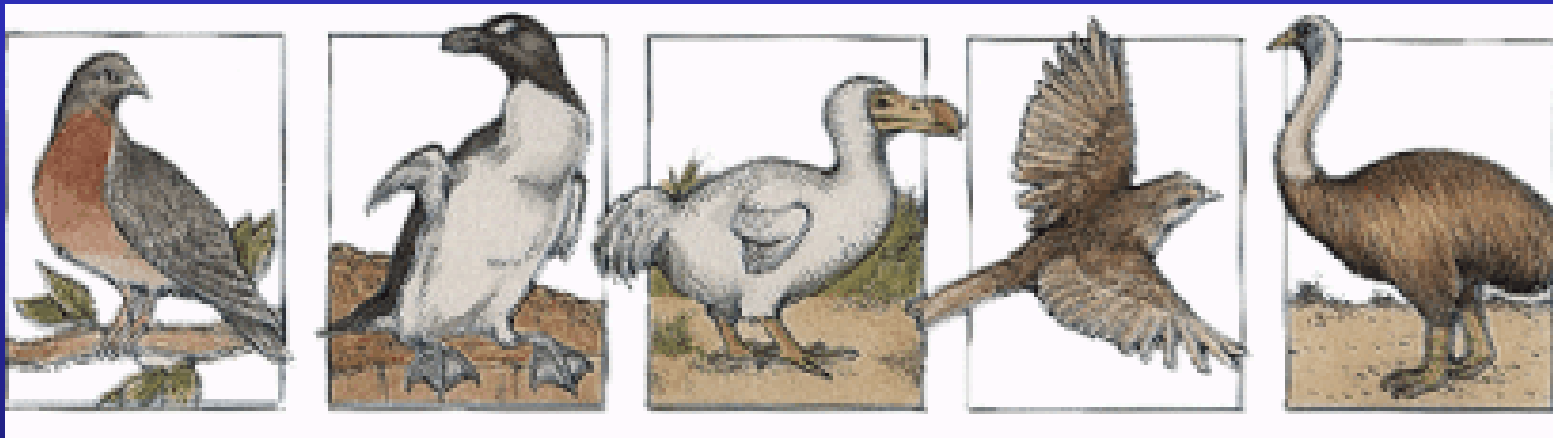
## 2. Current Crisis of Extinction

*Why do conservation biologist believe there is a mass extinction crisis?*

- **background** or **natural rate of extinction** can be observed in the fossil record;
- **mass extinction** events, involving widespread extinction of large numbers of species, have been observed to occur five times in the fossil record (20 to 60 million years apart);
- about 1.75 million species have been identified; estimates that as many of 100 million species exist;
- while difficult to document, estimates show that humans are causing extinction rates much higher than background rates, such that there is a crisis.

# Human Caused Extinction

*Various species have become extinct because of human activities.*



passenger  
pigeon

great  
auk

dodo

bushy  
seaside  
sparrow

*Aepyornis*  
(Madagascar)

Fig. 25–3

# Threatened & Endangered Species

*What are threatened & endangered species?*

- biologists distinguish three levels of extinction:
  - **local extinction:** when a species is no longer found in area it once inhabited, but is still found elsewhere;
  - **ecological extinction:** when so few individuals exist that a species no longer plays a significant ecological role;
  - **biological extinction:** when individuals of a species exist no longer exist.
- the Endangered Species Act requires listing & protection of two categories of species:
  - **endangered species:** a species with so few individuals that it could soon become extinct over all or most of its range;
  - **threatened species:** a species that is still abundant in its natural range, but declining such that it is likely to become endangered.

# Threatened & Endangered Species

*Some species that are endangered or threatened because of human activities. Populations of some species are recovering (such as the bald eagle & peregrine falcon).*

