

Fragmentation and Overexploitation

Preview

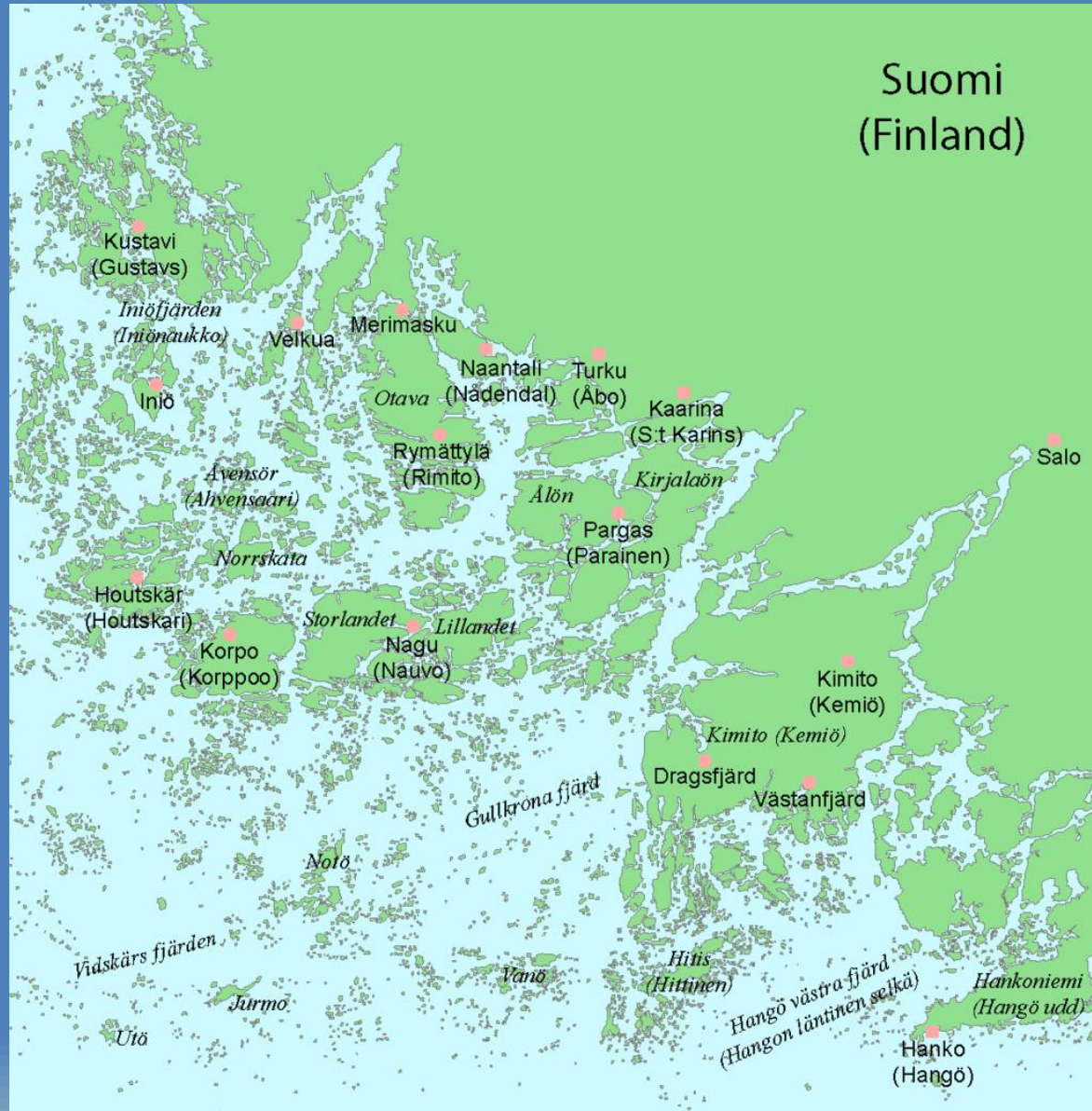
1. Habitat Fragmentation
2. Exploitation

1.

Habitat Fragmentation

- The breaking up of the landscape into small, isolated patches
- Islands
 - Islands have different:
 - Size
 - Age
 - Distance from other islands/land
 - Provide a working example of isolation
 - Dependent on spatial scale

1.



Archipelago Sea, Finland

1.



Flint Hills, Kansas

1.

A

Image © 2013 DigitalGlobe

Google earth

SW Calgary

1.



SW Calgary

1.



