The Battle over Sudan - a taxonomic war

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Probably the most well known, certainly the most highly publicised, individual rhino of recent times is Sudan. Recently deceased, Sudan represented the last remaining male Northern white rhino in the world today. Now with only two females left, strident efforts are being made to raise the funds necessary to save the Northern white rhino from extinction.

Behind these efforts, there rages a disagreement over whether the Northern white rhino (NWR) is a species in its own right, recently named the Nile rhinoceros, or a subspecies alongside its partner subspecies the Southern white rhinoceros (SWR). Whether this matters or not, will be considered later.

While it could be expected that there was a clear-cut scientific definition of a species and a subspecies, nothing could be further from the truth. In fact the classification system, taxonomy, is based on "concepts" -- defined as general notions or ideas!

A definition of a species was offered by renowned taxonomist Ernst Walter Mayr in 1942 who proposed that species were populations, or series of populations, that did not interbreed with one another under natural conditions. This became known as the Biological Species Concept. In later years, Mayr questioned the veracity of his own definition where it was applied too strictly and offered, in 1991, a revised definition whereby interbreeding populations were reproductively isolated from each other. For example, two species of Zebra, Grevy's and Plains, when found in close proximity, can mate but they do not produce fertile offspring.

BELOW: The northern white rhino male SUDAN.

THE DISTINGUISHING FEATURE(S) MUST BE DIAGNOSABLE AND THEREFORE CAN BE TESTED FOR.

PHOTO BY: OL PEJETA CONSERVANCY

PHOTOS BY: F PATTON

TOP & BELOW LEFT: The very hairy ears of the northern white rhino.

TOP & BELOW RIGHT: The sparsely hairy ears of the southern white rhino.

By 1997, there were some two dozen "Species Concepts" being proposed! Arising from this pack of concepts has been the Phylogenetic Species Concept which states that a species, with a parental pattern of ancestry and descent, must be distinguishable from another species. The distinguishing feature(s) must be diagnosable and therefore can be tested for.

So the battle lines for the Northern/Nile rhinoceros are set up -- the Biological Species Concept vs the Phylogenetic Species Concept.

SOME BACKGROUND

In 1900, it was thought that there were only 25 to 35 white rhinos left in the world, located in the Umfolozi Game Reserve in South Africa. Then, when the search for the source of the Nile led to expeditions into the interior of East/Central Africa, a whole new population of several thousand white rhinos was found in an area from south-western Sudan, western Uganda, north-eastern Congo, Chad and the eastern region of the Central African Republic.

It appeared that large rivers and other major landscape features were a major barrier to the spread of the species. Between the South African population and the East/Central African population was a large geographic gap (or reproductive isolation), hence the terms Southern and Northern.

While the SWR population was well conserved and has grown to some 20,000 individuals, the NWR suffered heavy poaching and was declared extinct in the wild in 2008. What remained were seven individuals in two zoo locations. Subsequent deaths and a relocation of some to the wild has left the two remaining at Ol Pejeta Conservancy in Kenya both of which are non-reproductive.

Thus, the future of the NWR is seen to be with Artificial Reproduction Technology, laboratory produced NWR embryos transplanted into surrogate SWR females to produce 100 per cent NWR calves. A practically difficult and highly expensive project running into millions of dollars and breaking new ground in science.

