Antelope Specialist Group
Groupe de Spécialistes des Antilopes

Taxonomy Policy
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Introduction

Antelope Specialist Group (ASG) is the designated IUCN Red List Authority and taxonomic authority, responsible for deciding which of the taxa within its remit should be included on the IUCN Red List and for making those Red List assessments.

IUCN Red List assessments are used, *inter alia*, to inform listings on the Appendices of CITES and the Convention on Migratory Species (CMS), in National Biodiversity and Strategy and Action Plans (NBSAPs), official lists of protected species, national legislation, and in conservation priority setting exercises at global, regional and local scales. In addition, the Red List Index is used to monitor progress on the Conservation on Biological Diversity (CBD) Aichi Biodiversity Targets, and the United Nations Sustainable Development Goals.

This wide range of applications at policy and practical levels makes it imperative that decisions on Red List assessments, and the taxonomic basis for them, have a sound scientific basis and are made in a consistent and transparent way.

More than 20 species concepts have been proposed, which differ in their theoretical basis, the criteria used to delineate a 'species' and the taxonomic arrangements that result. All these concepts have acknowledged limitations and no single concept is accepted by all conservation biologists.

ASG's view is aligned with the traditional Biological Species Concept (BSC) and the more recent Differential Fitness Species Concept (DFSC), based on the principle of reproductive isolation and potential effects on fitness. ASG considers that delineating species according to these concepts best capture the most conservation-relevant aspects of evolutionary processes and that they are the most informative and helpful to conservation of antelope diversity, especially when compared to pattern-based species concepts relying on diagnosability alone. Appendix 1 provides a more detailed rationale and references.

Taxonomic reference

The standard taxonomic reference followed by ASG is: *Mammals of the World: a taxonomic reference* (Wilson & Reeder 1993, 2005) and the chapter therein in the second edition on the Artiodactyla by the late Peter Grubb (Grubb 2005). ASG accepts some subsequent amendments to this taxonomy and nomenclature where reliable evidence supports the change and in a few cases to remain consistent with the classification used in *Mammals of Africa* (Kingdon and Hoffmann 2013). These changes are listed in Appendix 2.

Subspecies

Many antelope subspecies have been described, mostly on the basis of morphological features, such as length or shape of horns, differences in coat colour, craniometric measurements etc. Others have been named from specimens obtained at separate points along a geographical cline. These forms are best regarded as 'geographical races' that may not always reflect significant evolutionary divergence. Only a few named subspecies have so far been corroborated by genetic evidence. Some antelope subspecies are currently included on the Red List. A full taxonomic review is planned and antelope Red Listing will increasingly encompass subspecies and populations, where these are deemed to merit conservation attention.

Revisions and changes

ASG's existing taxonomic arrangement is not regarded as fixed and is kept under regular review: (1) the present arrangement is not fully consistent at the species, and especially subspecies, level; (2) advanced techniques of molecular analysis are producing new insights, clarifying phylogenetic relationships and divergence times, and revealing cryptic diversity.

ASG will give careful consideration to all proposed revisions to antelope taxonomy and/or nomenclature published in peer-reviewed journals. Decisions on acceptance will be made in consultation with relevant specialists, the Global Mammal Assessment Team and the IUCN Red List Unit.

ASG is developing a more integrative view of antelope classification. While DNA evidence is effective at revealing patterns of ancestry, it does not itself identify precise species boundaries, so other lines of evidence are usually needed. Proposed taxonomic changes will be evaluated against the criteria of the BSC/DFSC and also take into account other factors, including phylogenetic evidence (nuclear and mtDNA); karyology, biogeography, morphology, and behaviour. Taxonomic changes based only on mtDNA, minor morphological differences, very small sample sizes, or captive-bred specimens only, are unlikely to be accepted. Decisions will be communicated through *Gnusletter* and the ASG website.

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Appendix 1. Rationale

The following summarizes the rationale for the ASG position; for further details see the references cited.

Although the “species” is widely understood as a basic component of biodiversity, it is difficult to define the term in a way that can apply equally to all organisms and satisfy all biologists.

Around 26 species concepts have been described (Wilkins 2009, Hausdorf 2011, Frankham et al. 2012), all differing in their theoretical basis and the criteria used to delineate a species. When applied, these concepts produce different taxonomic arrangements and varying numbers of species. These varying taxonomic arrangements have clear implications for conservation at legal, policy, funding and implementation levels (Agapow et al. 2004, Mace 2004).

All species concepts have acknowledged limitations. Even when using the same concept, molecular and morphological analyses of the same species may produce discordant results, as may genetic studies investigating different parts of the genome. Moreover, assigning taxa to specific or subspecific rank is often open to interpretation of the available evidence, whether genetic or morphological, and therefore depends to some extent on subjective judgement.

