MAHARAJA AGRASEN UNIVERSITY BADDI , SOLAN (H.P)

SPECIES CONCEPT & ITS TYPES

Subject- Wildlife Biology

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MS. SHABANAM
ASSISTANT PROFESSOR
DEPARTMENT OF ZOOLOGY

Introduction

- To determine the variation and the limitation between species, many concepts have been proposed.
- When a taxonomist study a particular taxa, he/she must adopted a species concept and provide a species limitation to define this taxa.
- Plant kingdom as other living kingdoms has a hierarchy structure ends mostly with species rank.
- Species are one of the basic units to compare in almost all fields of biology.

Definition of Species

- A species is defined as the largest group of organisms in which two individuals are capable of reproducing fertile offspring, typically using sexual reproduction.
- These spiders are considered the same species.

- Definition of a species as a group of interbreeding individuals cannot be easily applied to organisms that reproduce only or mainly asexually.
- If two lineages of oak look quite different, but occasionally form hybrids with each other, should we count them as different species?
- Idea of a species is something that we humans invented for our own convenience.

VARIOUS CONCEPTS OF SPECIES

1. "No matter what variations occur in the individuals or the species, if they spring from the seed of one and the same plant, they are accidental variations and not such as distinguish a species permanently; one species never springs from the seed of another nor vice versa" - JOHN RAY.
2. Used a sexual system "natural system" for defining species - LINNAEUS.
3. "A species is a collection of all the individuals which resemble each other more than they resemble anything else, which can by natural fecundation produce fertile individuals, and which reproduce themselves by generation, in such a manner that we may from analogy suppose them all to have sprung from one single individual" - DE CANDOLLE.
4. Species as the fundamental units of evolution, species could be produced rapidly if the conditions were appropriate and in the absence of such conditions, species might remain unchanged for a long time - CHARLES DARWIN.

Morden Species Concept

- Taxonomist proposed different approaches of species concepts in modern science.
- To approach a satisfactory and acceptable classification the relationship between individuals should be considered.
- These relations could be phenetic or phylogenetic.

Types of Species Concept

1. BIOLOGICAL SPECIES CONCEPT.
2. MORPHOLOGICAL SPECIES CONCEPT.
3. ECOLOGICAL SPECIES CONCEPT.
4. EVOLUTIONARY SPECIES CONCEPT.
5. COHESION SPECIES CONCEPT.
6. PHENETIC SPECIES CONCEPT.
7. PHYLOGENETIC SPECIES CONCEPT.
8. PLURALISTIC SPECIES CONCEPT.
9. RECOGNITION SPECIES CONCEPT.
10. CLADISTIC SPECIES CONCEPT.

1. BIOLOGICAL SPECIES CONCEPT

1. "Groups of actually or potentially interbreeding natural populations which are reproductively isolated from other such groups" – MAYR.

- Groups of related plants which are distinct at the level of biological species do not interbreed when growing in the same area in nature.
- Biological Species Concept which is a non-phylogenetic species concept because it is potentially interbreeding process with no references of ancestry.

- Biological species concpts defines a species as members of populations that actually or potentially interbreed in nature, not according to similarity of appearance.

2. " Species are the members in aggregate of a group of populations that breed or potentially interbreed with each other under natural conditions" – FUTUYMA.

- Organisms may appear to be alike and be different species.
- Western meadowlarks and Easternmeadowlarks look almost identical to one another, yet donot interbreed with each other.

A) Eastern Meadowlarks

B) Western Meadowlarks

2. MORPHOLOGICAL SPECIES CONCEPT

1. "Species as the smallest groups that are constantly and determinedly distinctive and distinguishable by average means, species are the smallest natural populations permanently separated from each other by a distinct discontinuity in the series of biotype" - CRONQUIST.
2. "A species is a community, or a number of related communities, whose distinctive morphological characters are, in the opinion of a competent systematist, sufficiently definite to entitle it, or them, to a specific name" – REGAN.

ADVANTAGES OF MORPHOLOGICAL SPECIES CONCEPT

- 1. Applied to sexual and asexual organisms.
- 2. Useful for species concepts in the fossils record.

3. ECOLOGICAL SPECIES CONCEPT

- About ecological competition.
- "A species is a lineage which occupies an adaptive zone minimally different from that of any other lineage in its range and which evolves separately from all lineages outside its range" - VAN VALEN.
- "Species is a number of related populations the members of which compete more with their own kind than with members of other species" - COLINVAUX.

ECOLOGICAL SPECIES CONCEPT

- When two organisms are similar to each other, their needs are more likely to overlap, therefore, they are expected to contest, and consequently the more likely that they are of the same species.

