# What are meant by the words Taxonomy and Classification?

This explanation on classification is rather lengthy though, not too difficult to follow. Whoever bothers to work through it will get a useful grounding in taxonomy. Much of what follows will make more sense if this is read through a couple of times. Perhaps once, then again a week or two later.

Taxonomy and Classification basically mean the same thing. The words are sometimes interchangeable in the form written here. That is to say a person can work in taxonomy or classification. The person who does such work is usually called a taxonomist; that is a classifier of the animal or plant kingdom. The first word is of Greek origin the second is of Latin origin. In natural history it is the way we put order into the chaos of the millions of living creatures with which we share the planet. Whether that creature be a human, a whale, a lizard, a monkey, a bird, a tree, a sea shell, a bacterium or a piece of seaweed, they are all classified according to the international rules of taxonomy.

The system of binomial nomenclature or naming of the animal and plant kingdom by giving every creature its own two part name was devised and first used by a Swede called Carolus Linnaeus in 1753. The system gave us such a solid base to work from that it has been expanded to be all encompassing. It can now cater for every possibility in the individual naming of all the creatures of the planet. This system is still used today.

Many people refer to these specific names as Latin names and, although most of the names are in Latin form, many of them are not Latin but Greek. For example the common tiger snake found mostly in the south eastern corner of mainland Australia has the specific name *Notechis scutatus*. The first word or genus is made up of two words. Notos meaning south and echis meaning viper or adder, both Greek words. The species name scutatus is the Latin word for carrying a shield with scutum being the Latin word for shield. Though most specific names do come from the classical languages, it is not always the case.

To classify the animal kingdom we use six basic words, and you should learn at least these six words in this order.

| The Animal Kingdom | | | | | |
|---|---|---|---|---|---|
| Phylum | Class | Order | Family | Genus | Species |

There are eight sub-groups which precede their parent word. The words 'order' and 'family' can also be preceded by super.

| |
|---|
| Subphylum |
| Subclass |
| Superorder |
| Suborder |
| Superfamily |
| Subfamily |
| Subgenus |
| Subspecies |

This gives us fourteen pigeonholes into which we can place the names of living things. So, the full sequence would go like this:

| | | |
|---|---|---|
| | Phylum | Subphylum |
| | Class | Subclass |
| Superorder | Order | Suborder |
| Superfamily | Family | Subfamily |
| | Genus | Subgenus |
| | Species | Subspecies |

Someone may have found the need to use the terms superclass, supergenus or superspecies though as yet i've not found these words in use.

Note: The plural for genus is genera (not genuses).

To name most creatures on the planet you would never need to use all of these pigeonholes. So, let's name some animals starting with the wolf.

| | | | | |
|---|---|---|---|---|
| Phylum | Chordata | | | |
| Subphylum | Vertebrata | fish, amphibians, reptiles, birds and mammals. | | |
| Class | Mammalia | breast feeding mammals. | | |
| Subclass | Theria | marsupials and placental mammals. (For the mammals this subclass is sometimes split into three groups:) | | |
| | | prototheria | monotremes | egg laying mammals - platypuses and echidnas |
| | | metatheria | marsupials | pouched mammals - kangaroos and possums |
| | | eutheria | placental mammals | mammals that carry the unborn in a placenta - humans and dogs |
| Order | Carnivora | flesh-eating mammals. | | |
| Family | Canidae | fox, coyote, jackal, wolf and dog. | | |
| Genus | Canis | coyote, jackal, wolf and dog (note that fox is not included in this genus). | | |
| Species | lupus | wolf | | |
| Subspecies | youngi | | | |

*Canis lupus youngi* - This is the classification of the Southern Rocky Mountain Wolf. You will notice that the name of the genus Canis must start with a capital letter. The species and subspecies names lupus and youngi must start with lower case letters. It is also convention to write genus, species and subspecies names in italics. You might be interested to know that *Canis lupus youngi* a native of Nevada, Utah and Colorado became extinct in 1940. The Texas Red Wolf *Canis rufus rufus* became extinct in 1970. In the specific name *Canis rufus rufus* you'll notice that the second name is not lupus, the Latin word for wolf, as in the first group. This is because the Texas Red Wolf is not a true wolf. It is more closely related to the coyote so it does not carry the species name lupus. However, if the person who first described the animal really believed it to be a wolf and had used the term lupus for the species name, it would have to remain as such. That is International Taxonomic law.