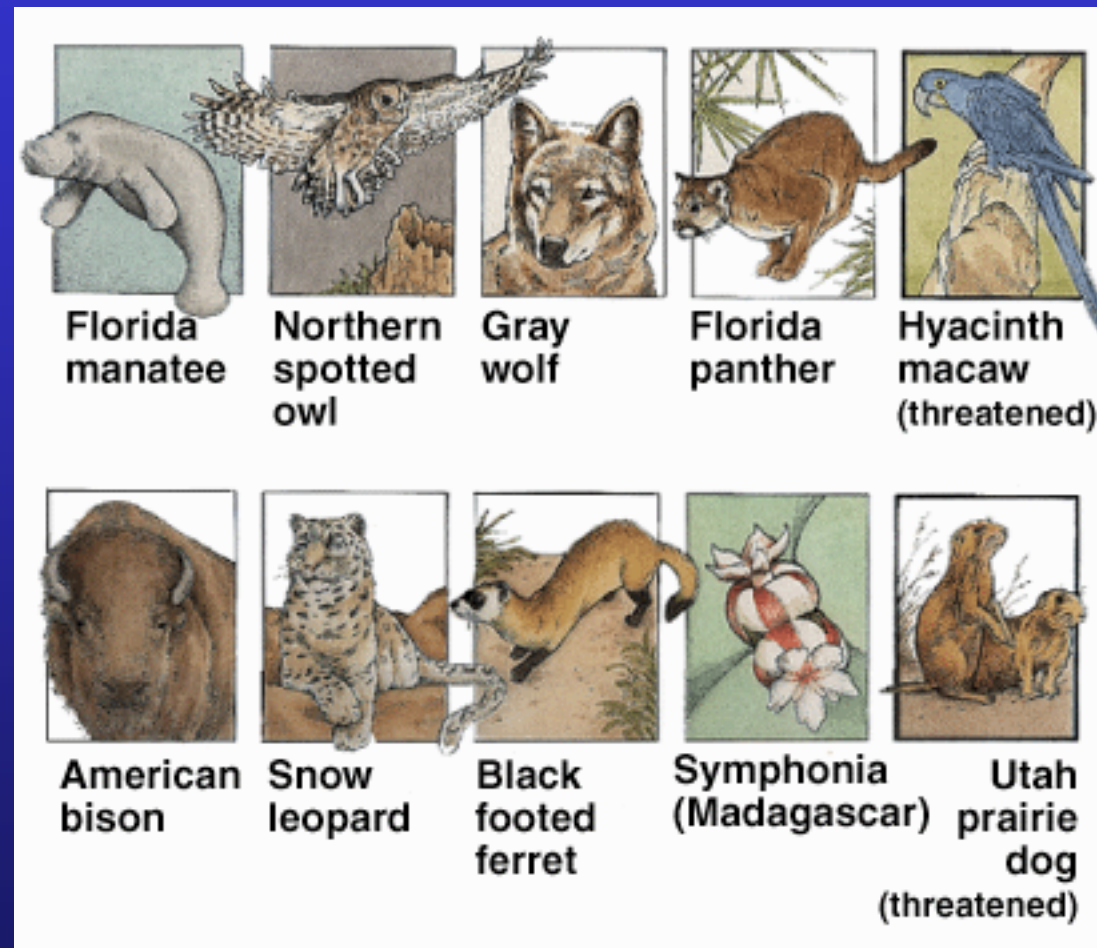


Fig. 25-4

# Threatened & Endangered Species

*More species that are endangered or threatened because of human activities.*

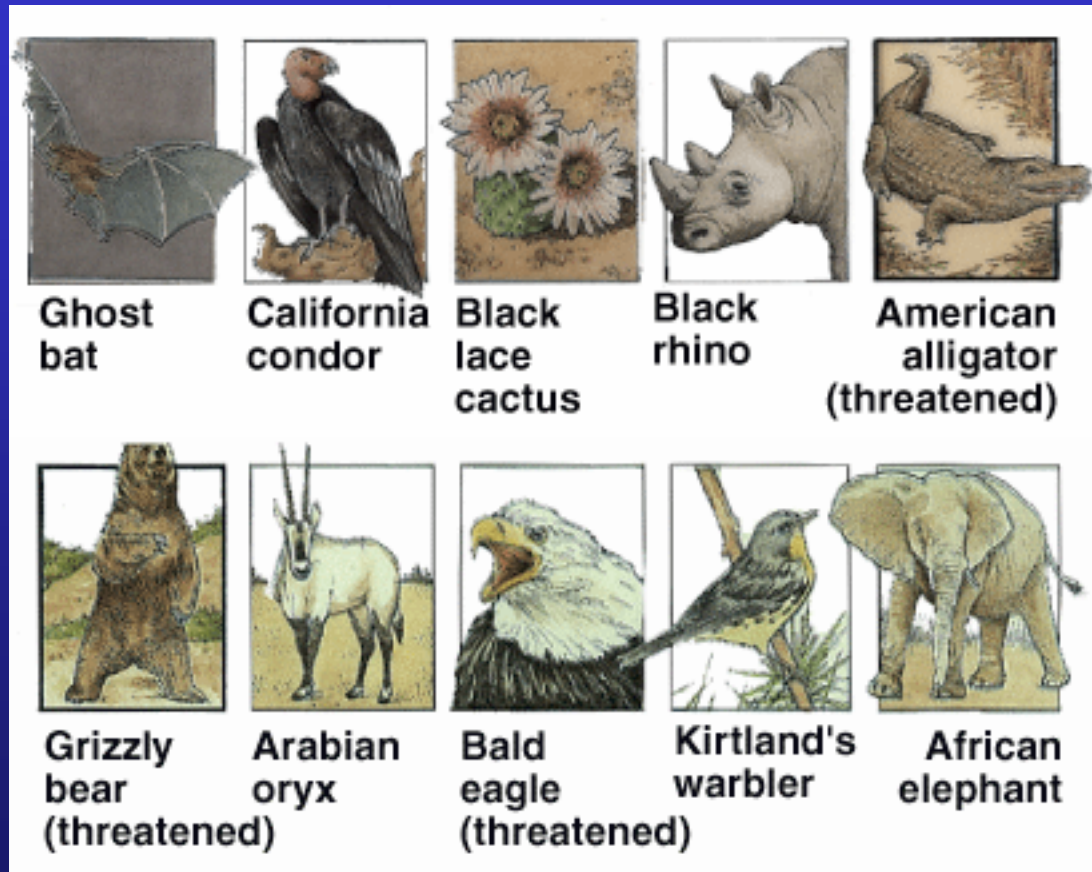


Fig. 25-4



# Threatened & Endangered Species

*Still more species that are endangered or threatened because of human activities.*

