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Global research output in Antelope species: A case study

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Abstract
An analysis of 1689 papers on global antelope research during 1989–2017, as indexed in Web of Science (WoS) database indicate 27247 citations received among the publications, registering an average citation of 16 per paper. The growth rate of publications varied from 0.80 to 6.30 % per year. Highest number of antelope papers published during 2015 and 2011 were 106 and 102 respectively. Most of the researchers on antelope preferred to publish their papers around 1460 as articles followed by each 53 reviews and proceeding papers, 26 book chapters, 24 abstracts and editorial materials equally, 22 notes, 12 letters, 10 news items and 5 other publications. USA is found to be the leading country in antelope research with 595 papers. The USA and the South Africa make up 35.2 and 14.9 % of global articles antelope on respectively. University of Pretoria and University of the Witwatersrand published the highest number of articles among the top 30 institutions. *African Journal of Ecology* was the top journal of publication output (72 papers; 847 citations; 1.78 IF); *Molecular Ecology* had the highest impact factor (12 papers; 441 citations; 6.01 IF); *Biological Conservation* received the highest number of citations (31 papers; 1190 citations; 4.29 IF) among the top 30 journals. Of the top 30 authors accounted, six authors have registered higher publications, of which the most productive author is *Milner-Gulland* with 36 papers and 1042 citations. The scientometric analysis reveals that the international status of antelope research is not satisfactory. Antelope non-habitat countries (i.e., USA, UK, Germany and France) have the highest number of publications compared to Antelope habitat countries. The IUCN, SSC and ASG organizations could motivate the antelope researchers with sufficient funding support to the Institutes/ Universities/Zoo/Conservation centre, etc. to do scientific research in order to conserve antelope species throughout the world.

Keywords: antelope; web of science; hist cite analysis; impact factor; highly cited papers

1. Introduction

The antelopes are the most distinguishing medium sized hoofed ruminant mammals which belong to family Bovidae. It has strong permanent un-branched horns consisting of a chitinous shell with a bony core and is not shed. True antelopes are found only in African and Asian continents. Antelopes have adapted a wide range of habitats, typically woodland, forest, savannah, grassland plain, marshes, etc., and several species are living in the mountain and rocky outcrops. A few species live in desert (both hot and cold), and a couple of species are even semi-aquatic live in swamp (East, 1988) [6].

Antelopes comprise a significant part of the herbivore biomass and are a valuable natural resource. They occupy a major, integral part of many African and Asian ecosystems and also a staple food for many carnivorous predators (East, 1989) [7]. Further, the biological and aesthetic significance of antelopes have often been important factors in the establishment of national park and wildlife reserves (East, 1989) [7]. Many factors contribute to the decline of antelope populations over wide areas of different regions (Africa and Asia continents) in the last five decades as follows:

- Hunting (legal and illegal),
- Habitat destruction,
- Competition with livestock,
- The growing human population and development,
- Wide expanses of grassland converted to agriculture or subjected to increased levels of livestock grazing,
- Large areas have been degraded or destroyed by over grazing and soil erosion,
- Overuse of ground water has led to problems of desertification and increased salinity (i.e., unsuitability habitats of antelopes),
- Construction of settlements and industrial enterprises further encroach on antelope habitat,

New roads open up in remote areas and crossing mountains make way to exploitation, facilitate hunting, and enable herders to transport flock into areas previously used only by wild herbivores, while roads, railways, and canals impose physical barriers which may reinforce isolation of fragmented populations and interrupt migration routes,

- Wars and civil conflicts, which have affected several countries in the region (notably Afghanistan, Iran, Iraq, Syria, Kuwait, Lebanon, etc.), inevitably have adverse impacts on antelope habitats and by making law enforcement difficult or impossible, and hindering conservation measures,

- Under deteriorating economic conditions, people will naturally seek to utilize large mammal populations as a source of food etc.

These factors pose threat to surviving antelope populations in different regions. As there is an urgent need for global scientific research on Antelope species, this study could be helpful in the development of conservation and management strategies of this species (East, 1989; Mallon and Kingswood, 2001) [7, 19].