Now let's look at how you would differentiate between a domestic dog and a dingo in the taxonomic system.

| The domestic dog. | |
|---|---|
| Phylum | Chordata |
| Class | Mammalia |
| Order | Carnivora |
| Family | Canidae |
| Genus | *Canis* |
| Species | *familiaris* |
| Subspecies | *familiaris* |

If there were no subspecies you would just use the species name once, so a domestic dog would be called *Canis familiaris*. However, because a subspecies does exist you must repeat the species name *Canis familiaris familiaris*. This then shows that at least one subspecies does exist and leaves a place for it in the taxonomic system. So a dingo is called *Canis familiaris dingo*.

Although the dingo has been classified as a subspecies, for convenience sake or some other reason, it is just not possible that a dingo is a subspecies. If you imagine that when the dingo was first looked at by science and, if it had been noted that:

1. It had a shorter back to hight ratio than other dogs, giving the impression of it being rather tall for its length. Also, instead of a bark or a howl its call was something akin to a cross between a chortle and a yodel.
2. It was almost as small as a chihuahua and looked as strangely different as such, when compared to other dogs.

Then, with a description like this it could be reasonable to call a dingo a subspecies. Also, if it were found that it could not breed together with other dogs then it would be reasonable to classify it as another species.

However, when you consider the difference between a chihuahua and a great dane which are both classified as the same species and you then consider the dingo, what do you get? Just another dog. A distinctly different dog when

compared to other dogs but *Canis familiaris* none the less. The dingo is what is correctly called a cline or a gradation amongst the world of dogs. And, with all the special features that go to make it as such it should be respected as a dingo. It would also be reasonable and very sensible to protect the dingo in its pure form as a genetic resource; we do not know what we may need in the future.

The descriptions above (a) and (b) go part way in describing the basenji. The basenji can be found in the engravings of ancient Egyptian tombs dating back to 3,600 B.C. It was found to still exist in 1870 by explorers of the Congo region of Central Africa and is kept by many people to this day. The basenji is still a dog *Canis familiaris*.

## The classification of humans and apes

Humans did not come from monkeys, chimps or gorillas; the proof is in the DNA but we did come from a common ancestor and that proof is also in the DNA. However, it appears that our ancestors did not swing through the trees, nor did they walk around on two legs.

The scientific jury is in, on the genetic relationship between humans and the apes; so i've had to change my original work on classification a little. In recent years there has been some real understanding on the measuring of how much we share our DNA (deoxyribonucleic acid) with all the other species of monkeys and apes.

The creatures in question are listed below, but this story excludes the monkeys found in the Americas, they are known as new world monkeys and have nothing to do with our lineage.

### Our family tree

| |
|---|
| old world monkeys (many genera and species) |
| common gibbon |
| siamang gibbon |
| orangutan |
| highland gorilla |
| western lowland gorilla |
| eastern lowland gorilla |
| human |
| common chimpanzee |
| pygmy chimpanzee |

- Monkeys share around 93% of their DNA with humans and also with the anthropoid apes; they differ in over 7% of their DNA from the rest of us, so the old world monkeys are the farthest from all apes, including us.
- Gibbons differ by 5% in their DNA from humans and other apes. Siamang gibbons and common gibbons differ from each other by 2.2% of their DNA.
- Orangutans differ by 3.6% in their DNA from humans, gorillas and chimpanzees.
- Gorillas are equidistance apart from humans and both of the chimp species by about 2.3% of their DNA.
- Humans share 98.4% of their DNA with both common and pygmy chimpanzees. Both these chimpanzees differ from us by about 1.6% of their DNA.
- Common chimpanzees and pygmy chimpanzees are 99.3% identical in their DNA and so they differ from each other by 0.7%.

It all started to happen over 30 million years ago, which was well after the dinosaurs. At the end of the cretaceous period, about 60 million years ago, the last dinosaurs left the earth. If you dig up dinosaur bones you'll not find any bones belonging to: humans, monkeys, apes, elephants, cows, horses or even rattlesnakes, they came much later. However, there must have been something in our lineage around during the time of the dinosaurs, or we would not be here. Sometime over 30 million years ago, what were to become all the different kinds of old world monkeys had split company from what were to become humans and apes; the tailless ones, excluding guinea pigs of course.