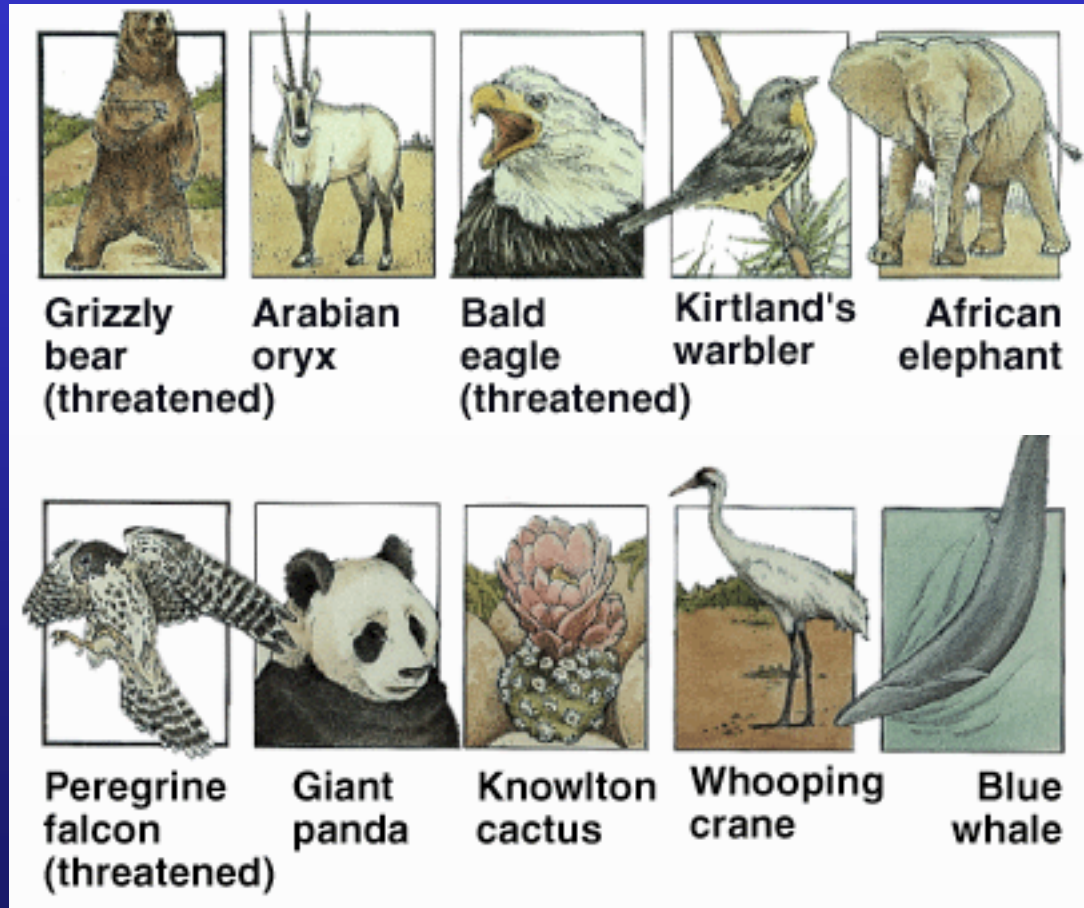


Fig. 25-4

# Threatened & Endangered Species

*Some characteristics of extinction-prone species:*

- low reproductive rate (e.g., blue whale, California condor);
- specialized feeding habits (e.g., giant panda)
- feed at high trophic level (e.g., Bengal tiger)
- large size (e.g., Asian elephant)
- limited breeding area (e.g., green sea turtle)
- limited distribution (e.g., woodland caribou)
- fixed migratory patterns (e.g., whooping crane)
- preys on livestock (e.g., timber wolf)
- behaviors that contribute to extinction (e.g., Carolina parakeet, when one bird shot others hover over body)

# Threatened & Endangered Species

*Worldwide about 25% of mammals are at risk of extinction. The highest percentages at risk are apes & monkeys (46%), moles & shrews (36%), & antelopes & cattle (33%).*