Antelope Specialized Group (ASG) was created in 1978, through the initiative of late Harold J Coolidge, founder of the Species Survival Commission (SSC) and a former President of International Union for Conservation Nation (IUCN) (East, 1988) [6]. Species Survival Commission and Antelope Specialized Group have more than 100 members comprised of 40 countries. This group surveyed the antelope species region wise of African and Asian continents and published their findings as Global Survey and Regional Action Plant Part 1, 2, 3 and 4 (East, 1988, 1989, 1990; Mallon and Kingswood, 2001) [6-8, 19]. 59 species are recognized as occurring in 9 countries in the East and Northeast African regions (East, 1988) [6], 36 species inhabit in 10 countries of the Southern and South-Central African regions (East, 1989) [7], 44 species in 22 countries in the West and Central African regions (East, 1990) [8], 25 species in 37 countries from North Africa, the Middle East and Asian regions (Mallon and Kingswood, 2001) [19].

Scientometrics is a valuable technique for evaluation of research performance of any disciplines (social science, economics, commerce, political science, biological science, engineering, medical etc.) in a country or a group of countries or institutions, etc. In recent years, scientometric has been broadly used as a quantitative analysis method in many scientific research fields such as pheromone biology research (Rajagopal *et al*., 2013) [24], nitrogen research (Gao and Guo, 2014) [10], phosphorus research (Gao *et al*., 2015) [11], solar cell research (Dutt and Nikam, 2016) [5], cereal crop research (Tripathi and Garg, 2016) [34], *Mycobacterium Tuberculosis* and *Leprosy* research in India (Rahul and Nishy, 2016) [23], conservation research importance (Doi and Takahara, 2016) [4], breast cancer (Ram, 2017) [26], chemistry research in India (Arunachalam *et al*., 2017) [1], earth research in India (Vishnumaya *et al*., 2017) [35], liver disease research in SAARC countries (Naheem *et al*., 2017) [21], etc. There are very few reports available on the animal research published in the Web of Science/Elsevier's Scopus/Science Citation Index/CAB/Midline databases, etc., such as fish (Jayashree and Arunachalam, 2000) [16], buffalo (Rathinasabapathy and Rajendran, 2010) [27], goat (Rathinasabapathy, 2012) [28], duck (Rathinasabapathy, 2013) [29], sheep research (Rathinasabapathy *et al*., 2014) [30], cow research (Pateria and Prabhavathi, 2015) [22], camel (Gupta *et al*., 2015) [13], elephant (Rajendran, 2015) [25], nursing (Singh and Pandita, 2018) [32], dengue (Majid *et al*., 2019) [18] etc. However, scientometric study has not yet been done on Antelope species research. Therefore, the present study analyses Antelope-related publications which are indexed by *WoS* in the last 29 years (1989 – 2017). Global scientific research on antelope species is analyzed at the level of overview, journal, country, institution, author, etc. The study also explores the hot spots for antelope research by analyzing articles published in high-quality journals. These efforts will provide a blue-print of the mainstream research on Antelope species.

The objective of this paper as follows:

1. To examine the output of antelope species research, its growth and global publication during 1989 – 2017.
2. To study the document type-wise contributions and subject domain with GCS and LCS citation score.
3. To determine the distribution of antelope research among the different countries.
4. To identify the most prolific institutions in the field of Antelope research.
5. To find preferred journals in which Antelope researchers publish their work.
6. To identify the most prolific authors with h-index, affiliation and countries.
7. To identify the highly cited papers (with title of the paper, author, country, journal, year of publication, impact factor and number of citations received) in Antelope research.

2. Materials and Methods

The Web of Science database was searched for all records of papers published in peer-reviewed journals and other bibliographical forms. This study is based on the world publication data on Antelope research retrieved from *WoS* database for the 29 years (1989–2017). In the present study, the main string used to retrieve data on Antelope research is as follows:

Title-Abs-Key: Antilope and
Title-Abs-Key: Antelope and
Pubyear > 1989 and
Pubyear < 2017

The study examines research activities in different higher education and research institutions across world.

2.1. Hist Cite Analysis

The year of publication, journals and authors were analyzed and displayed in tables using HistCite. HistCite developed by Garfield and colleagues (HistCite, http://www.histcite.com/ index.htm; Garfield *et al*., 2003) [12] which is an analytical and visualization tool which enables analysis of a subject and helps a searcher to identify the most significant work on a topic and trace its evolution. It also helps to identify highly productive and highly cited authors in any chosen area of research, particularly top and high impact journals, prominent institutions, etc.

2.2. Total Global and Local Citation Scores Analysis

The total Global Citation Scores (GCS) and total Local Citation Scores (LCS) are examined to identify the pattern of research contribution on Antelope research. TLCS is the number of times an author's papers included in a collection have been cited by other papers also in the collection. TGCS is the number of times an author's papers included in a collection have been cited in the Web of Science.