There is a recurring telltale pattern in our DNA, which is the pattern of equidistance. Starting with what we call monkeys, you'll notice that they, the monkeys, are all about 7% distance in their DNA from all the other apes including us. So when whatever it was that split company to go on its merry way and eventually become a monkey, it did so leaving a decisive record of its departure. What became monkeys, kept or developed tails while we, the anthropoids, remained tailless or became tailless.

Just over 20 million years ago what were to become gibbons broke ranks from the rest of us and by about 10 million years ago they had split into two groups: the common gibbons and the siamang gibbons; in all there are now nine species of gibbons in these two groups.

The interesting fact is that gibbons are all 5% distance from all the rest of us in their DNA even though they have split into two groups and have also differentiated into nine species. The two groups of gibbons differ by 2.2% in their DNA from each other and yet they have remained 5% different from the rest of us. There is something consistent and constant about deoxyribonucleic acid (DNA).

The orangutans parted company from the rest of us about 15 million years ago and have kept a 3.6% distance from all the others in their DNA ever since.

The gorillas left our group about 10 million years ago and they have split into three types of gorillas: the highland gorilla, and the eastern and western lowland gorillas and their DNA has remained at a constant 2.3% distance from both humans and chimps.

Around 7 million years ago what were to become humans started to do their own thing and left what were to become chimps to do theirs. We humans have remained exactly 1.6% different in our DNA from both the other species of chimps (common and pygmy), even though they have split from each other by 0.7% in their own DNA. Their split occurred within the last 3 million years.

This means that the gorilla branched off from our family tree before we did and when we parted from the lineage, we left what were to become the both species of chimps. So the closest relative to the chimp is the human, not the gorilla, orangutan, gibbon or any other creature. The common and pygmy chimps differ from each other by 0.7% of their DNA and differ from us by 1.6%, so we are their closest relatives. The DNA of the chimpanzees is closer to ours than is the difference between that of the two species of gibbons.

## Another way of looking at it

As each creature broke ranks it kept a record in its DNA of the order of its departure in relation to all the rest. The strange, interesting and valuable tracer phenomenon left for us to understand our family tree, is that once one of us broke away, the percentage of difference that appeared, seems to remain constant, regardless of what happens to the one that broke away. For example since the old world monkeys separated from our lineage they have diverged into many species, some of them becoming quite different from each other. However it seems that they all retain that 7% difference from the rest of us. The first to leave were the monkeys, which are not apes. The most obvious difference between monkeys and apes is that monkeys have tails.

### We all broke ranks in this order and the DNA proves it

| Monkeys | Gibbons | Orangutans | Gorillas | Humans | Chimpanzees |
|---|---|---|---|---|---|
| 1st | 2nd | 3rd | 4th | 5th | 6th |
| | | | | | |
| Percentage (of DNA) from the rest of us | | | | from chimps | from us |
| 7% | 5% | 3.6% | 2.3% | 1.6% | 1.6% that = 98.4% like us |
| | | | | | |
| old world | | | | | |
| | common | | | | |
| | siamang | | | | |
| | | orangutan | | | |
| | | | highland | | |
| | | | western lowland | | |
| | | | eastern lowland | | |
| | | | | human | |
| | | | | | common |
| | | | | | pygmy |
| | | | | | |
| Approximate years ago (in millions) when each group split from the lineage:- | | | | | |
| 30 | 20 | 15 | 10 | 7 | |

Notice also that the percentage markers get smaller down the line from monkeys to chimps: 7%, 5%, 3.6%, 2.3% and 1.6%; meaning that five markers have landed in sequence which is a rather hard call. You try to throw just by chance numbers 1, 2, 3, 4, and 5 in that order.

Chimpanzees are genetically closer to us than they are to gorillas or orangutans. Whether we want to believe it or not chimpanzees are our closest cousins, we left their lineage about 7 million years ago and the story is in the DNA.