DISADVANTAGES

1. At what point does one stop the process of splitting divergent forms into new species?

4. EVOLUTIONARY SPECIES CONCEPT

- "It is a single lineage of ancestordescendant populations of organisms which maintains its identity from other such lineages and which has its own evolutionary tendencies and historical fate" – WILEY.
- "Concept was developed by Simpson" - include asexual organisms and extinct species.

5. COHESION SPECIES CONCEPT

- "It is an evolutionary lineage that serves as the arena of action of basic micro evolutionary forces, such as gene flow (when applicable), genetic drift and natural selection" – TEMPLETON.
- "Cohesion concept is similar to the evolutionary species concept" - population genetic stress on the origins of phenotypic similarity within species.

6. PHENETIC SPECIES CONCEPT

- "A species is a set of organisms that look similar to each other and distinct from other sets" – RIDLEY.
- Phenetic concept measures as many characters as possible in as many organisms as possible.
- It identifies phenetic clusters by multivariate statistics.
- Smallest unit in these clusters has sufficient similarity to be called a species.

PHENATIC SPECIES CONCEPT

- Since the frogs depicted here look the same —even though they are prevented from mating with each other - they would be considered the same species according to the pheneticspecies concept.

PHENATIC SPECIES CONCEPT

1. A great content of information and more characters in the taxa concerned should be attained
2. Each trait has an equal weight when forming natural taxa
3. Overall similarity between two taxa is a result of their individual resemblance among the many traits used to compare them
4. Taxa can be identified and recognized because correspondences of characters differ in the groups of organisms under investigation
5. Taxonomy is usually viewed and practiced as an empirical science

7. PHYLOGENETIC SPECIES CONCEPT

PHYLOGENETIC SPECIES CONCEPT

- Species as a group of organisms that share an ancestor.
- Species are individuals show a high degree of resemblances in many unique traits which give a monophyletic clusters based on discriminative phenotypes.
- It is applicable on both sexual and allopatric populations.

DISTADVANTAGES OF PHYLOGENETIC CONCEPT

1. It is rarely possible to reconstruct with certainty the past evolutionary pathway.
2. It is hardly possible to devise a satisfactory method of designation a branching pattern by means of a single linear sequence.

- Many attempts have been made to produce a system – to construct a sequence starting with the most primitive and ending with the most advanced.
- Ensuring that each taxon recognized is a monophyletic or polyphyletic.

8. PLURALISTIC SPECIES CONCEPT

- "Factors that are most important for the cohesion of individuals as a species vary" – CAMPBELL, REECE.
- Use more than one species concepts in order to be applicable arose the idea of a pluralistic species concept.
- For understanding all species living at all times, a broader concept of species should be applied.
- When a given species concept is favored in a given conditions, that does not mean it could be universally applicable.

9. RECOGNISATION CONCEPT

- Species is a set of organisms thst can recognize each other as potential mates.

1. American crickets – different species sings different songs.
2. As many as 30 or40 different species of crickets may be breeding.
3. Female cricket recognizes the song of amles of her own species and will breed only with a male who sings that songs.

- Recognition concept should define very similar species to the biological concept.