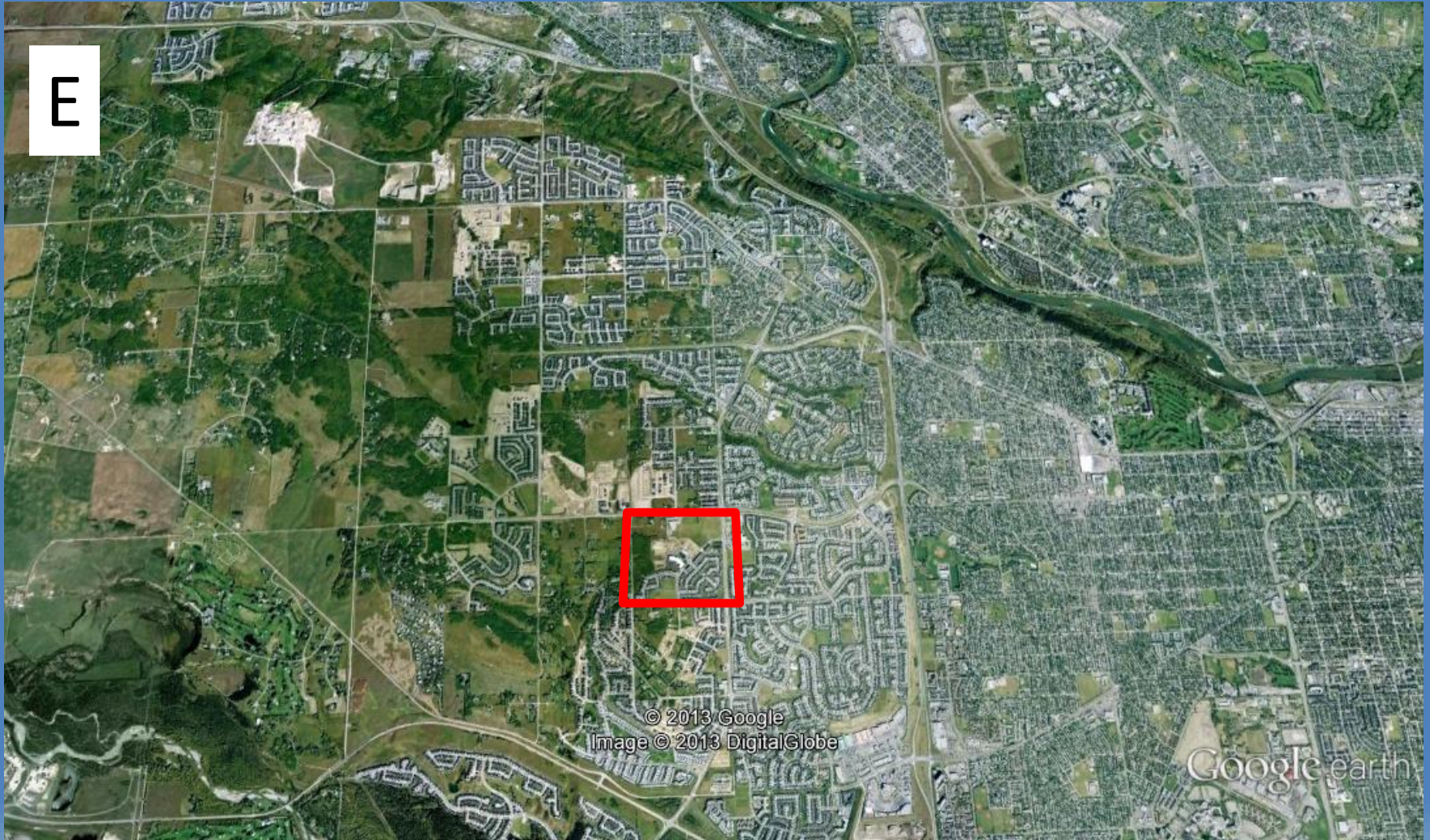
SW Calgary

1.



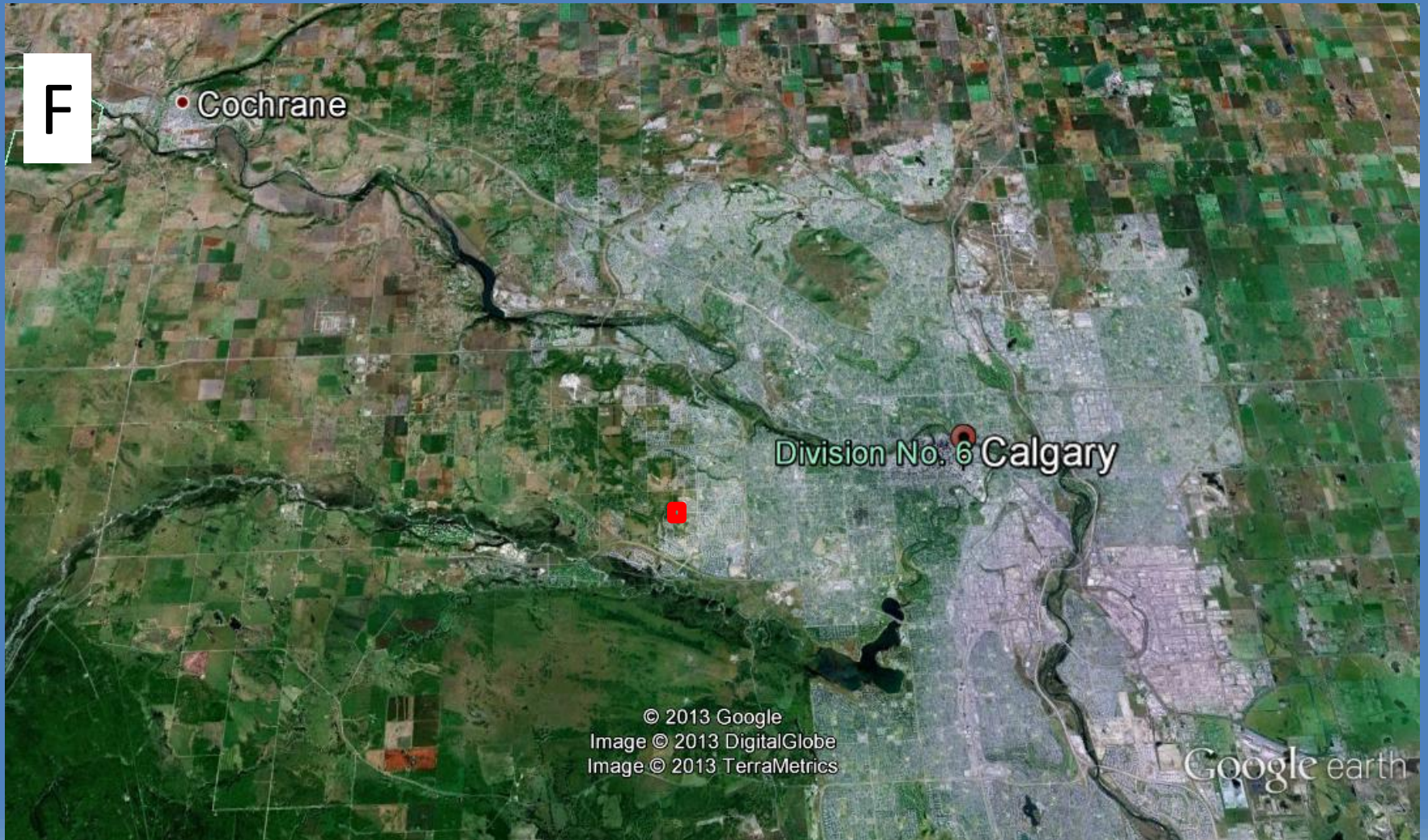
SW Calgary

1.