There is something else worth considering. When each of these creatures listed above branched out to go it alone, the chances are that each of them did not look anything like what their common name suggests. So what started out to look like a monkey most likely looked nothing like a monkey and what turned out to be what we know as a gorilla most likely looked nothing like a gorilla to begin with. So it would follow that humans or chimpanzees could not have started out looking anything like what we would name as a human or chimpanzee today; they each had a long road to travel and we are all still travelling it.

## How should chimps and humans fit into the taxonomic system?

It appears that the common and pygmy chimps differ by only 0.7% of their DNA and are accepted as different species or at least sub-species, so it would be fair to assume that by our 1.6% difference, we would have to also be a different species. It may also be reasonable to assume that we are of a different genus; considering that some creatures that appear much closer to each other than chimps do to humans, are of different genera. However, it is looking more and more like the chimpanzees belong to the same family as the human family 'Hominidae' and in plain language they should be called hominids, but they are not humans and never will be.

After all the shouting has died down, a fact still remains a fact, so perhaps it's time that some of us grew up and had a serious look at what is real. It is now permissible to present evidence in court based on DNA as "irrefutable evidence". Being able to see and interpret a pattern is a sign of intelligence. Let us continue to develop our intelligence and continue to move on; we are not chimpanzees. A problem with many of us is that we try to get facts to fit a theory instead of finding a theory to fit the facts.

It might also be fair to have a little more respect for our unfortunate long lost cousins that cannot speak for themselves and stop those hideous experiments that are performed on them; both medical and military. These experiments are carried out by their clever and civilized cousins, the humans! Sadly some of their cousins have proven to be the most dangerous and sadistic animals ever to walk the earth. As you read this, such experiments are happening.

It might also be a very civilized idea to seriously consider that they might also like a place left for them in which to live. All of the tailless apes, who can never speak for themselves, are in trouble and that trouble is caused by their civilized cousins who are very good at speaking on their own behalf and very quick to take what they want for themselves.

When you learn about classification it is worth learning about the plight of, and afford some respect for that which you are classifying, otherwise classification is nothing more than academic twaddle.

Now let us look at how we the humans, until quite recently, were seen to differ in the taxonomic system from the apes. You will notice that we have a lot in common with the chimps. So much so, that the criteria used in the laws of classification kept us together right up to the Superfamily called Hominoidea; it is at that point we parted company.

This is how it was generally accepted that humans were differentiated from the chimpanzees, changing immediately after Superfamily.

| Human | | Chimpanzee | |
|---|---|---|---|
| Phylum | Chordata | Phylum | Chordata |
| Class | Mammalia | Class | Mammalia |
| Order | Primates | Order | Primates |
| Superfamily | Hominoidea | Superfamily | Hominoidea |
| Family | Hominidae | Family | Pongidae |
| Subfamily | Homininae | Subfamily | Ponginae |
| Genus | *Homo* | Genus | *Pan* |
| Species | *sapiens* | Species | *troglodytes* |

The small table below is how i personally believe that a minimum grouping should look, with one change made in the line of Family with all else remaining the same. My thoughts may change with more information and extra thought on this subject.

| | | | |
|---|---|---|---|
| Family | Hominidae | Family | Hominidae |

Considering that the Superfamily is already Hominoidea, then it should follow that in the Family line we humans could not be classified as Pongidae, so the chimps would have to join us in the Family Hominidae. However,

perhaps we are quite far enough removed to keep the chimps in the Subfamily Ponginae; though some taxonomists may have clearer thoughts in that area. Personally i do not believe that the chimpanzees could be grouped into the Genus *Homo* and should remain in the Genus *Pan*.

Below are the conventions used to differentiate between three meanings. Otherwise, with the classification of the humans the words look rather similar. We belong to what is called the family of hominids to which perhaps the chimpanzee should also belong, instead of belonging to the family called pongids.

Look at the endings of the following words

| | |
|---|---|
| Superfamily | - oidea - Hominoidea |
| Family | - idae - Hominidae |
| Subfamily | - inae - Homininae |

When classifying plants the family name takes a different ending, whereas in animals, the family ending is - idae, in plants the word must end in - aceae. So, for example, the family name for the cypress tree is cupressaceae.