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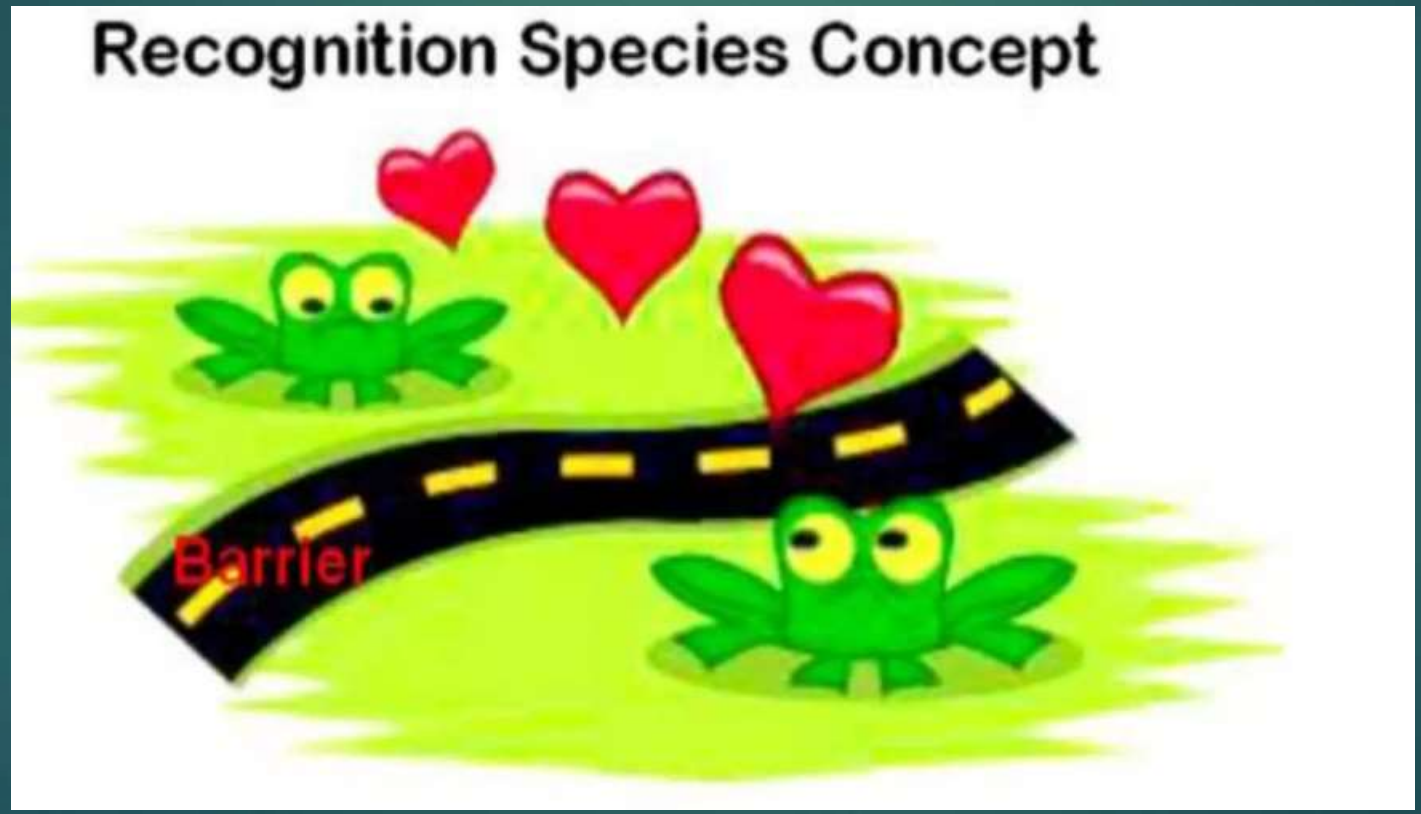
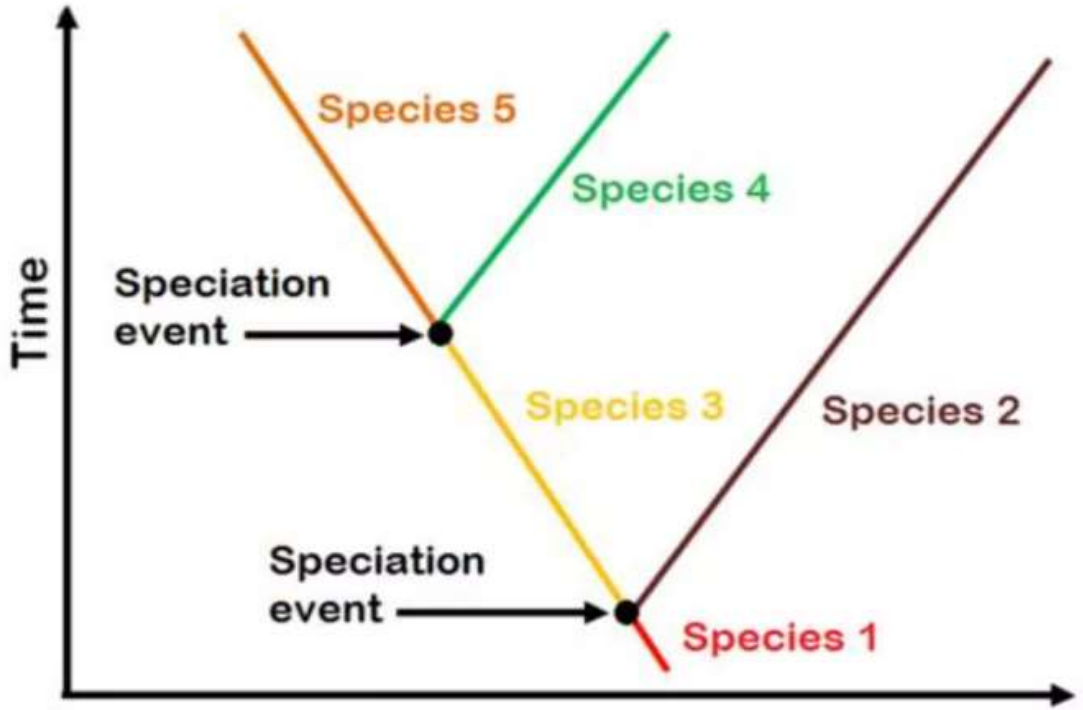
BARRIER IN RECOGNITION SPECIES CONCEPT



10. CLADISTIC SPECIES CONCEPT

- Species as a set of organisms between two speciation events, or between one speciation event and one extinction event.
- According to this, species comes to exist when a lineage of organisms is split into two.
- When a speciation event occur, the ancestral species becomes extinct, giving rise to two new species.

