

Difference Between Monophyletic Paraphyletic and Polyphyletic

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Key Difference - Monophyletic Paraphyletic vs Polyphyletic

A taxon is a group of organism that uses in [phylogeny](#). Taxa are defined for the ease of identification and [classification](#) and also to understand the relationships between the organisms. Taxa are created based on their characteristics. Some taxa include related organisms while some taxa consist of unrelated organisms. Ancestor and descendants are grouped under taxa. Monophyletic, paraphyletic and polyphyletic are such groups used in phylogenetic studies. **A monophyletic taxon is defined as a group that consists of the most recent common ancestor of a group of organisms and all of its descendants, a paraphyletic taxon is defined as a group that consists of the most recent common ancestor and some of its descendants while a polyphyletic group is defined as a group of unrelated organisms that lacks a most recent common ancestor.** This is the **key difference** between monophyletic, paraphyletic and polyphyletic taxa.

What is Monophyletic?

Monophyletic group is a group of organisms that includes an ancestral species and its entire descendent species. Monophyletic group is also known as a clade. A clade is a natural kind of a group that is very important in phylogenetic classification. Monophyletic groups are created based on the shared derived characteristics. Hence monophyletic group can visualize relationships among the organisms in a [phylogenetic tree](#).

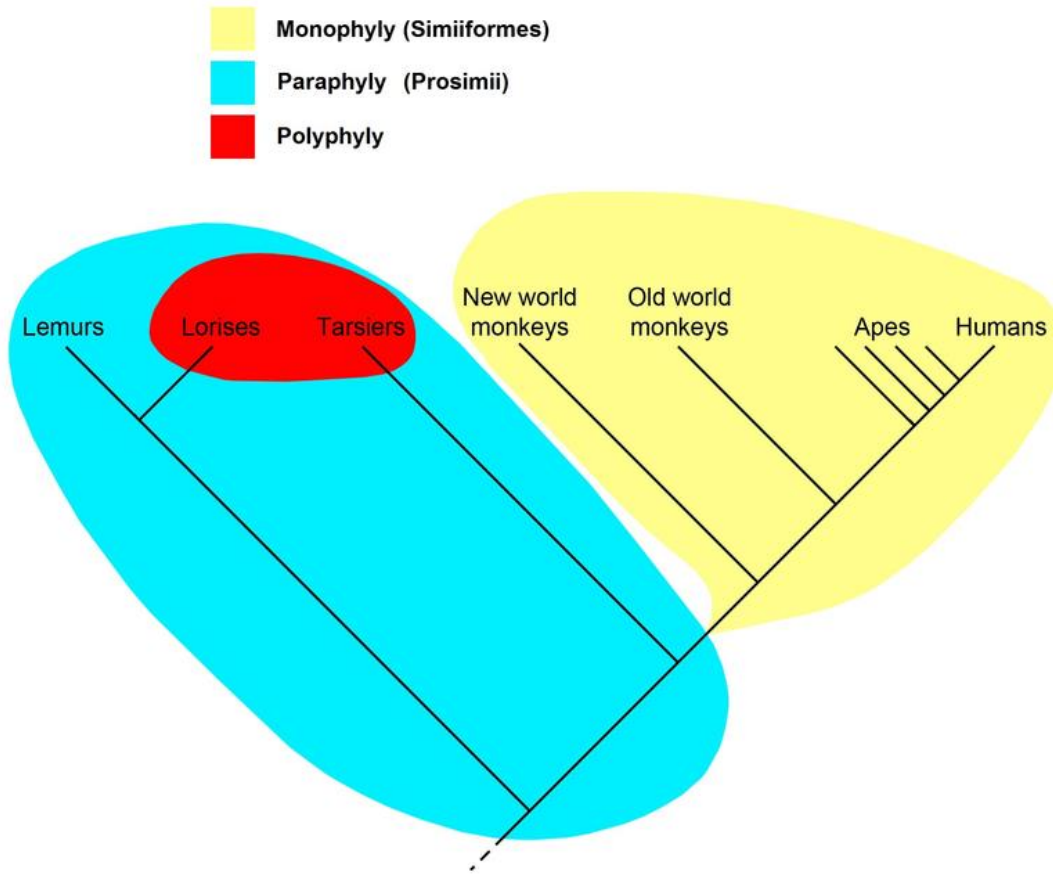


Figure 01: Monophyly, Paraphyly and Polyphyly

Monophyletic groups are marked or shown in [cladograms](#). The cladogram shows the relationships and also amount of evolution by the branching order and branching length respectively. Mammalia and Aves are considered as well known monophyletic taxa.

What is Paraphyletic?

Paraphyletic group is a group of organisms that consist of an ancestral species and some of its descendant species. Not all the descendent species are included in this group. Paraphyletic group is nearly monophyletic. The paraphyletic group is created based on the symplesiomorphy. Some well known paraphyletic taxa are Pisces and Reptilia.

What is Polyphyletic?

A polyphyletic taxon is a group of organisms that lack a common ancestor. The polyphyletic group consists of unrelated organisms who are descended from more than one ancestor. It is kind of an unnatural group of organisms. Normally when a polyphyletic taxon is found, it is reclassified since it is a totally unnatural assemblage.