BACK TO THE BATTLE

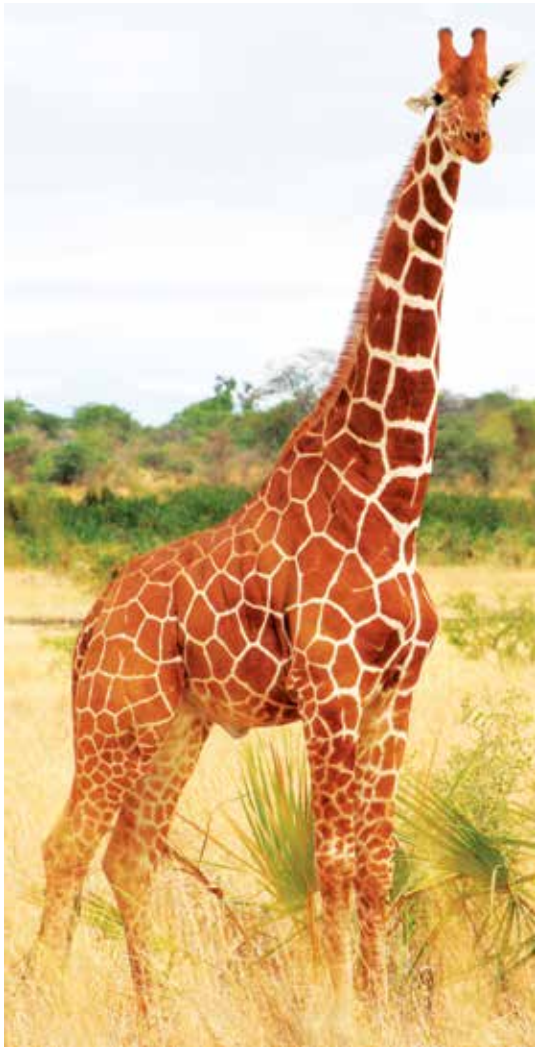
Can NWR be seen to be clearly distinguishable from SWR and therefore a different species?

Renowned taxonomist Colin Groves, now deceased, and colleagues tests suggest they are distinguishable by characters of the dentition, skull and long bones, body size and conformation, presence or absence of body hair and genetics. They also claim that the NWR and SWR have distinctly different evolutionary histories. However, the opposition argue that the data used was based on the testing of too small a sample.

To the casual observer NWR and SWR are very similar except for one consistent feature -- the very hairy ears of the NWR, which can be

DID YOU KNOW

The white rhino is the third largest African animal (after the elephant and hippo) and weighs between 1,700 and 2,400 kg.
White rhinos are not actually white, but grey. White rhinos are not actually white, but grey. The confusion results from a misinterpretation of the Dutch word 'wijde' (meaning wide, not white), used to describe the rhino's mouth.



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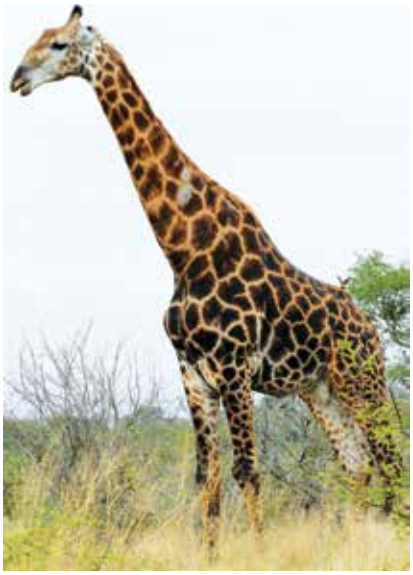

LEFT: Reticulated Giraffe.

MIDDLE: Southern Giraffe.

RIGHT: Masai Giraffe.

These three were considered sub-species of one overall species but recently redefined by some as belonging separately to one of now four different species.

seen in historical photographs and the three live individuals.

So, are NWR and SWR not the same species but subspecies of the same species?

Renowned geneticist Eric Harley and colleagues compared the entire mitochondrial DNA genome of the white rhino. The testing undertaken was to assess the time when they evolved from one entity into two -- the NWR and SWR. Their conclusion was that divergence occurred somewhere between 0.46 and 0.97 million years ago. Additionally other researchers had shown that the lineage divergence time could be as much as 300 per cent less than the gene divergence time for times less than one million years. So NWR/SWR could have split as recently as 200,000 years ago.

