

Understanding taxonomy listings

As with my accompanying title 'understanding bird orders and families', I wanted to have a reasonable grasp of the way bird species are named and listed. Apart from the scientific names, taxonomic groups and hierarchical ranking, I needed more information about the actual meaning of certain related terms and phrases, such as Linnaean taxonomy, binomial nomenclature, cladistics etc.

But, despite a lot of reading and getting to understand the subject, I couldn't always remember certain aspects, which is why I decided to compile these notes for future reference. Personally I find that I can retain factual details better if I've physically written them down. Consequently, the vast bulk of this information is in my own words, albeit cribbed from various sources. I've tried to produce a useful document that's in some sort of logical order. Whilst there is a little bit of repetition with the classification definitions within my 'glossary' section, here everything is together and explained in far greater detail. The only other point I feel obliged to make, is that these are purely layman's notes as I have no background or any authority to produce such information. Hopefully, I've understood the subject sufficiently without misinterpretation and haven't made any silly errors in putting it all together.

Background

The original form of biological classification, now commonly known as taxonomy, was established way back in the mid 18th century by a Swedish natural scientist called Carl Linnaeus. He produced a hierarchy system of ranked groups of species, which we now often refer to as Linnaean taxonomy. At that time the animal kingdom was simply divided into classes, such as Aves for birds, then into orders, families, genera and finally species.

Binomial nomenclature

This is the term for the formal system that's used today to correctly name all living things. It produces a unique two-part species name in a Latin grammatical form. The two parts together are known as the binomial name or binomen. In general use though, the term binomen is more usually referred to as the Latin name or scientific name of the species, with the latter being the more commonly used.

The first part of the binomen is the name of the genus to which the species belongs, with the second part being the unique name of that particular species. This is very much like our version of having a family surname and a given name. The full scientific name should always be written in italics, but with only the genus being capitalised. The second, species part of the name, is never capitalised even if it derives from a proper noun, such as the name of a person or place. If you are reading a scientific publication you may well see a four-part name where the binomen is followed with the 'authority', being the original author of the specific name and the year in which that name was first published (ie. Linnaeus, 1758). However, in general bird books, species guides, magazines, web articles etc., it is usually only the standard two-part scientific name that is used. The current system is governed and controlled by the ICZN - International Code of Zoological Nomenclature. Whilst there are strict rules in place concerning all aspects of binomial nomenclature, some have had to be adapted or modified over the years to cope with the number of new species being identified and added, thereby creating an extended system.

Scientific names

Before I move on to taxonomy listings, it's interesting to note how the scientific parts of the bird's name (both for the genus and the specific name) are derived. Obviously this is a complex subject, but from

what I understand the two parts of the name are normally based on one of just nine defined categories of naming.

In simple terms these are 1) plumage or colouration (ie. *alba*) or physical characteristics (ie. *minor*), which is known as a morphonym; 2) a name that normally commemorates the person credited with the discovery or recording of the species (ie. *cetti* after Francesco Cetti, or *saundersi* after Howard Saunders who was an authority on gulls and terns), alternatively a name derived from a fictitious or mythical character, all of which are known as an eponym; 3) an indigenous or native derived name, more frequently used generically rather than specifically, known as an autochthonym; 4) geographical or place names, normally used specifically and usually with the addition of an adjectival suffix such as *-ensis* or *-anus* (ie. *himalayensis*, *galapagensis* or *africanus*) known as a toponym; 5) a name based on an arrangement such as relationship or resemblance (ie. *similis*), known as a taxonym; 6) a name based on the bird's natural habitat (ie. *Limosa* from *limosus* meaning muddy), known as a bionym; 7) a name based around the species behaviour or habits (ie. *explorator*), known as an ergonym; 8) a name relating to the food or prey of the species (such as with suffix *-phagus* meaning eater), known as a phagonym; and finally 9) a name based on the specific sound or call of the bird, which surprisingly is rarely used, known as a phononym.

Whilst all scientific names, regardless of their origin, are treated as Latin, some are derived from Ancient Greek. This is also the case with the above category names, morphonym, eponym etc. For example, with morphonym (which actually accounts for almost half of all generic names and over half of the specific names) we have in Greek *morphe* meaning form, and *onuma* meaning name.

Nomenclature v classification

Although closely linked, the specific terms nomenclature and classification in respect of this particular subject do not have the same meaning. Nomenclature relates to the naming of species as noted above, whereas classification is more to do with the ordering of species or families into groups.

Current taxonomic listings

I made a comment above about new species being identified and added to the system. Whilst the number of species has grown since the Linnaeus era, there has also been more detailed analysis, particularly in recent years with genetic studies, that has resulted in biologists and scientists needing to introduce various intermediate taxonomical ranks. For example, whereas we originally had bird families, below order and above genus, we now have additional levels in an extended system with superfamilies and subfamilies. And, slightly further up the ranking there are additional orders, such as superorder and suborder.