SW Calgary

1.



SW Calgary

1.

Habitat Fragmentation

- MacArthur and Wilson (1967)
 - Proposed island biogeography as model to explain observed patterns of species diversity on islands
 - Species richness a function of:
 - Immigration rate
 - Extinction rate

1.

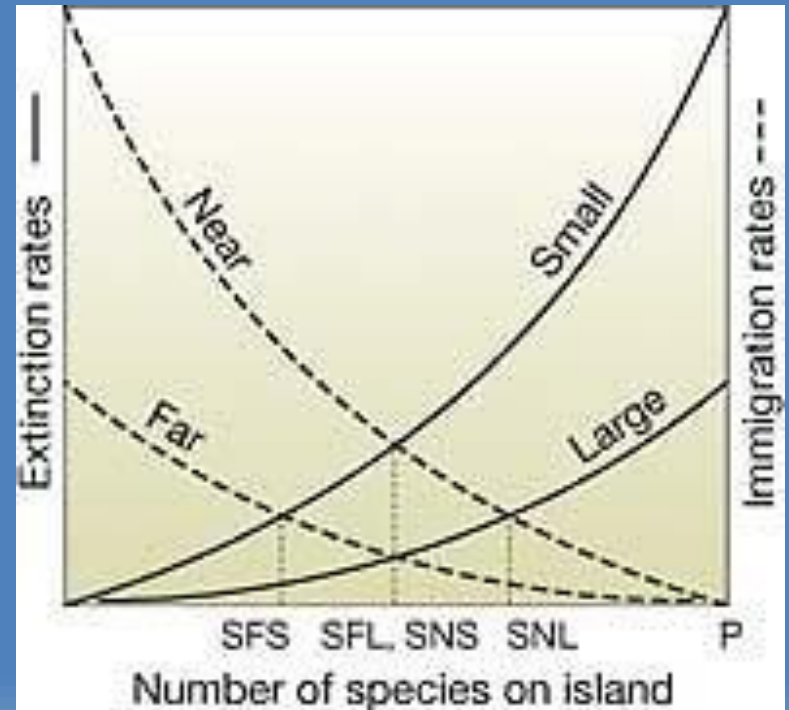
Habitat Fragmentation

- Immigration rate = Rate of arrival for NEW species to the island
- Extinction rate = rate at which species on island go extinct

1.

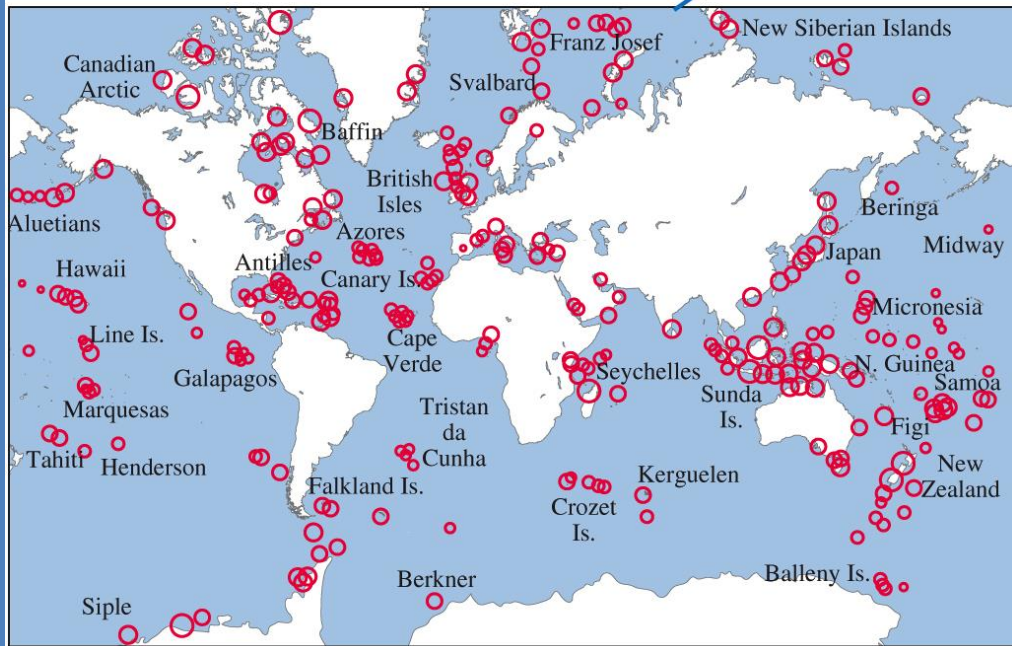
Point at which two lines cross:

- Predicted species richness for island
- Differs according to island size and isolation



