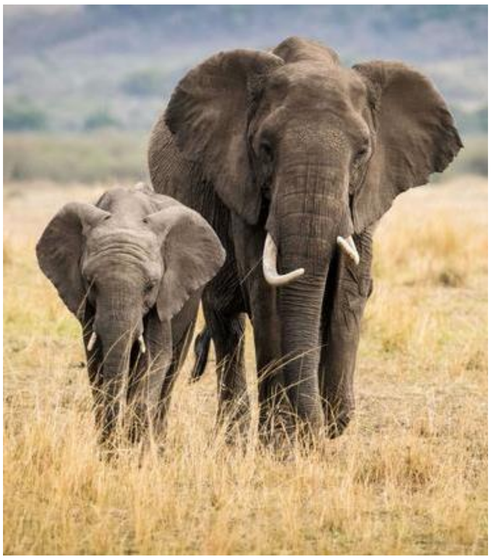


TOPIC NOTES FOR BIOD2701: BIODIVERSITY AND CONSERVATION

Completed in 2017 with HD

Contents

WK1: Identification - (Associate Professor Molly Whalen)

Identification is required to ascertain the species of a specimen and to distinguish that species from others. Means of identification can include:

- Identification guides
- Reference collections e.g. museums, herbarium
- Expert determination
- keys

Dichotomous keys: an identification system that involves a series of statements that lead to two further options. (much like a flow-chart) these are comprised of couplets and can be presented as bracketed or indented.

- couplets: paired statements e.g. 4 petals or 5 petals
- Bracketed key: paired choices on adjacent lines
- Indented key: pairs of choices indented

Bracketed
1a. lays eggs…. Go to 4
4a. terrestrial…. echidna
4b. aquatic…. platypus

Indented
1a. lays eggs
- 2a. terrestrial…. echidna
- 2b. aquatic…. platypus

WK1: Habitat fragmentation – (Associate Professor Duncan Mackay)

Habitat fragmentation: the breaking up of a habitat via land clearance creating isolated 'pockets'. These smaller pockets will support fewer species compared to a large continuous habitat. Consequently, from a conservation standpoint it is more beneficial to purchase one large reserve than several small reserves that add up to an area of equal size.

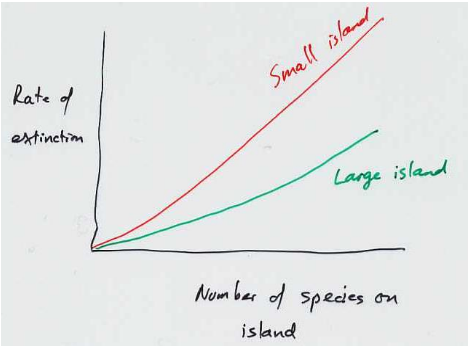
To maintain biodiversity within these pockets, the rate of dispersal can be increased by the construction of 'corridors', pathways that link up the fragmented habitat.

The equilibrium theory of island biogeography

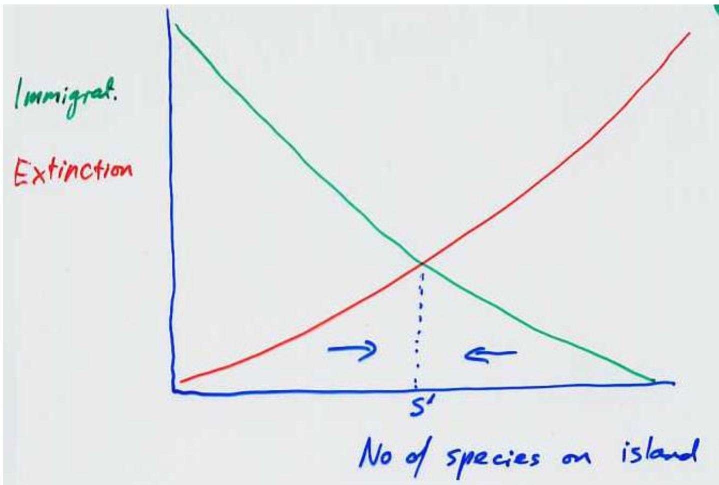
- This model can be used to predict the rates of immigration verses extinction and therefore identify the number of species present.

The number of species on an island is impacted by two factors

1. The arrival of new species by immigration
   - ➔ The rate of this occurring can be impacted by the size of the island, as a larger island offers an easier 'target' to hit
   - ➔ The distance from the mainland also factors in because the closer the island is to shore; the more likely species will be able to survive the journey and reach the island.
2. Loss of resident species by local extinction
   - ➔ An increased number of species on the island is associated with increased interspecies competition and therefore a higher extinction rate.
     - Smaller islands possess smaller populations putting them at a greater risk of local extinction from chance events e.g. fires, storms, new predation
     - However, decreased space also corresponds with higher interspecies interactions.



When plotting the rate of species immigration and species extinction on the same graph, where the curves meet results in the point of equilibrium diversity (S'). S' estimates the probable biodiversity that will be present on the island.



Letting (S) represent the total number of species that can immigrate to the island, it can be said that:

- If $S < S'$ extinction exceeds immigration and diversity declines
- If $S < S'$ immigration exceeds extinction and diversity increases

It can also be expected that (S') will correspond with a larger value with an increase in island size or closeness to shore.

The application of this theory has affected characteristics of reserves with trends including:

- large reserves as oppose to smaller ones
- A single large reserve instead of several smaller ones
- Close proximity to one another (relative closeness is preferable)
- The implementation of corridors between reserves
- round reserves are better than jagged ones

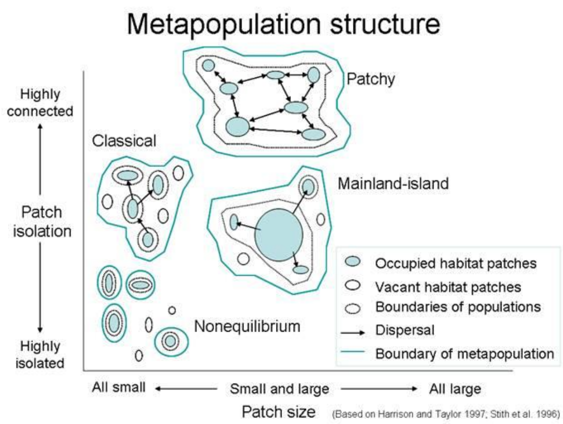
The species area relationship:
S=cA^z
Or
Log(S) = log(c) + z log (A)
Z usually = 0.25
(species numbers tend to increase with increased area)

WK2: Metapopulations – (Associate Professor Duncan Mackay)

Metapopulation: a collection of local populations that are connected by dispersal.

Richard Levin's model of metapopulations: dp/dt = mp(1-p) – ep
P = fraction of patches occupied
M = colonisation rate
E = extinction rate
Assumptions:

- Local populations are full or empty
- Movements from an occupied patch to all other patches is equally likely
- Not spatial correlation in occupancy



p* = 1 –e/m

- for persistence, need m>e
- e increases as area falls, so for a given array of patches, patch area must be greater than some minimum to allow persistence.

Implications:

- Currently empty patches may need to be conserved
- Allowing or facilitating dispersal between local population and patches is important
- Landscape structure and connectivity needs to be thought about.

Conditions for metapopulation persistence

- Habitat patches support local breeding populations
- No single population is large enough to ensure long-term survival
- Patches are not too isolated to prevent recolonization
- Local population dynamics are sufficiently asynchronous to make simultaneous extinction unlikely