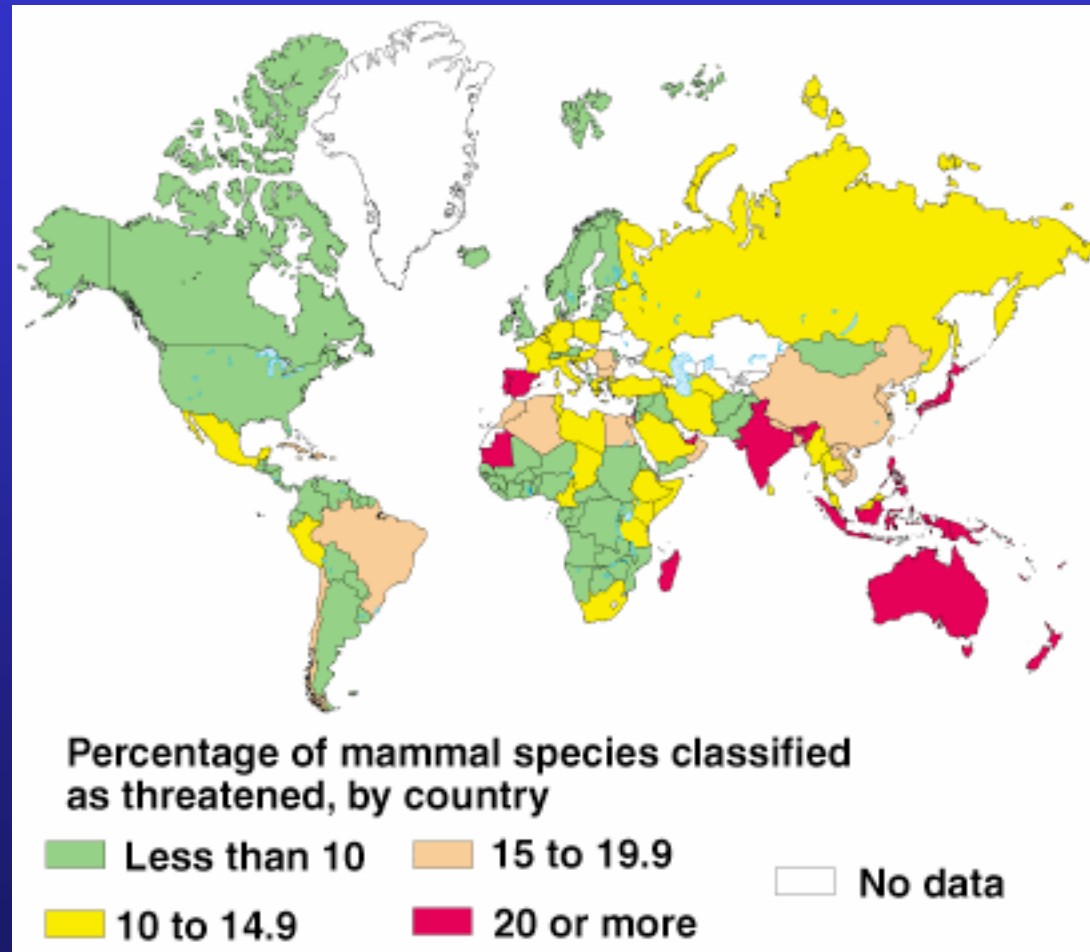


Fig. 25–5

# Threatened & Endangered Species

*Estimated number of species extinctions of plants & animals by state in the lower 48 states. Alabama leads in extinct species.*

