

Principles for the linear sequence of AviList

How does one determine which species start and close the list—as well as the order of all the species in between? AviList builds on principles commonly employed to best reflect our knowledge of the evolution of birds. This can be visualised using a bifurcating tree, where the basal trunk represents the common ancestor of all living birds and each bifurcation a speciation (divergence) event. This kind of tree is the common output from phylogenetic studies and is often arranged such that at each bifurcation, the branch leading to the fewest terminal branches (or tips, or leaves) of the tree is drawn first, while the other branch is drawn second. Repeating this at each new bifurcation creates a “direction” in the tree, following increasing species diversity.

While passerines (order Passeriformes) diverged from other orders of birds more recently than ostriches (order Struthioniformes), all extant groups or species of birds have in fact evolved for precisely the same amount of time since they split off from their most recent common ancestor. Thus, no group of birds is more “primitive” than another; instead, some groups have speciated more and others less and some have lost more of its branches to extinction through time and others fewer.

The principle of increasing species diversity

The primary principle of increasing species diversity is translated from a tree comprising all extant bird species of the world into the linear sequence that is reflected in AviList. Since no one tree comprises all species of the world, a multitude of scientific studies have been used to infer the linear sequence, where possible. This often means integrating results from different studies and as a general rule of thumb when results have differed, integrative taxonomic studies and phylogenomic studies have been given priority, followed multi-locus phylogenetic studies that include both nuclear and mitochondrial genetic markers. The principle of increasing species diversity has been implemented on different taxonomic levels, including all of orders, families, and genera. However, not all genera have yet been updated to species level.

Additional hierarchically ordered principles

The overarching principle of following the increasing species diversity is largely translatable to the linear sequence of a list. However, at certain bifurcations in the tree, both branches lead to the same number of descendant species. For these cases, we have chosen to implement an additional set of hierarchically ordered principles, which can be consistently applied throughout the tree/list:

1. **The principle of increasing *taxon* diversity.** Apply the principle of increasing diversity, but applied at subspecies level, so that the clade

comprising the fewest terminal taxa is listed first.

2. **The principle of priority.** If the number of taxa is equal between the two clades, list first (a) the clade that was scientifically named first (earliest) or, if not applicable, (b) the clade that comprises the species that was scientifically named first.

For the principle of priority, the first case (a) can typically be employed for *sister genera* or *sister species*. Thus, in the case of two sister genera with the same number of species and the same total number of taxa (monotypic species + number of subspecies of polytypic species), the genus whose present *genus name* was described first will also be listed first. In the case of two sister species with the same number of subspecies, the *species* that was first described will be listed first.

In cases that comprise *equally large sister clades of multiple species, but not whole genera*, (b) the clade is listed first which comprises the *species first described*. For example, take a monophyletic clade within a genus, comprising of four monotypic species: A described in 1882, B (1898), C (1923), and D (1877), grouped in one sister clade comprising species A+B and another comprising species C+D. Here, the C+D clade will be listed first, so that the linear sequence reflected in the list is D, C, A, B.

Finally, if the year of description is the same, the name that was published first during that year has priority. If two names were published in the same paper or journal issue, priority is settled as earliest mention by page number (or occurrence on a single page).

Subspecies order

The relationships between subspecies are often poorly mapped, but are often linked to some extent to geographical distribution and proximity to each other. At present, it is rarely meaningful to try to apply sequence principles at the subspecies level similar to those above, and therefore subspecies are listed according to a different convention, which has long been applied by the IOC: They are ordered according to geographical occurrence, approximately from northwest to southeast based on the centroids of the respective subspecies' range.