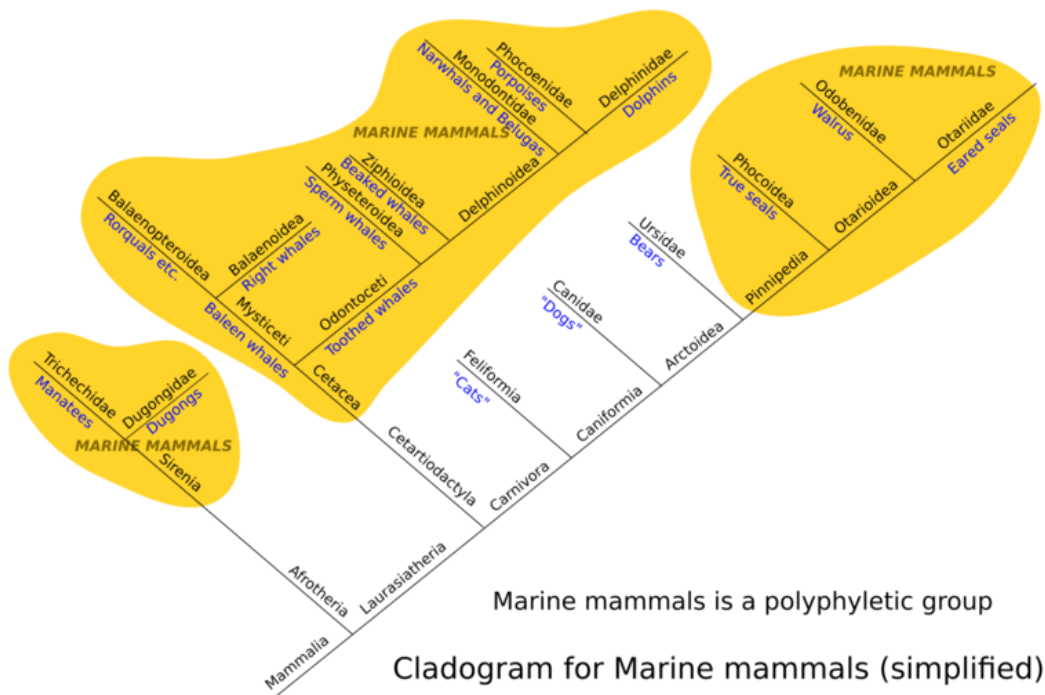


Figure 02: Polyphyletic group

Some well-known polyphyletic taxa are Agnatha and Insectivora.

What are the Similarities Between Monophyletic Paraphyletic and Polyphyletic?

- All these terms are used to define taxa of organisms.
- All terms are used to define a group of organisms.
- When defining, the most recent common ancestor is considered in all groups.
- All these groups explain the relatedness of the organisms.

What is the Difference Between Monophyletic Paraphyletic and Polyphyletic?

Monophyletic vs Paraphyletic vs Polyphyletic

Monophyletic	Monophyletic group is a taxon that consists of a most recent common ancestor and all its descendants.
Paraphyletic	Paraphyletic group is a taxon that consists of a most recent common ancestor and some of its descendants.
Polyphyletic	Polyphyletic group is a taxon that consists of unrelated organisms who are from a different recent common ancestor. This group lacks a most recent common ancestor.
Descendants of a Common Ancestor	
Monophyletic	Monophyletic group includes all descendants of the ancestor.
Paraphyletic	Paraphyletic group does not include all the descendants of the ancestor.
Polyphyletic	Polyphyletic group does not include all the descendants of the ancestor.
Common Ancestor	
Monophyletic	Monophyletic group has a common ancestor.
Paraphyletic	Paraphyletic group has a common ancestor.
Polyphyletic	Polyphyletic group lacks a common ancestor.
Based On	
Monophyletic	Monophyletic is a group based in synapomorphy.
Paraphyletic	Paraphyletic is a group based in symplesiomorphy.
Polyphyletic	Polyphyletic is a group based on convergence.
Nature	
Monophyletic	Monophyletic group is a natural taxon.
Paraphyletic	Paraphyletic group is a natural taxon.
Polyphyletic	Polyphyletic group is an unnatural assemblage of organisms.

Summary - Monophyletic Paraphyletic vs Polyphyletic

Organisms are classified based on their different characteristics such as morphological and molecular level characteristics. They are grouped for the purpose of identification and phylogenetic analysis. Monophyletic, paraphyletic and polyphyletic are three groups that can be identified in phylogenetic trees. The monophyletic group consists of a most recent common ancestor and its entire descendants. It is a natural group that uses in phylogeny. The paraphyletic group consists of a most recent common ancestor and some of its descendants. The polyphyletic group is an unnatural assemblage of unrelated organisms which lack a most recent common ancestor. This is the difference between monophyletic, paraphyletic and polyphyletic.

Reference:

- 1.Carr, Dr Steven M. Monophyletic, Polyphyletic, & Paraphyletic Taxa. [Available here](#)
- 2.Editors. "Monophyletic - Definition, Explanation and Quiz." Biology Dictionary, 27 May 2017. [Available here](#)
- 3."Monophyly." Wikipedia, Wikimedia Foundation, 11 Jan. 2018. [Available here](#)

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