It is sometimes useful to understand how the taxonomic system works in the real world. So, we will step back a moment to look at an argument that is going on about the naming of the chimpanzees. As stated there are two types of chimpanzees, one from East Africa called the Common Chimpanzee, and one from further west in central Zaire. The West African chimp is known as the Pygmy Chimpanzee or the Bonobo. There are some who say that they are two different species, and if that proves correct; their specific names would look like this:

| | |
|---|---|
| Common chimpanzee | *Pan troglodytes* |
| Bonobo or Pygmy chimpanzee | *Pan paniscus* |

The other argument says than the Bonobo is a subspecies. So if that proves to be the case then their specific names would have to be:

| | |
|---|---|
| Common chimpanzee | *Pan troglodytes troglodytes* |
| Bonobo | *Pan troglodytes paniscus* |

If you'd like to read a very well researched book on this subject and much more, i recommend: 'The Rise and Fall of the Third Chimpanzee' by Jared Diamond, read at least chapter 1 called 'A Tale of Three Chimps'.

If any person has a problem with my figures on DNA please let me know and if need be they can be corrected. It is not fair having people commit numbers to memory that are not correct.

## Classification of tiger snakes

Here is the full classification of the common tiger snake *Notechis scutatus* which is a full species in its own right, followed by Kreffts tiger snake *Notechis ater ater* to which are related various sub-species of tiger snakes.

| Common tiger snake | | Kreffts tiger snake | |
|---|---|---|---|
| Phylum | Chordata | Phylum | Chordata |
| Subphylum | Vertebrata | Subphylum | Vertebrata |
| Class | Reptilia | Class | Reptilia |
| Order | Squamata | Order | Squamata |
| Suborder | Serpentes or Ophidia | Suborder | Serpentes or Ophidia |
| (The Latin name 'Serpentes' or the Greek name 'Ophidia' are optional here.) | | | |
| Family | Elapidae | Family | Elapidae |
| Genus | *Notechis* | Genus | *Notechis* |
| Species | *scutatus* | Species | *ater ater* |

The word next to Order you see is squamata, that is from the Latin word squama meaning scale as on snake or fish etc. Squama is also the Italian word for a scale but not the scale on which you weigh something.

## About International Taxonomic Law

A type specimen is the original specimen after which a species is described and named. The specimen is called a holotype if it was collected by the person who described it. All type specimens and holotypes must be deposited in some major museum collection to allow reference or further research in the future. Once a species name has been given to a type specimen or a holotype that is the name it must keep for ever more. That is international taxonomic law. A species may be moved from one genus to another if it is found to be in a genus that is obviously incorrect. However, if someone attempts to change a species name where there exists a type specimen or holotype wherever it may be, then technically that new species name is invalid. That is the law in place and agreed to by taxonomists the world over. That law is there to stop personal egos getting in the way of a stable system that has been working for over two hundred years. If we ever allow people to change a species name then it would become a free for all. We would be left with an unreliable and unstable system of chaos. What would then be the point of classifying anything?

Here is an example or a mistake that by International Taxonomic Law that cannot be changed. The Garial which is sometimes referred to as the Gavial. It is a large Indian, river dwelling long snouted fish eating crocodile. In Hindi a small pot is galled ‘ghara’ and the male of this crocodile carries a large raised area on the end of its snout that looks just like that. Hence its name in Hindi Garial. When the name was submitted for acceptance, the person in the office misread the letter ‘r’ for a ‘v’ and so officially in the International Taxonomic system the creature carries the name Gavialis gangeticus instead of Garialis which is what it should have been. The Garial by the way is the rarest crocodile in Asia, in recent years their populations have crashed. It has lot to do with the skin trade.

Here is another example, if once its proposed name is accepted, it cannot be changed by International Taxonomic Law. This snake was named after the author of this site. As a newly described species it was given the name Pailsus rossignolli. Now considering that this new species carries my surname it does jump out at me that my name has been misspelt. Rossignoli has only one letter L not two. The person who described the snake as a new species did not check up on the correct spelling before giving the snake its name.

I may change my name legally by deed poll. By International Taxonomic Law that snake, if accepted in that form, must keep its name as it is, unless it is found that it is not a new species. If that were to happen then it would just go on being what it has always been. The poor old snake of course would not know anything about these human shenanigans.

Hopefully the correct spelling will be accepted and not have this snake go the way of the Garial/Gavial.

*Pailsus rossignoli*
Photograph by: Attilio (Joe) Marra