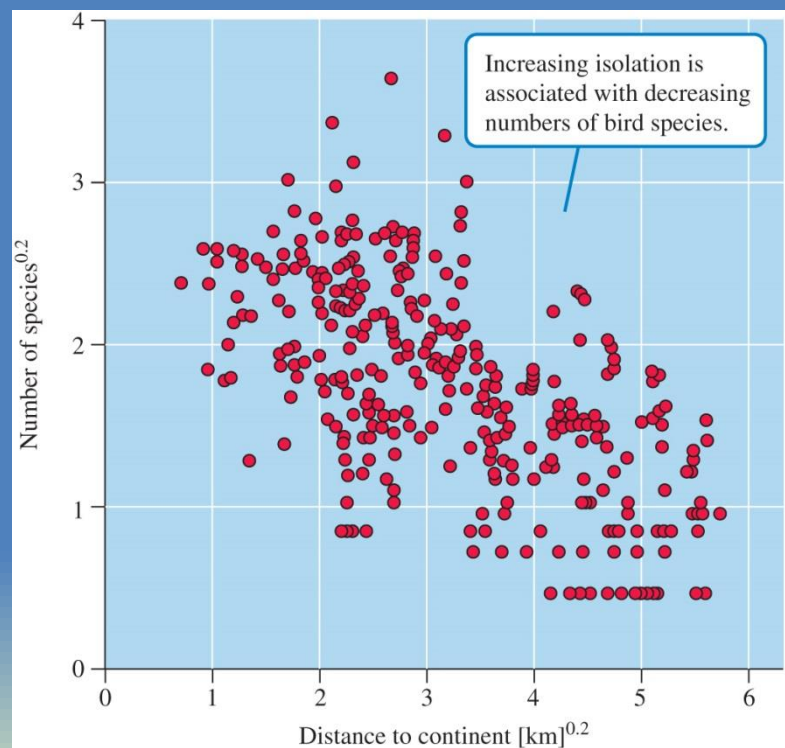
1.

Islands of different sizes were located at different distances from the nearest mainland.



Island area classes [km²]

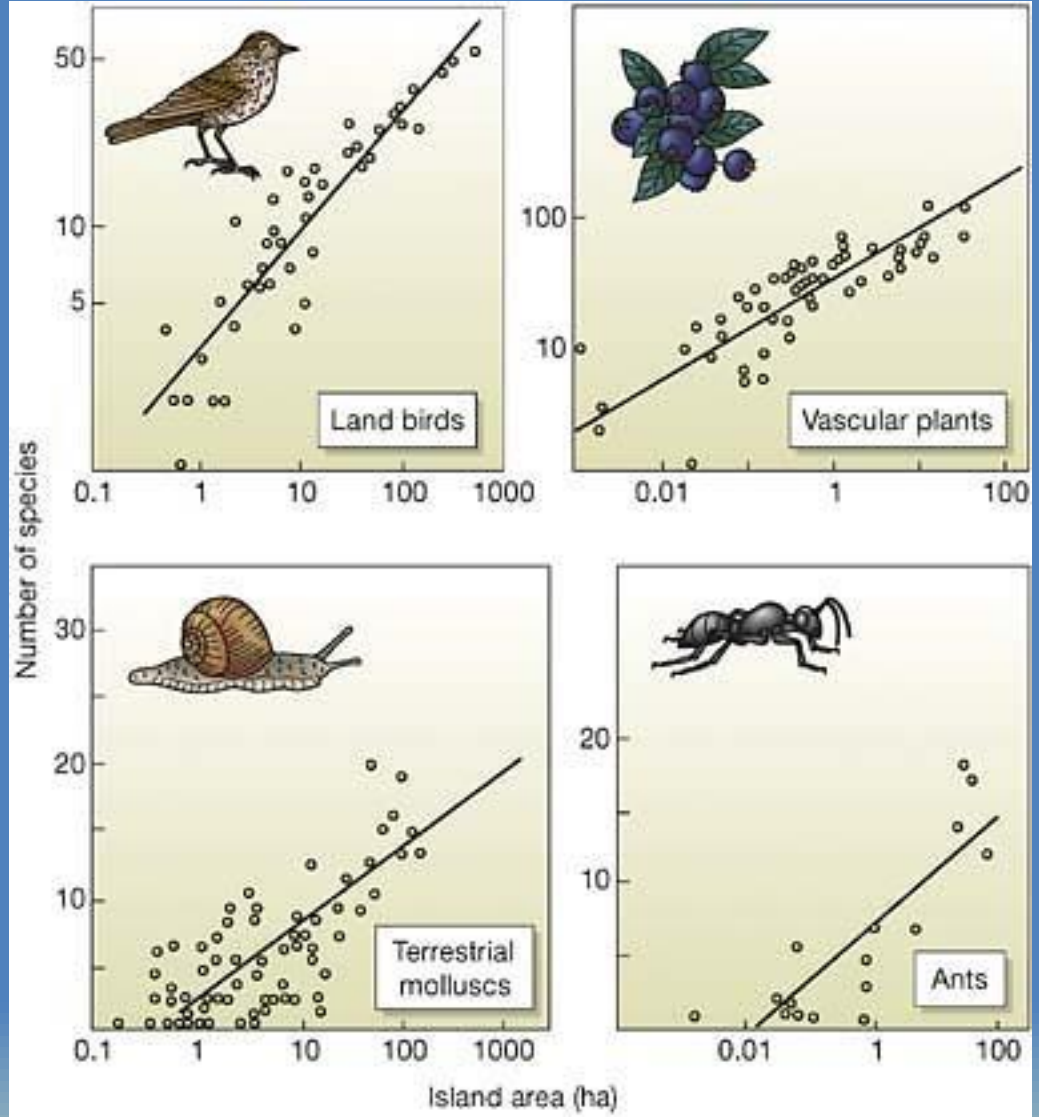
		<i>n</i>
○	> 100 000	15
○	10 000 – 99999	38
○	1000 – 9999	94
○	100 – 999	129
○	10 – 99	45
○	1.0 – 9.9	20
○	< 1.0	5