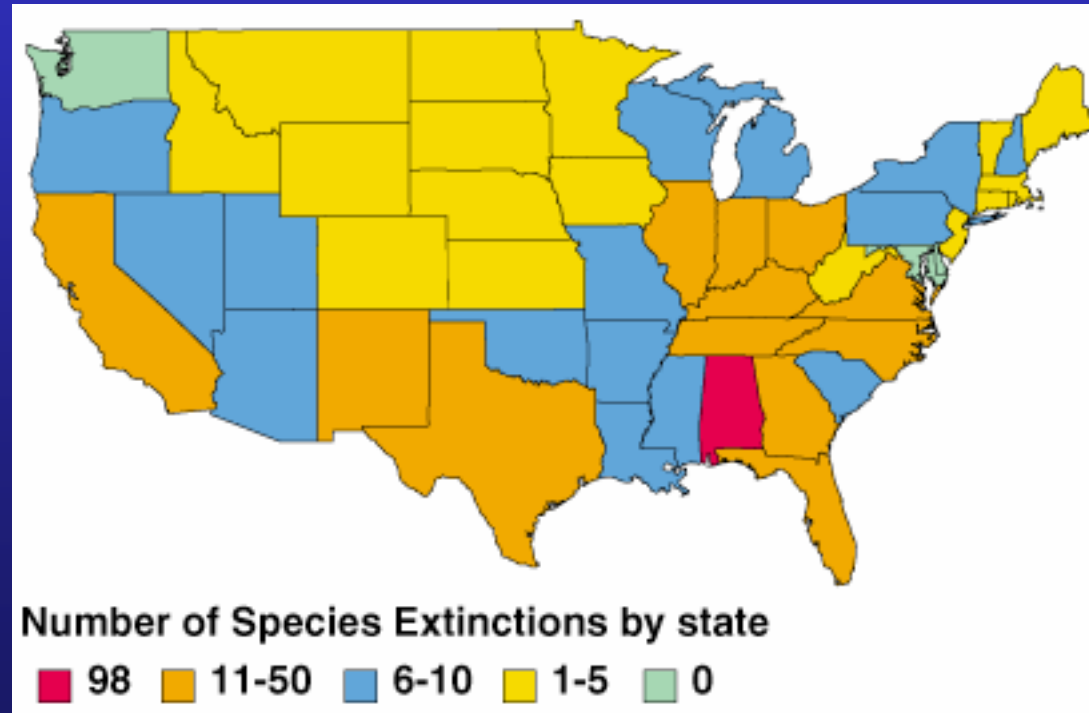


Fig. 25-6

# 3. Causes of Extinction & Depletion

## Root causes:

- human population growth;
- economic systems & policies that fail to value the environment & promote exploitation;
- greater per capita resource use as a result of economic growth.

## Direct causes:

- habitat loss & degradation;
- habitat fragmentation;
- commercial hunting & poaching;
- overfishing;
- predator & pest control;
- sale of exotic pets & decorative plants;
- climate change & pollution;
- deliberate or accidental introduction of nonnative species.

# Causes of Extinction & Depletion

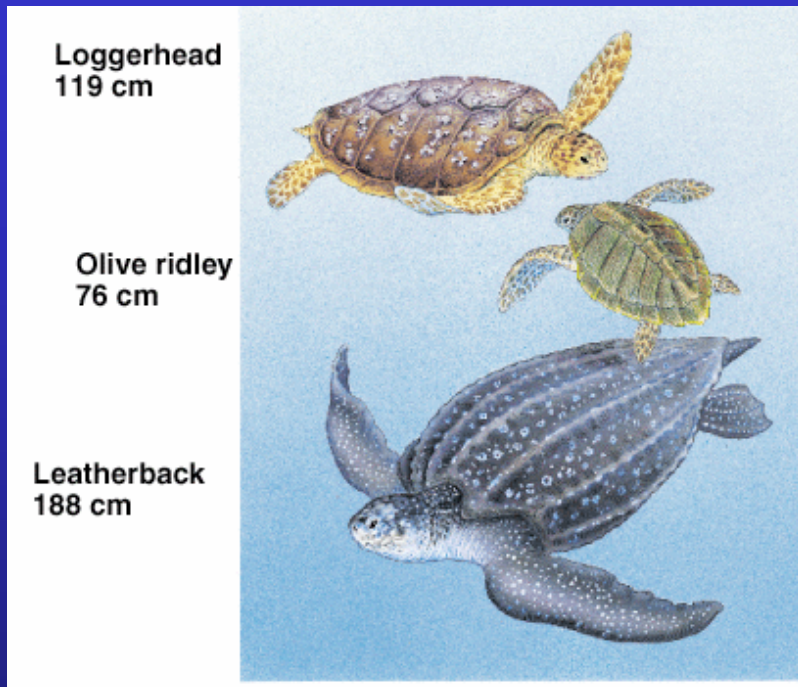
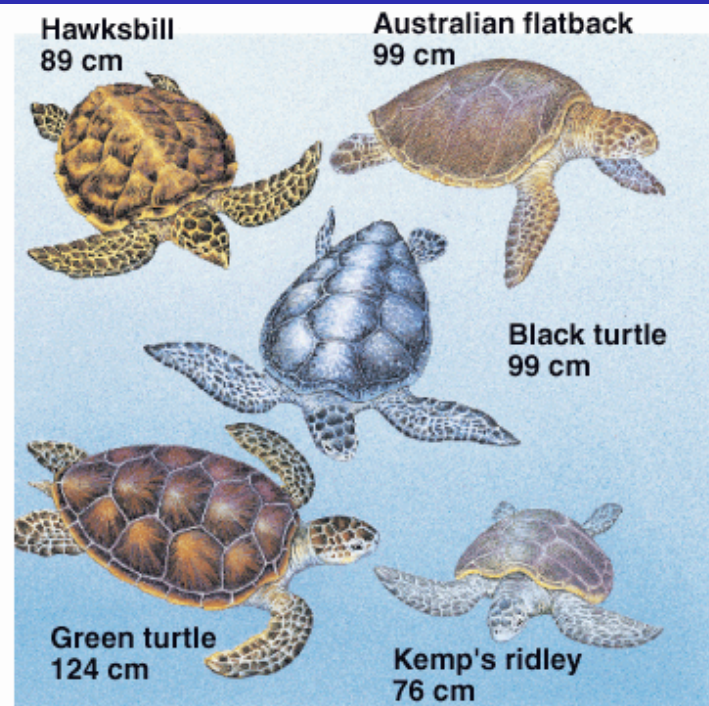


Fig. 25-13



*Many species of sea turtles are becoming endangered because of loss of beach habitat for laying eggs, taking of eggs for food, & unintentional capture by fishing boats.*

# Causes of Extinction & Depletion

*Deliberate or accidental introduction of nonnative species is the second biggest cause of animal & plant extinctions (after habitat loss & degradation).*

- example: introduction of fire ants in 1930s from South America to Alabama; subsequently spread throughout south, Texas, & various states in western U.S.; where established up to 90% of local ant populations reduced or eliminated;
- example: introduction to Great Lakes of zebra mussels from Europe & quagga mussels from Russia (in ship ballast water) has depleted food for other lake species & caused major property damage.