According to the traditional Biological Species Concept (BSC) "*species are groups of interbreeding natural populations that are reproductively isolated from other such groups*" (Mayr 1942, 1963). This concept has been widely applied and it functions well in many cases, but may be more problematic in others, such as in species complexes where boundaries between taxa are unclear, where natural hybridization can produce fertile offspring, The Differential Fitness Species Concept (DFSC) is also based on reproductive isolation but takes a somewhat broader view than the BSC, including negative fitness effects in other groups (Hausdorf 2011).

Two other widely cited species concepts are the Evolutionary Species Concept (ESC) and the Phylogenetic Species Concept (PSC). The ESC was revised by Wiley (1978) as: “*an evolutionary species is a single lineage of ancestral-descendant populations which maintains its identity from other such lineages and which has its own evolutionary tendencies and historical fate*”.

The Phylogenetic Species Concept (Eldredge and Cracraft 1980, Cracraft 1983) defines a species as “*the smallest diagnosable cluster of individual organisms within which there is a parental pattern of ancestry and descent*”. This is essentially pattern-based, in contrast to the BSC and DFSC which favour evolutionary processes and distinctiveness.

However, since ‘diagnosable species’ share a single character that other groups lack, without considering populations or reproductive barriers, the principle becomes more problematic to apply in several situations: 1. Where populations differ morphologically but are connected, or potentially connected, by gene flow; to take an extreme example, humans across the world display clear morphological variation that is heritable, but they not *a priori* reproductively isolated. 2. When intraspecific variation is expressed as a phenotypic cline over large geographic ranges, sampling at widely separated sites can result in ‘diagnosable’ clusters of individuals that intergrade. 3. Many taxa have been split into small, fragmented subpopulations due to relatively recent anthropogenic factors, such as overharvesting, habitat degradation or even being taken into captivity. These subpopulations may quickly develop individual characteristics through the process of genetic drift and soon become ‘diagnosable’. These may not, though, have developed reproductive barriers, and if these subpopulations are reconnected through reversal of the threats or conservation management, interbreeding and gene flow can be expected to result. 4. As pointed out by Frankham et al. (2012), recognizing these 'diagnosable' subpopulations as species could prevent genetic rescue by reinforcement with individuals from outside that 'subpopulation/species', a potentially harmful consequence. 5. The principle of diagnosability is open-ended, so improvements in the refinement of analytical processes will inevitably lead to increased resolution of 'diagnosability'. Applying the principle of diagnosability inevitably leads to an increase in the number of 'species' (Agapow et al. 2004, Groves and Grubb 2011) thus contributing to 'taxonomic inflation' (Agapow et al. 2004, Frankham et al. 2012, Zachos et al. 2013).

ASG considers that the principle of reproductive isolation, despite its acknowledged limitations, and as expressed through the BSC or DFSC, remains the most reliable criterion for delineating species because it takes account of evolutionary history and processes and phylogenetic relationships (Agapow et al. 2004, Mace 2004, Coyne and Orr 2004, Frankham et al. 2012, Zachos et al. 2013); ASG specifically agrees with (Frankham et al. 2012) that: "*minimum harm to fitness is done and maximum potential benefits to fitness and evolutionary potential when reproductive isolation is used to define species*".

Appendix 2. Taxonomic and nomenclatural differences between ASG's taxonomy and Grubb (2005)

Grubb 2005	ASG	Reference	Notes
Taurotragus derbianus	*Tragelaphus derbianus*	Kingdon & Hoffmann (2013)	Several authors support use of *Tragelaphus*
Taurotragus oryx	*Tragelaphus oryx*		
Eudorcas rufina	Invalid taxon	Groves (2013)	Only known from specimens in markets – assumed misidentified
Eudorcas rufifrons	*Eudorcas albonotata*	Kingdon & Hoffmann (2013)	
	Eudorcas rufifrons		
	Eudorcas tilonura		
Gazella arabica Lichtenstein 1827	Invalid taxon	Bärmann et al. (2013)	Type specimen misidentified
Gazella arabica bilkis	*Gazella bilkis*		Provisional – maybe invalid as separate taxon
Gazella gazella	*Gazella gazella*	Wronski et al. (2010) Lerp et al. (2012)	Israel and Levant
	Gazella arabica		Arabian Peninsula
Gazella subgutturosa marica	*Gazella marica*	Wacher et al. (2010)	
Gazella erlangeri	Not recognised		No information on occurrence in wild
Saiga borealis	*Saiga tatarica mongolica*	Kholodova et al. (2006) Campos et al. (2010)	
Alcelaphus caama	*Alcelaphus buselaphus caama*	Kingdon & Hoffmann (2013)	
Alcelaphus lichtensteinii	*Alcelaphus buselaphus lichtensteinii*		
Damaliscus korrigum	*Damaliscus lunatus korrigum*	Kingdon & Hoffmann (2013)	
Damaliscus superstes	*Damaliscus lunatus superstes*		
Neotragus moschatus	*Nesotragus moschatus*	Kingdon & Hoffmann (2013)	
Cephalophus brookei	*Cephalophus ogilbyi brookei*	Wilson (2005) Kingdon & Hoffmann (2013)	Under review
[Not listed]	*Philantomba walteri*	Colyn et al. (2010)	Newly described species

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