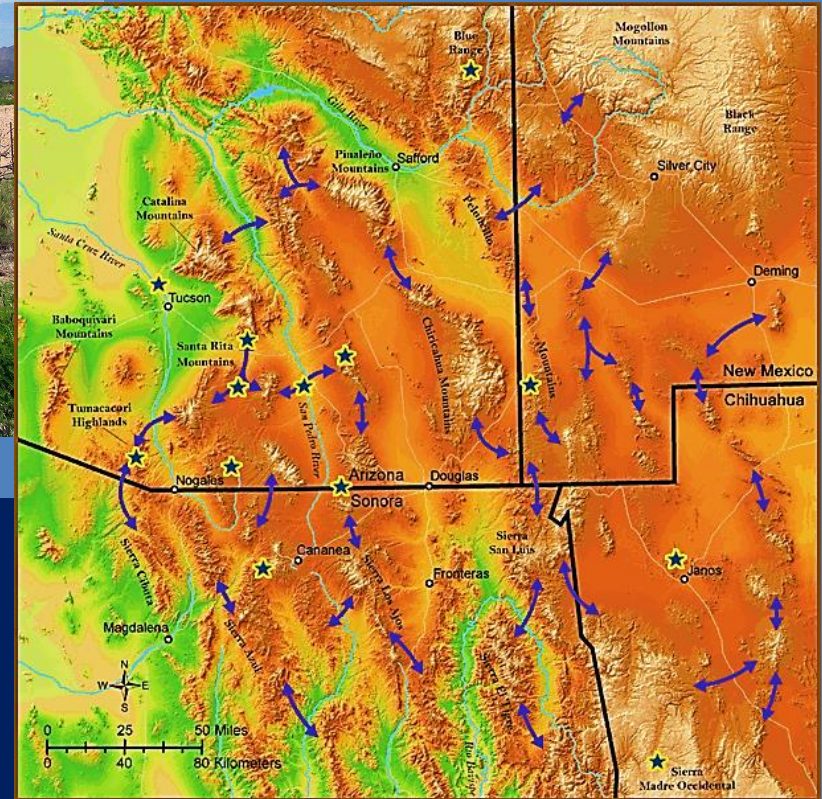
Island Size and Isolation

1.

- Similar relationships
- Different slopes



1.



High biodiversity

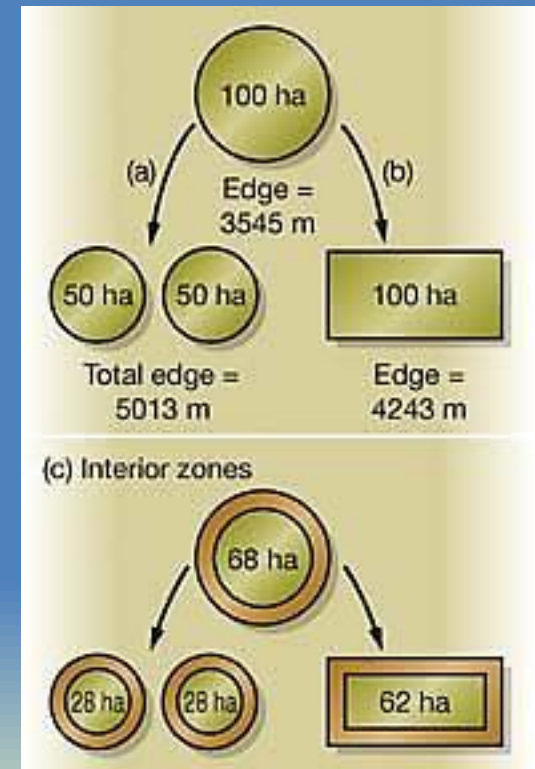
- Unique geology
- Climate/Topography
- Distance to other regions
- Future projections?

“Sky” Islands

1.

Habitat Fragmentation

- Why fragmentation stinks
 - Amount of edge
 - Area/perimeter ratio
 - Patch shape



1.

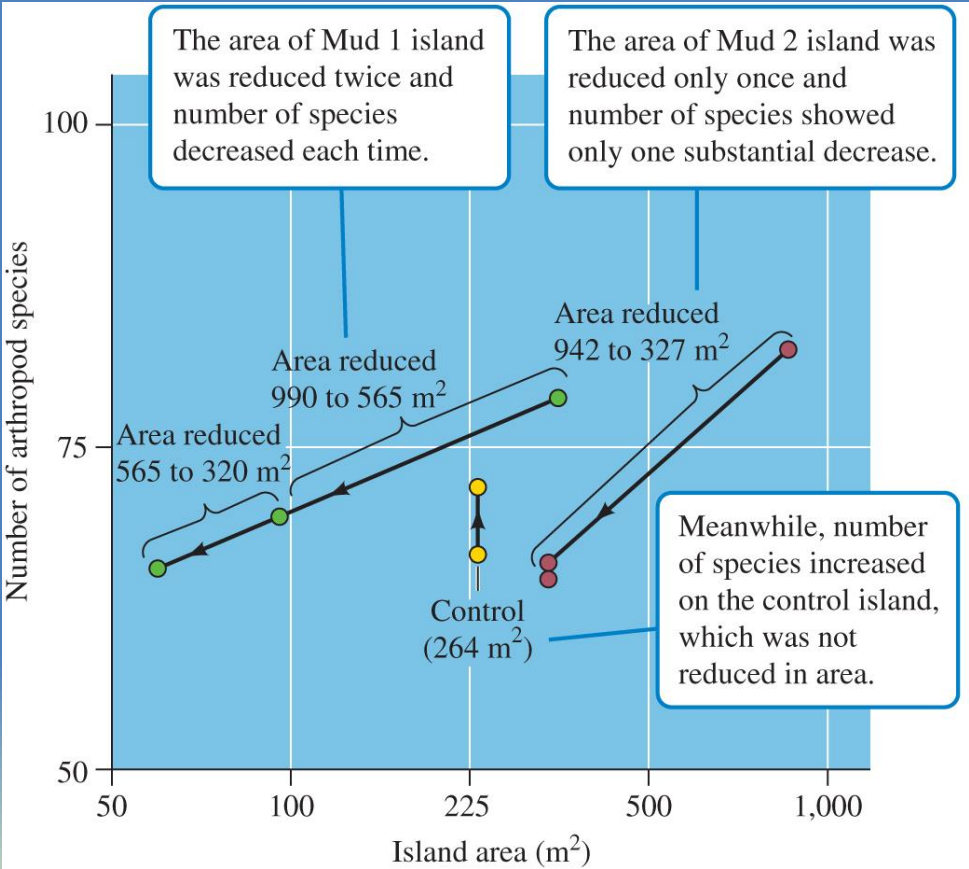
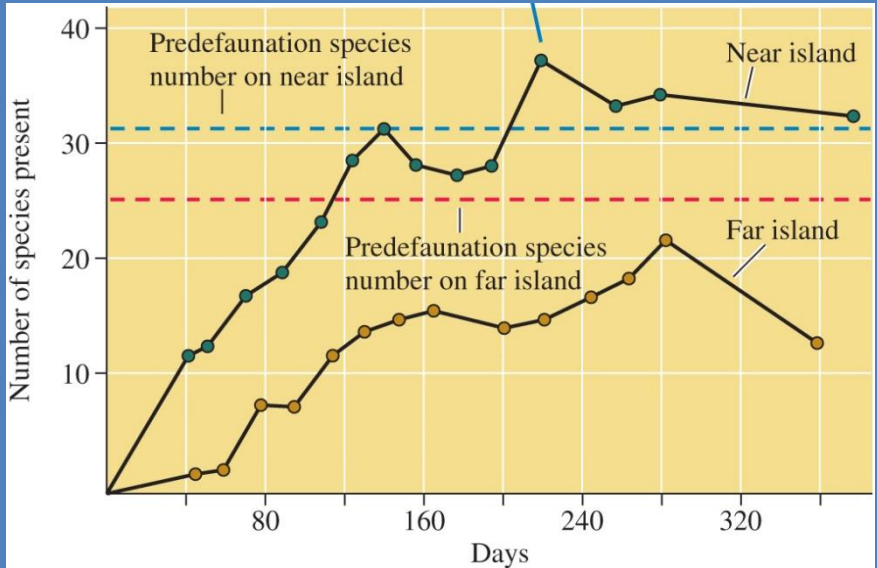
Habitat Fragmentation