CLADISTIC SPECIES CONCEPT



CONCLUSION

- With this large number of concepts it is not an easy or simple decision to adapt one.
- It depends on the criteria and the aim of each project.
- Species is a group of individuals sufficiently distinct from other groups to be considered by taxonomist to worth specific rank.
- Term ‘‘sufficiently distinct” here is the most important one.

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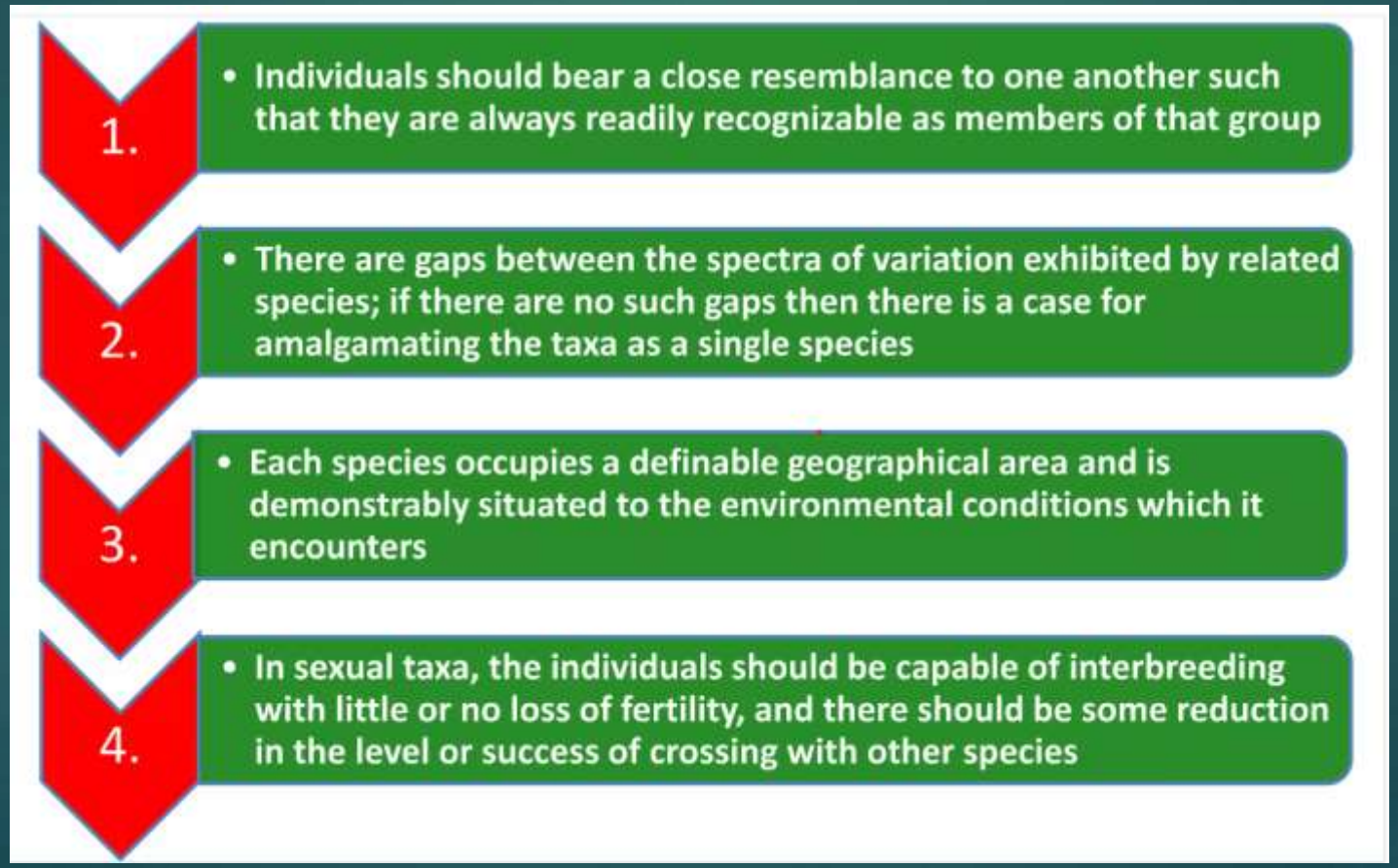
- Taxonomists decide these sufficient distinct according to what information they have.

TAXONOMISTS VIEW

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