(see table 25–2)

# 4. Protecting Wild Species

*Three approaches to protecting wild species:*

- **ecosystem approach:** aims to preserve balanced populations of species in their native habitats;
- **species approach:** based on identifying & protecting endangered species on a case-by-case basis;
- **wildlife management approach:** manages game species for sustained yield.



# Protecting Wild Species

***Bioinformatics** is the applied science of managing, analyzing, & communicating biological information.*

- **building computer databases** to organize & store useful biodiversity information;
- **providing computer tools** to find, visualize, & analyze biodiversity information;
- **providing means for communicating** biodiversity information, especially using the internet.

# Protecting Wild Species

*The **Endangered Species Act (ESA)** of 1973 authorizes the listing & protection of threatened & endangered species & subspecies.*

- National Marine Fisheries Service (NMFS) charged with listing & protection of marine species;
- U.S. Fish & Wildlife Service charged with listing & protection of all other species;
- since 1975 intense efforts have attempted to weaken the ESA;
- ESA is still one of the most powerful means for protecting wild species.

# 5. Case Studies

*Reduction in the ranges of four mammals have resulted from a combination of habitat loss & hunting.*

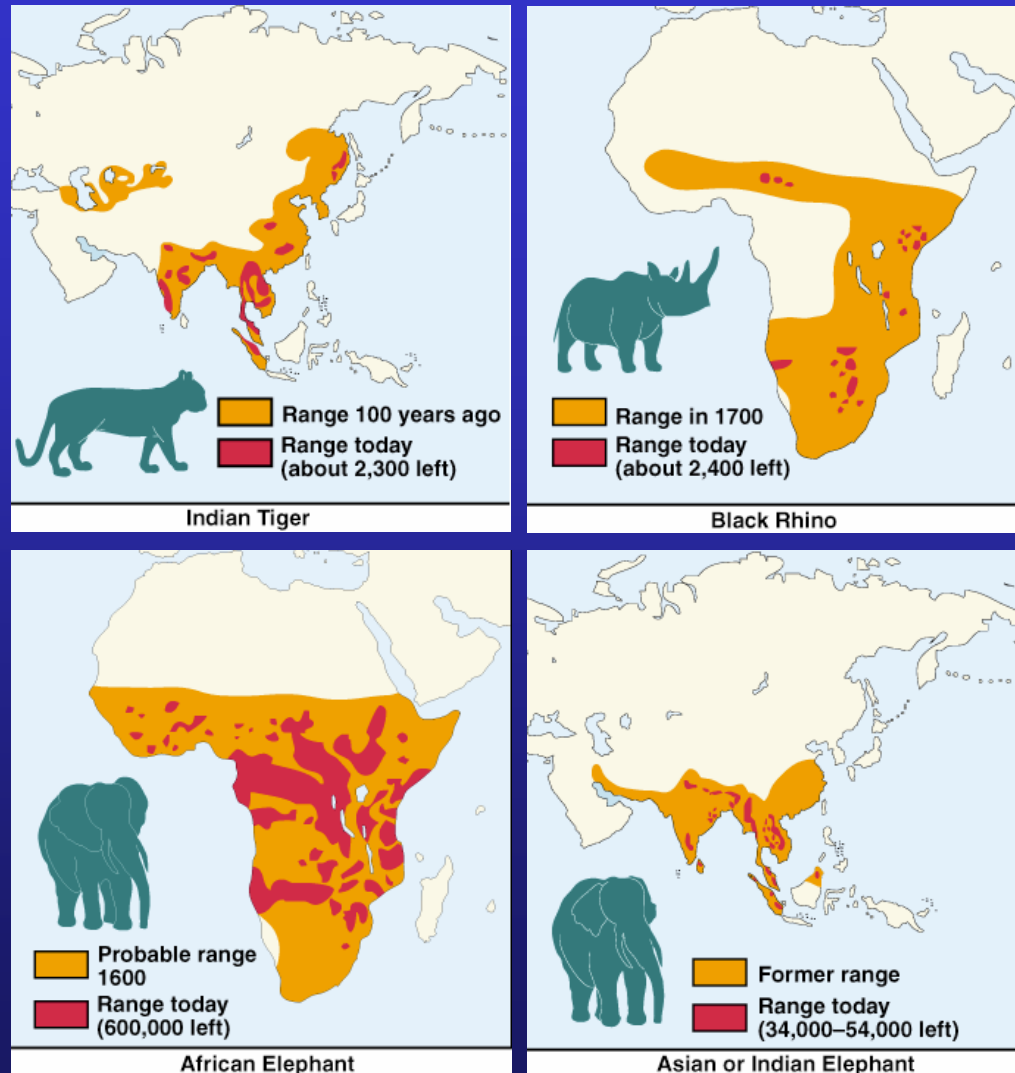


Fig. 25–8

# Case Studies

*In recent years overfishing has become an increasing threat to aquatic biodiversity.*