- Simberloff and Wilson (1969; 1976)
 - Experimental evidence of island biogeography



1.

Island Isolation



Island Size

2.

Exploitation

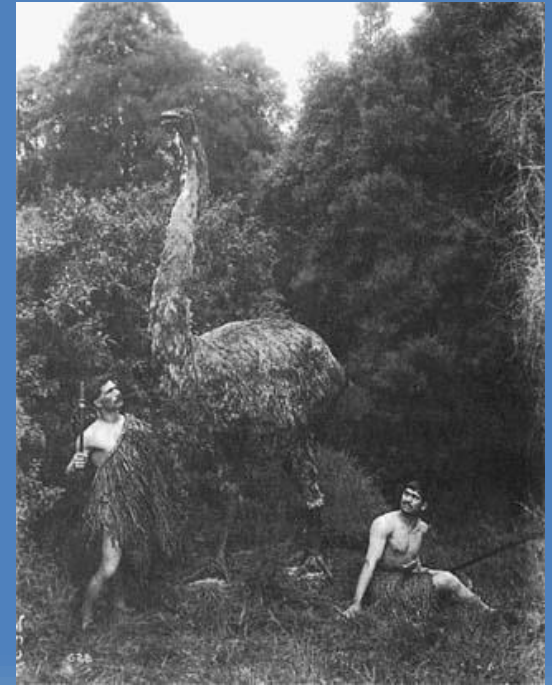
- Human overuse of a population of organisms such that it:
 - Threatens population viability
 - Alters its habitat



2.

Exploitation

- Where has it been documented?
 - Islands
 - New Zealand
 - Hawaii
 - Madagascar



2.

Exploitation

- Where has it been documented?
 - North America
 - Passenger pigeon
 - Carolina parakeet
 - Bison

2.

Exploitation

- Overhunting
 - Subsistence
 - Commercial
 - Recreational

2.

Exploitation

- Why is commercial hunting so enticing?
 - Markets exists
 - Exotic vs. domestic
 - Supply and demand
 - “Tragedy of the Commons”
 - Differences in currency

2.