Cladistics

Still on the subject of taxonomic listings I wanted to understand where the relatively new rank of 'clade' would be used. The "Taxonomy in Flux" full ranking system includes clades and, although I was primarily interested in what was happening at order, family and species level, I wanted to check out how clades fitted in. A quick look on *Wikipedia* told me that cladistics was an approach to biological classification in which organisms are categorised based on shared derived characteristics that can be traced back to a group's most recent common ancestor and are not present in more distant ancestors - this approach being originally referred to as phylogenetic systematics. So, that being said, I found that 'clade' was simply a convenient term derived from cladistics. It was first used in 1957 by the biologist Julian Huxley to define a group of species that consist of a common ancestor and lineal descendants, which would represent a single branch on the "tree of life". It produced another level of ranking that could sit between superorder and order, and because clades can be nested one inside

another, it meant that this area of the ranking system could be extended further if necessary. This is certainly the case in respect of the full "Taxonomy in Flux" system, but for the purpose of this explanation I will leave it there as I really want to concentrate on what happens at species level.

Species and subspecies

Following on from the above and 'understanding bird orders and families' we are now at species level. We know that similar species are grouped within a family, and that that family sits within an order. We also know that all species have a scientific name based on their genus, which is extended into a binomen to produce their unique two-part species name. But, many species have a wide geographical range which often, but not always, means that there are variants of that species.

Consequently there is a need to have a system to record subspecies - this being the only rank below species formally accepted by the ICZN. The categorisation of subspecies is determined for various reasons, but in each case the subspecies still has to have a unique scientific name. This name is taken from the binomial (two-part) name of the species as previously explained, and extended with a unique subspecies name to form a three-part name known as a trinomen. For example, the common Brown Noddy is *Anous stolidus*. It is known to have four subspecies around the world. It's an endemic species in Galapagos, but because there are closely related species elsewhere in the world, it is actually an endemic subspecies. So, whilst its scientific name is *Anous stolidus*, its extended subspecies name is *Anous stolidus galapagensis*. With this example the third part of the name is pretty obvious and, referring back to the notes on scientific names, it can be seen that galapagensis is derived from a toponym - a place name. Also note that the name is not capitalised even though it's based on a proper noun.

At subspecies level there are often situations regarding range or populations of a particular bird that can result in disagreement over whether it should be considered a subspecies or a full species in its own right. When this occurs it is common practice to put the species name in parentheses. A prime example is the American Herring Gull - *Larus smithsonianus*, known as the Smithsonian Gull in North America, where it is usually considered a subspecies of the European Herring Gull - *Larus argentatus*. This gives us two names for the same species, *Larus smithsonianus* where it's considered a separate species and *Larus argentatus smithsonianus*, when it's classed as a subspecies. Neither are incorrect, so an impartial name may better be written as *Larus (argentatus) smithsonianus* to highlight the uncertainty.

Further separations and/or commonly used terms

There are two further low-ranking separations that also need to be considered and understood, which are 'tribe' and 'race'.

Personally I've found the latter the most confusing as, in most cases, it's more of a generic term or alternative reference for subspecies. It's an informal rank used in a similar situation to morph, the term used to describe plumage colour variants of an adult species, but in this case for separating a species or subspecies by geographical location. I've found it a difficult term to pin down. I have books that make constant and consistent mention of the races of certain species regarding their range and giving the trinomial name as that recognised in the area (ie. taking the common Brown Noddy as an example again, my "Birds of Seychelles" book refers to the race *pileatus*, which breeds in the Indian Ocean as the species seen in the Seychelles. This makes total sense, but *Anous stolidus pileatus* is one of the four subspecies mentioned earlier and, therefore, the term 'race' is simply being used here instead of subspecies), whereas other books may loosely use 'race' in the context of describing birds that frequent a certain area, but are not actually a defined subspecies.

The other separation, '*tribe*', is easier to understand. It's another informal rank, not dissimilar to 'clade', but this time used to subdivide the systematic tree above genus, but below family or subfamily. For example, ducks, together with geese and swans are in the family Anatidae. This family is then divided into a number of subfamilies with Anatinae being the subfamily for ducks. There's no problem with this except that there are many different types of duck above genus level, so to make taxonomy listings clearer the different types are separated into groups known as tribes - ie. *Tadornini* for shelducks, *Mergini* for seaducks, *Anatini* for dabbling ducks etc.

Ranking levels and naming

So, following all this through, we should now have a pretty good understanding of the system, together with a few examples. The ranked group names are usually constructed from the generic names with their level distinguished by a particular suffix, so as a final note, notwithstanding previous comments regarding certain informal separations such as clade, the standard ranks commonly used in bird classification are, from highest to lowest :-

superorder	... imorphae
order	... iformes
suborder	... i
superfamily	... oidea
family	... idea
subfamily	... inae
tribe	... ini

Although I deliberately haven't transformed any of the above text, it is common practise to emphasise the ranking of ORDER with capital letters, and the lower level of *tribe* italicised as the species *genus* or full *scientific name*, whereas family and subfamily names are left in standard text.

A typical example, extended from previous references, would be ANSERIFORMES (the order for waterfowl) in which we have Anatidae (the family for Ducks, Geese and Swans) and, further down that taxonomical ranking, Anatinae (the subfamily name for Ducks), which is split into various tribes, such as *Mergini* (for Seaducks). There are various genera within Seaducks, one being *Mergus* (Mergansers), with the scientific name for the Red-breasted Merganser being *Mergus serrator*.

Order :	ANSERIFORMES	Waterfowl
Family :	Anatidae	Ducks, Geese and Swans
Subfamily :	Anatinae	Ducks
Tribe :	<i>Mergini</i>	Seaducks
Genus :	<i>Mergus</i>	Mergansers
Species :	<i>Mergus serrator</i>	Red-breasted Merganser