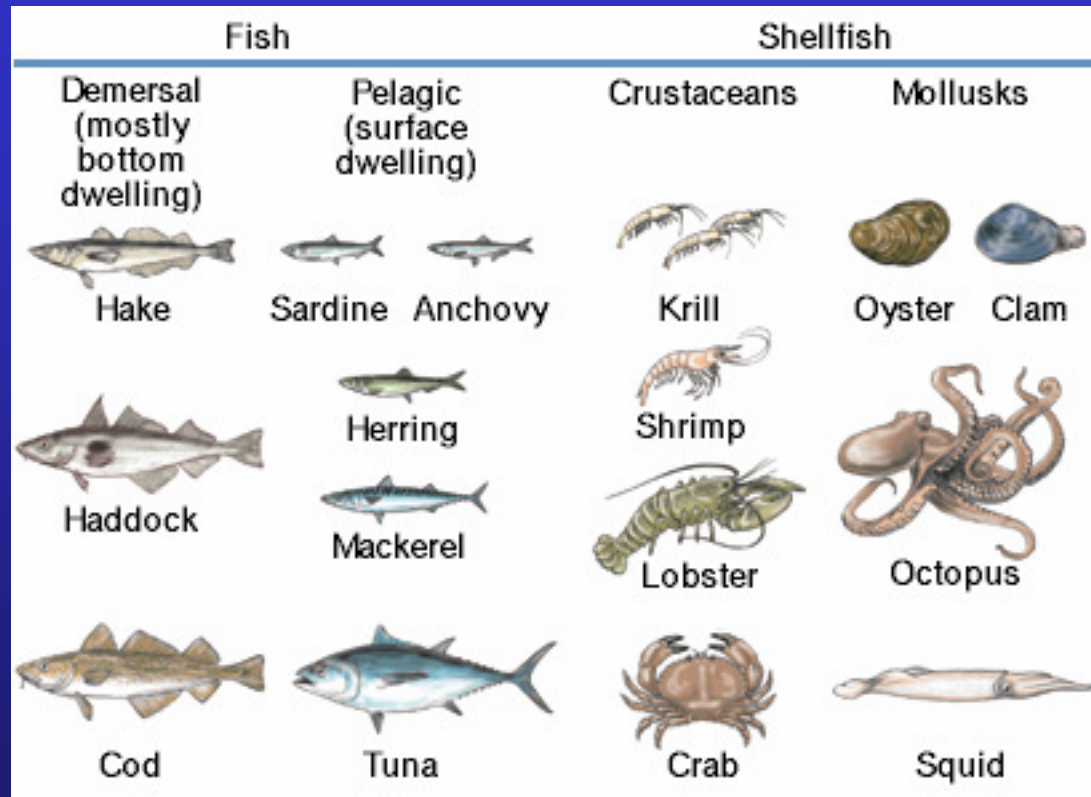


Fig. 25–11

# Case Studies

*Major commercial fishing methods. Modern methods enable increasing harvest of decreasing populations.*