Today



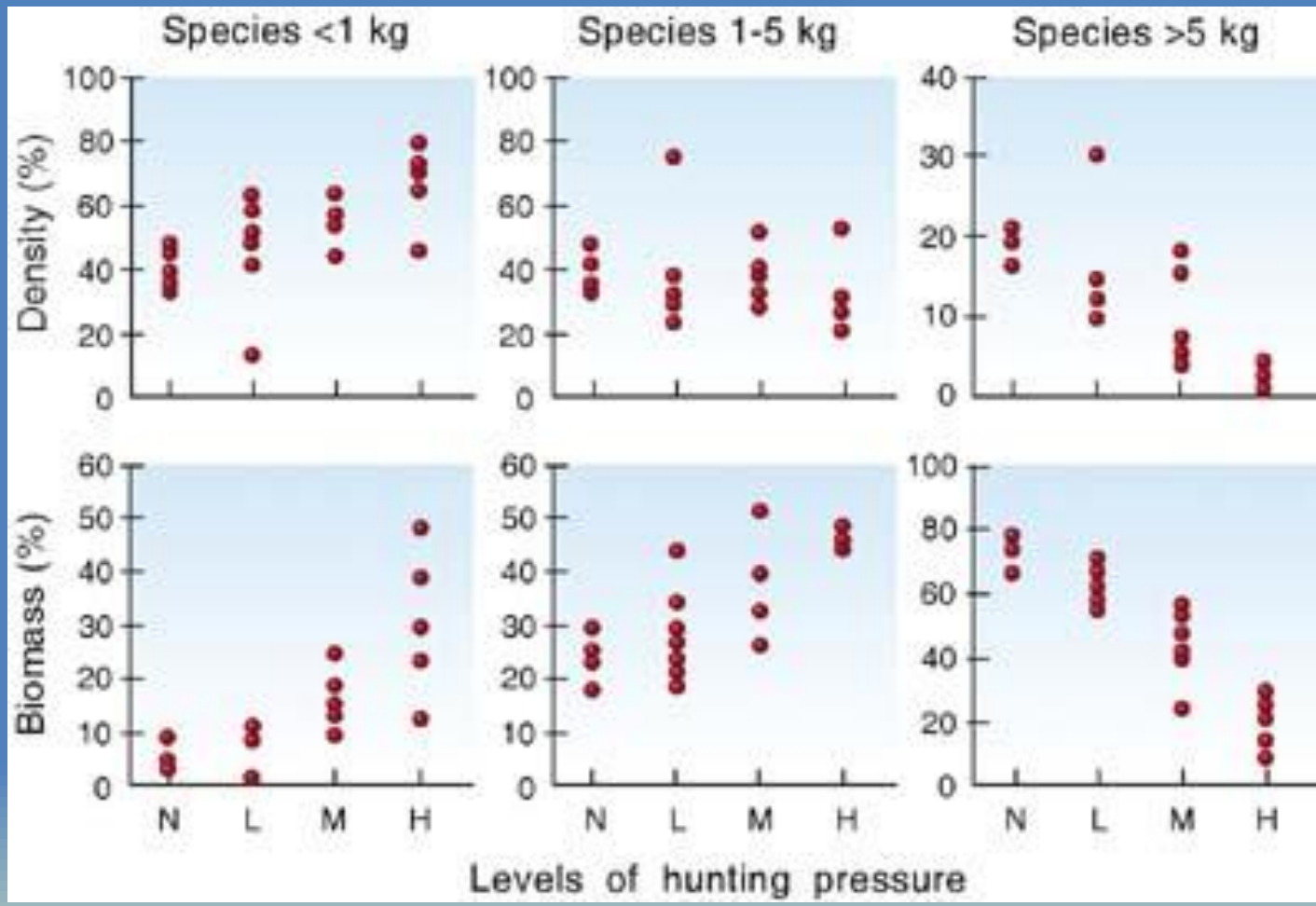
100 years ago



Punt Gun

2.

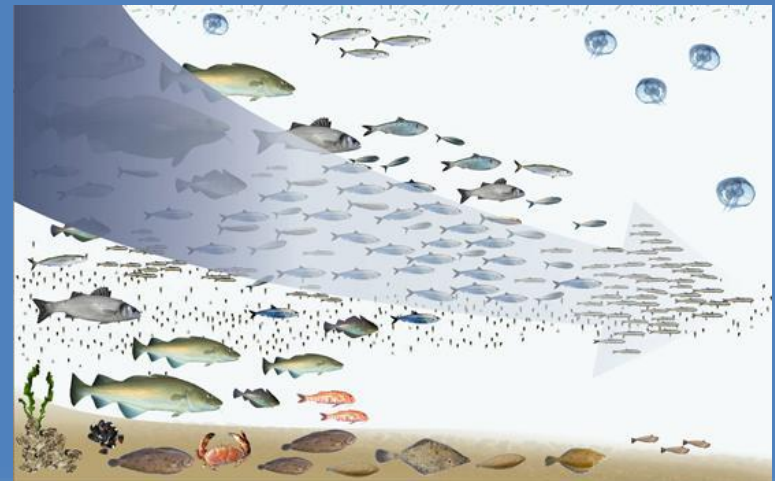
Effects of hunting pressure



2.

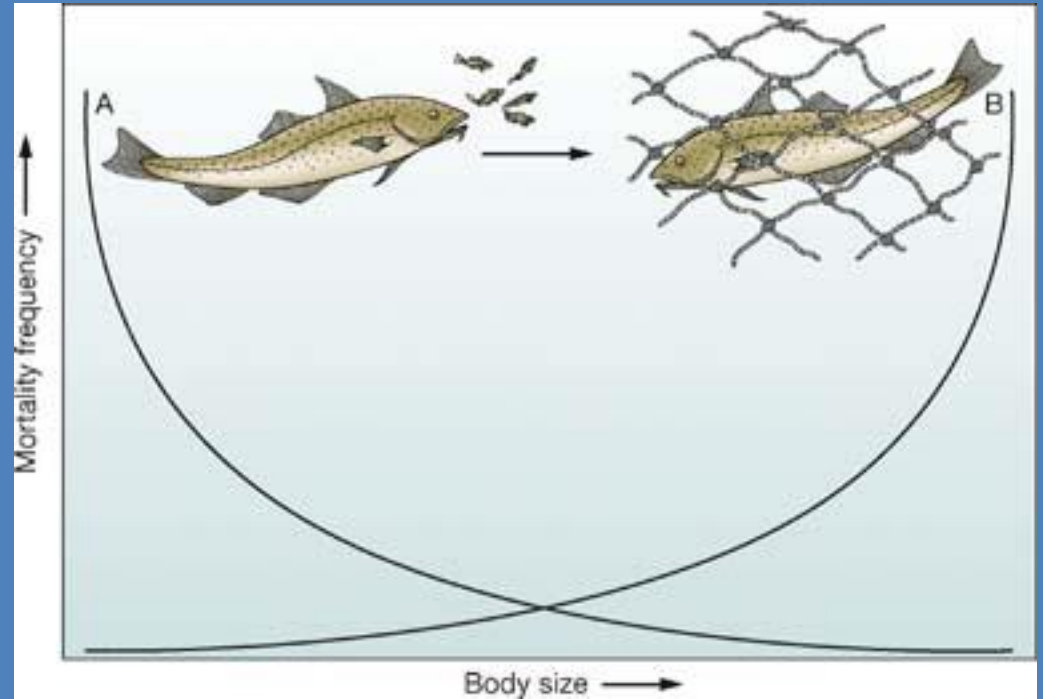
Exploitation

- Overfishing
 - 366 of 1519 species-area specific fisheries
 - Higher → lower trophic level
 - “fishing down the food web”