They further point out that, at Ol Pejeta, the NWR and SWR when placed together, mated so there was mate recognition as required under the Biological Species Concept. However, no offspring resulted, so it was not possible to show if they were fertile. In any case it has been postulated that the specific circumstances of

SO, ARE NWR AND SWR NOT THE SAME SPECIES BUT SUBSPECIES OF THE SAME SPECIES?

the mating might not be regarded as completely natural.

Just to muddy the waters further, Czech scientists tested to see if NWR and SWR could recognise each other by the sounds they made (vocalisations) and found consistent differences which were in accordance with the recognition of NWR and SWR as two distinct species.

Having summarised the background of the two sides in the taxonomic battle of the NWR, the question remains. Does it matter if NWR are a species or a subspecies?

Under the heading '*Agony of Truth*', Jonathan Baillie, then Director of Conservation Programmes at the Zoological Society of London, stated: "We know that there are limited resources. So we have to think about how we use these limited resources to most effectively conserve the threatened species and ecosystems we have ... in reality, we're going to have a set amount of resources and we're going to have to make tough decisions. We're going to have to think about which species and which ecosystems we start on first."

The Biological Species Concept may result in the lumping together of differences between populations into subspecies, while the Phylogenetic Species Concept may result in the splitting of populations into species in their own

DID YOU KNOW

Giraffes are the tallest mammals on Earth. Their legs alone are taller than many humans– about 6 feet.

They can run as fast as 35 miles an hour over short distances, or cruise at 10 mph over longer distances.

PHOTOS BY: P CAMPBELL

right. It is argued that over-lumped taxonomic schemes have made, and continue to make, numerous species invisible to conservation, risking them becoming extinct unnoticed.

That tough choices have to be made as to where to spend the limited resources, raises the question -- should a subspecies of one species be considered worthy of conserving ahead of a species of another? There are only around 65 individual Javan rhinos and possibly only between 25 and 35 individual Sumatran rhinos left in the world today while white rhinos number some 20,000.

Writing in Pachyderm No 49 January–June 2011, the Chairman of the African Rhino Specialist Group (AfRSG) stated: "That the debate as to whether or not the NWR is a subspecies or separate species is somewhat academic and practically largely irrelevant!"

TOP: Grevy Zebra and below: Plains Zebra are taxonomically different species but can breed together and produce fertile offspring.

Embracing the Biological Species Concept to define NWR as a subspecies, the authorities (the IUCN informed by the AfRSG), have leant their tacit support to actions that may result in the spending of eventually (potentially) millions of dollars of funding on NWR conservation rather than on an alternative rhino or any other worthy species.

It can be argued that donors have the right to place their money where they want to and, if told that they should not go ahead with their chosen project, might well decide not to donate to anything. This is no excuse but for the fact that there is no truly independent and knowledgeable body that can advise donors on conservation priorities.

Bringing the NWR back from the brink of extinction so that it can be reintroduced into its historic range, (when adequate security permits), where there are currently no rhinos, would be of great value not just to improving the biodiversity of the relevant countries, but also to their potential to attract tourists and consequent improvements to their economies.

Conservation choices should be made on the basis of science and, helpfully, there are some who believe the science underpinning the Phylogenetic Species Concept applied to NWR is sound so they are a species and deserve the investment being made to bring them back from extinction. And, as a consequence of the scientific developments necessary to do so, many more endangered species may also benefit.

That there is no overarching independent oversight group to advise on conservation priorities needs to be addressed sooner rather than later.

Further reading, available from rhinoresourcecenter.com:

Groves, C.P.; Cotterill, F.P.D.; Gippoliti, S.; Robovsky, J.; Roos, C.; Taylor, P.J.; Zinner, D., 2017. Species definitions and conservation: a review and case studies from African mammals. Conservation Genetics 18: 1247-1256 - DOI 10.1007/s10592-017-0976-0

Harley, E.H.; De Waal, M.; Murray, S.; O'Ryan, C., 2016. Comparison of whole mitochondrial genome sequences of northern and southern white rhinoceroses (Ceratotherium simum): the conservation consequences of species definitions. Conservation Genetics 2016 (early view): 1-7