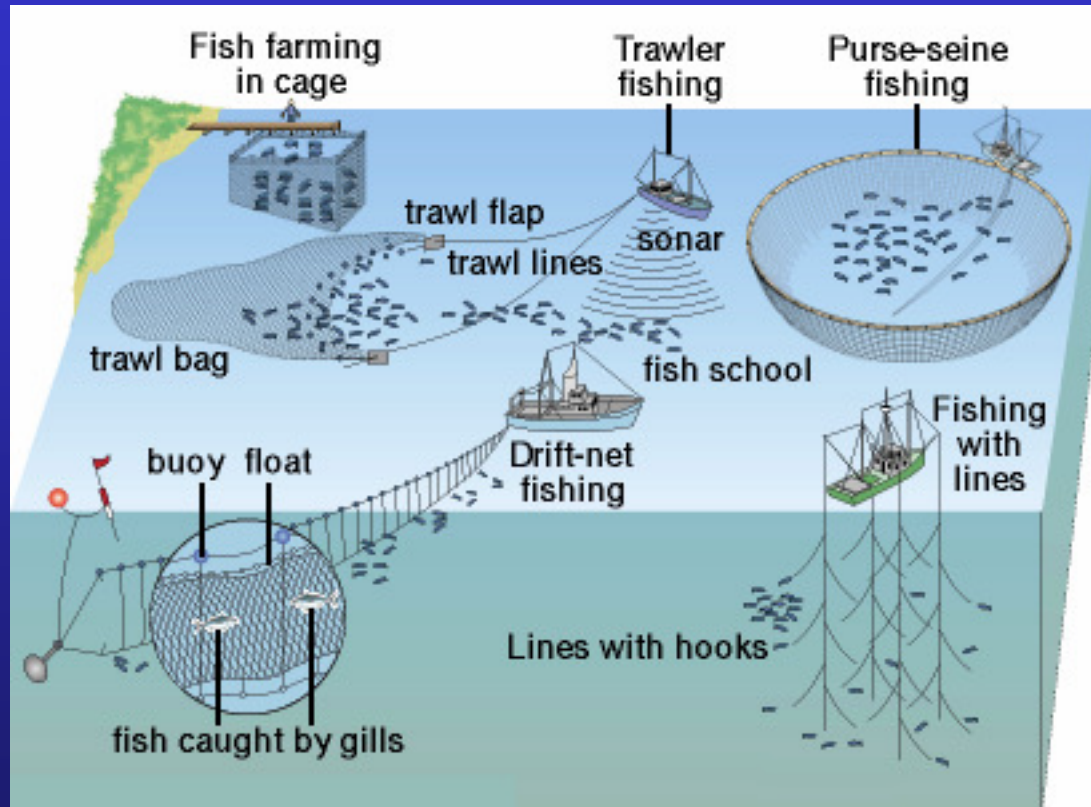


Fig. 25-12

# Case Studies

*The major flyways used by migratory birds, mostly waterfowl. Managing populations of waterfowl requires multinational efforts to protect habitats along the flyways.*



Fig. 25–19

# Case Studies

*Populations of cetaceans (whales & dolphins) have been depleted & many species are threatened or endangered.*

*Between 1995 & 1975 overharvest drove 8 of 11 major whale populations to commercial extinction. Populations are in process of recovering.*

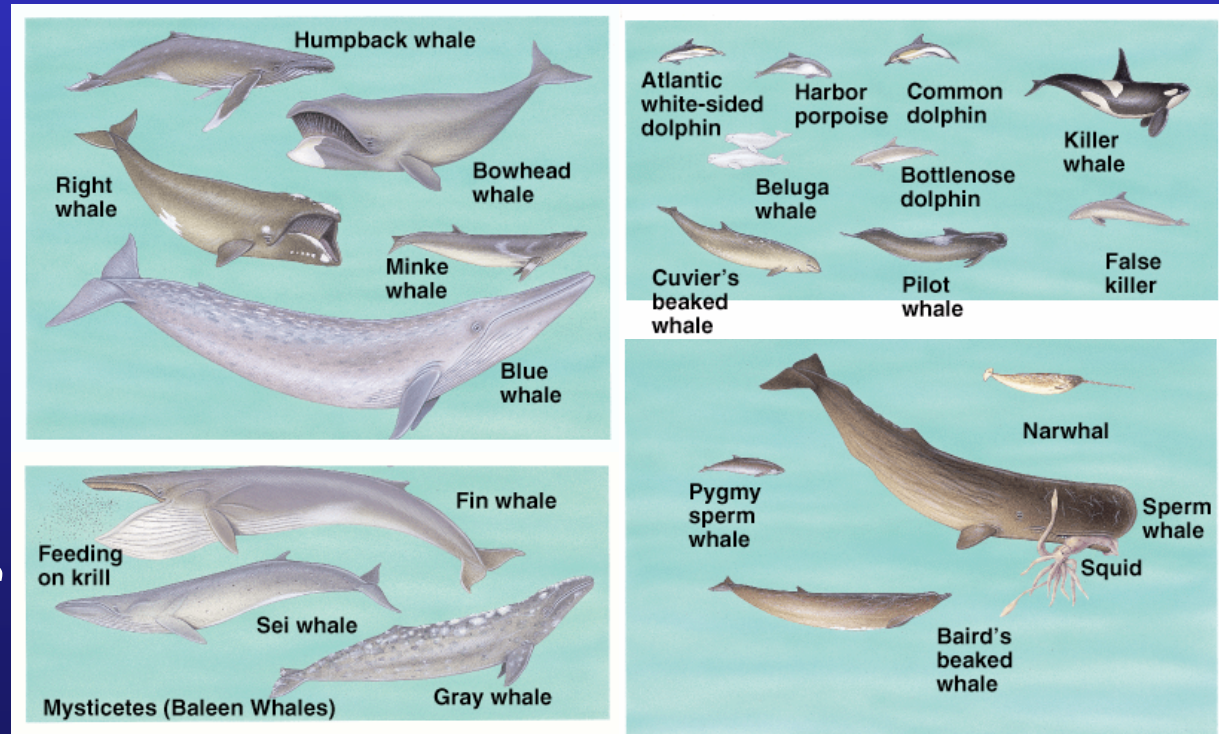


Fig. 25–20