

Systematics

Chapter 3


Taxonomy.

- Classifying and naming organisms
 - Standardizes names and facilitates communication
- Taxon: a group of organisms (e.g., species, family)
 - Plural is "taxa"
- Basic unit is scientific name
 - Example: *Bubo virginianus*

Taxonomy

- Species then placed into larger groups


Class Aves
 Order Strigiformes
 Family Strigidae
 Genus *Bubo*
 Scientific Name *Bubo virginianus*



Taxonomy.

- Species then placed into larger groups

Class Aves
 Order Strigiformes
 Family Strigidae
 Genus *Surnia*
 Scientific Name *Surnia ulula*



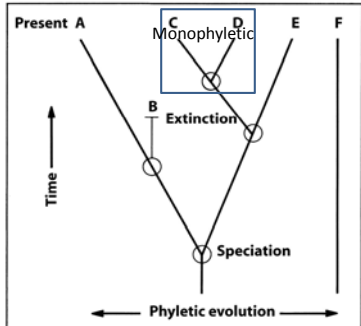
What is a Species?

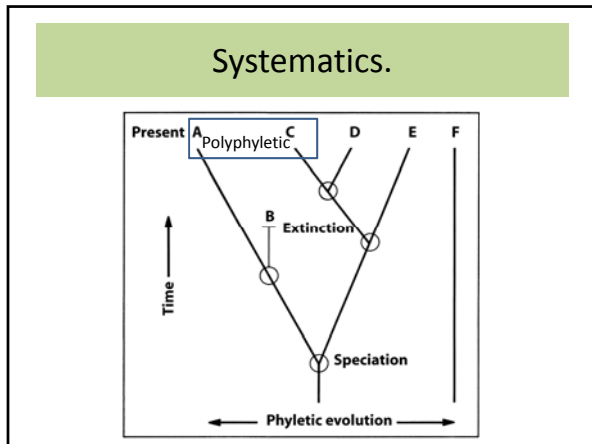
- **Biological Species Concept** (Mayr, 1970):
 "Species are groups of interbreeding natural populations that are reproductively isolated from other such groups"

Systematics.

- Taxonomy informed by evolutionary relationships
- Goal is to have a naming system that accurately reflects how taxa are related to each other
- **Monophyletic** Groups

Systematics





Systematics

- Scrub Jay Distribution

The map shows the distribution of Scrub Jays in the United States, with shaded areas indicating their range in the western and central regions. To the right is a photograph of a Scrub Jay perched on a branch.

Taxonomic Characters.

- What is relevant to relatedness?
 - Need to evaluate when similar characters indicate **common ancestry**, versus convergence
 - Some characters are **conservative**

Taxonomic Characters

- What is relevant to relatedness?

The diagram shows a phylogenetic tree of birds with a vertical axis for time: Early Cretaceous (155 mya), Late Cretaceous (135 mya), Late Cretaceous (100 mya), Cretaceous, Paleocene (65 mya), and Modern ornithurines. Key nodes and groups are labeled: Archaeopteryx, Sinornis, Iberomesornis, etc. (at 155 mya); Ambiortus, Gansus (at 135 mya); Primitive ornithurines; Enantiornithines; Lithornithids; Neornithes; Gobipteryx, Avisaurus, etc. (at 65 mya); Palaeognathae; Neognathae; Passerines; Nonpasserines; Transitional shorebirds, paleognaths, etc.; Hesperornithiforms; Ichthyornithiforms. A horizontal arrow at the bottom is labeled 'Diversification'.

Taxonomic Characters

- What is relevant to relatedness?

The diagram shows a lateral view of a bird skull with the following bones labeled: Premaxillary, Maxillopalatine, Maxillary, Palatine, Jugal, Pterygoid, Quadratojugal, Occipital condyle, Prevomer, Paraphenoid rostrum, Basipterygoid process, Quadrate, and Basisphenoid.

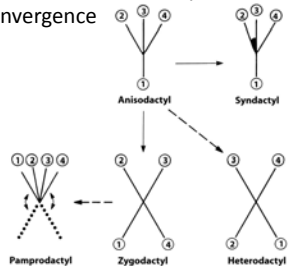
Taxonomic Characters

- What is relevant to relatedness?

The diagram shows a phylogenetic tree of Charadriidae birds. The root is labeled 'Thick-knee'. One branch leads to 'Avocet'. Another branch leads to 'Oystercatcher'. A third branch leads to 'Charadriidae', which further divides into 'Lapwing' and 'Plover'.

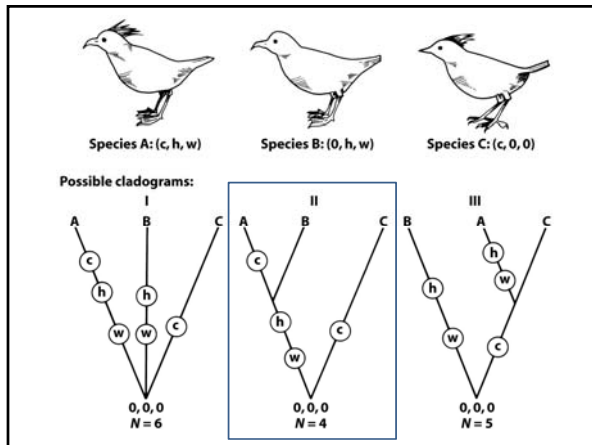
Taxonomic Characters.

- Foot Structure
 - More complex characters are less likely to be confounded by convergence

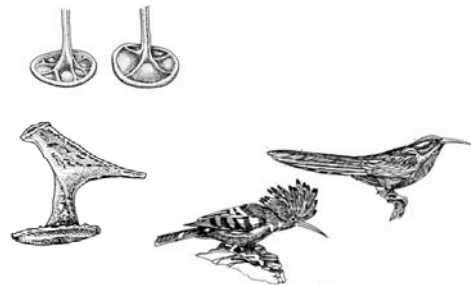


Cladistics.

- Study of Evolutionary Branching Sequences
 - Determine relatedness through **parsimony**
 - Less evolutionary change is probably more correct



Cladistics.



Biochemistry.

- Egg White Proteins
- Allozymes
- DNA
 - DNA-DNA Hybridization
 - Discovered convergence of Australian Songbirds with Eurasian species
- Mitochondrial Genes
 - Species level comparisons

Biochemistry

- DNA-DNA Hybridization