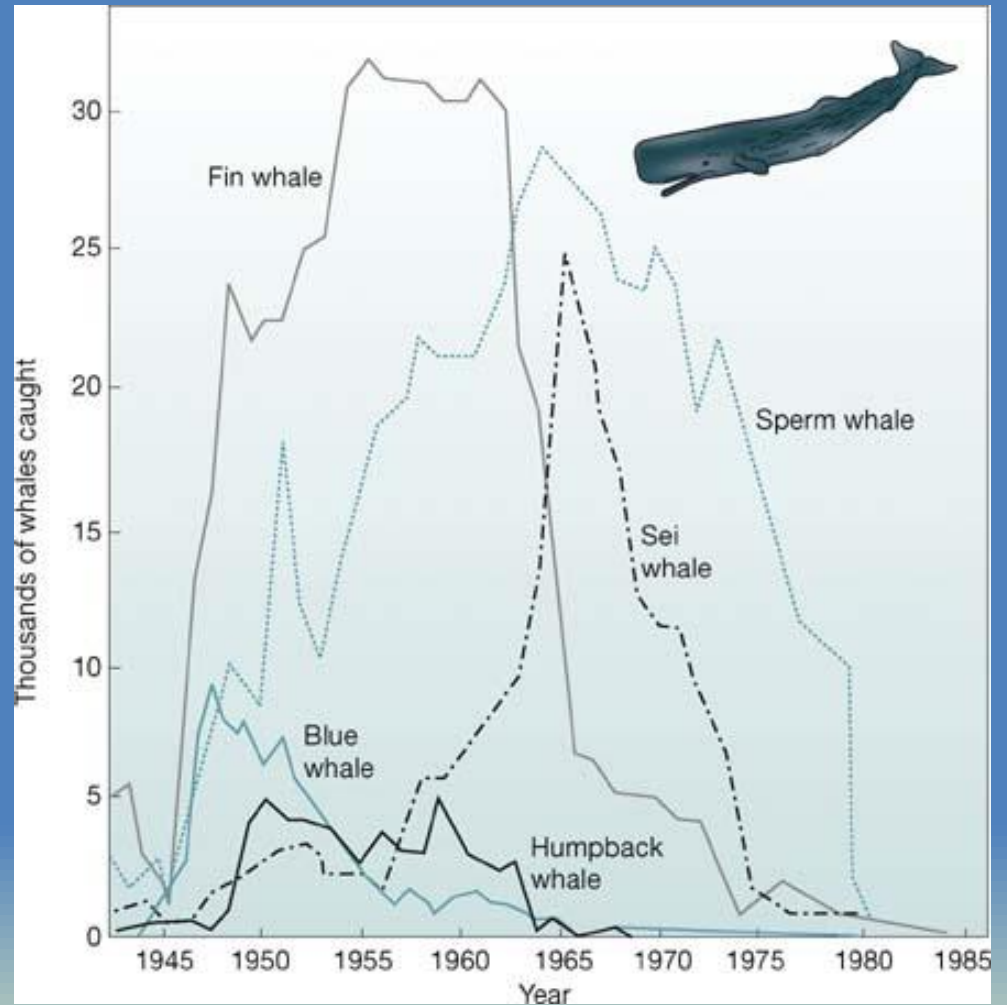
2.

Body size and fishing pressure



2.

Changes in Species Availability



2.

Exploitation

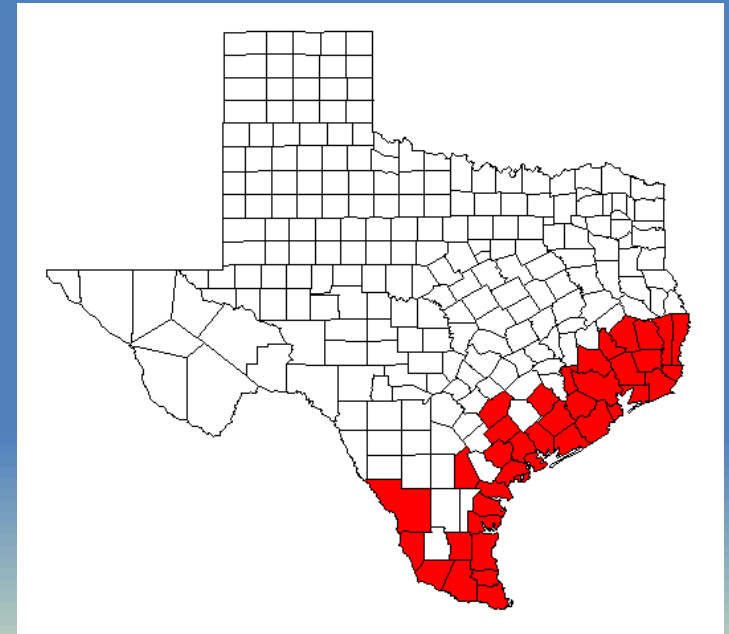
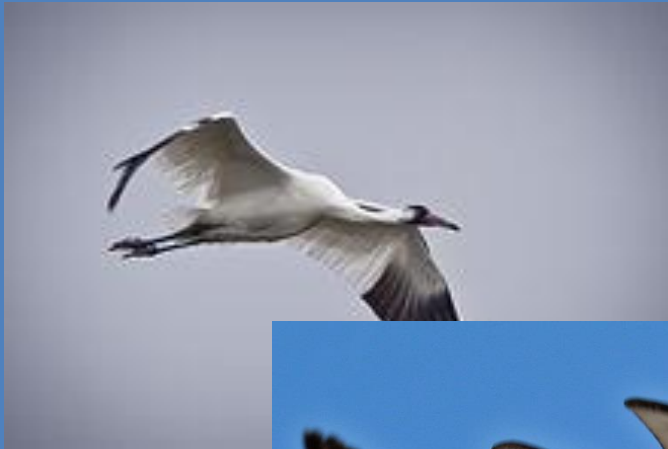
- Incidental exploitation
 - Bycatch



2.

Exploitation

- Incidental exploitation
 - Recreational use



2.

Exploitation

- Ecosystem effects
 - Keystone species
 - Important symbioses

Resources

Publications

Hunter Jr., M. L., and J. Gibbs. 2007. Fundamentals of Conservation Biology, 3rd Edition. Blackwell, Malden.

Multimedia

Sea Around Us: www.seaaroundus.org