2.3. Impact Factor

The impact factor values from Journal Citation Reports (JCR) 2016 were also added for the identified journal titles.

3. Results

3.1. Distribution of Antelope species

Several antelope conservators are dedicated to contribute to the global survey of antelope species in different region of

African and Asian countries. Antelope species are found more than 78 countries (Supplementary Table 1). Among these, more number of antelope species are found in Kenya (37 species) followed by Sudan (36 spp.), Tanzania (35 spp.), Zaire (32 spp.), Uganda (30 spp.), Ethiopia (30 spp.) and South Africa (30 spp.). In East and Northeast African regions, 60% of species are classed as satisfactory, with most of the remainder as threatened. The Kenya contained 37 antelope species followed by Suden (36 spp.), Tanzania (35 spp.), Ethiopia (30 spp.) and Uganda (30 spp.). In Southern and South Central African regions, approximately 80 % of 35 extant species are classed as satisfactory, with the remainder threatened. More number of antelope species occurred in South Africa (30 spp.) followed by Angola (26 spp.), Swaziland (26 spp.) and Zimbabwe (24 spp.). It has shown that 44 species are classed as satisfactory, with most of the remainder as endangered in West and Central African regions. The highest number antelope species are found in Nigeria (25 spp.) followed by Central Africa Republic (24 spp.), Cameroon (23 spp.), Ghana (20 spp.), Ivory Coast (20 spp.), Sierra Leone (20 spp.) and Chad (20 spp.). In North Africa, Middle East and Asia regions, 75-85 % of antelope species are classed as endangered and remainder has been classified as vulnerable. The most antelope species are found in Algeria (8 spp.) followed by Tunisia (7 spp.), Morocco (6 spp.), Libya (6 spp.), Egypt (6 spp.), China (6 spp.) and India (6 spp.; Table 1). Bushbuck is the most widely distributed antelope species found in 40 countries followed by Waterbuck (in 37 countries), Grey Duiker (in 36 countries), Roan (in 34 countries), Oribi (in 34 countries) and Sitatunga (in 30 countries) (Supplementary Table 2).

3.2. Year and Document type wise distribution of Antelope research output

During the period of 29 years from 1989 to 2017, 1689 papers were published on different aspects of Antelope research. The number of records obtained from the Web of Science (*WoS*) database for each publication year is given in Table 1. A total of 1689 publications in 10 document types were found in the 29-year study period. The highest number of papers was published in 2015 and 2011 (106 and 102 papers respectively) whereas the lowest number of papers was published in 1989 (13 papers). 1689 papers have been cited by 27247 antelope researchers. For each published paper, we can hotlink to both local and global citation score. The highest number of global citation score was recorded during 2004 (1654 citations). In contrast, the highest local citation score was recorded during 1999 (196 citations). The annual rate of growth is inconsistent and fluctuated during the study period. The growth rate of publication varied from 0.80 to 6.30 % per year. This scientometric analysis demonstrates the growing influence of antelope research and this study is supposed to attract more researchers' interest and be more productive in the future. Out of 1689 publications 1460 were articles, accounted for 86.4% of the total documents followed by 53 each reviews and proceeding papers, 26 book chapters, 24 each abstracts and editorial materials, 22 notes, 12 letters and 10 news items and 5 were others publications (Table 2).

3.3. Country wise distribution of Antelope research

The contribution of publications provided by a total of 100 different countries is represented in the 1689 publications during 1989 – 2017. Table 3 listed the top performance of 30 countries on Antelope research based on both quantity (publication) and quality (citation). Among these countries, United States of America ranked first in terms of the number of publications (595 papers) with 11801 received total citation score followed by South Africa 252 papers, UK 220 papers, Germany 105 papers, China 92 papers, France 63 papers, India 63 papers, Canada 61 papers, Australia 47 papers, Italy 31 papers, each 30 papers in Czech Republic and Switzerland, 28 papers in Russia, each 26 papers in Norway, Spain and Zimbabwe, each 23 papers in Kazakhstan and Kenya, each 21 papers in Denmark and Japan, each 20 papers in Belgium and Zambia, 19 papers in Tanzania, 18 papers in Saudi Arabia, 16 papers in Netherland, each 15 papers in Poland and Uganda, 14 papers in Brazil, each 13 papers in Austria and Mexico. The USA and South Africa are the top two countries in terms of publications from 1989 to 2017, making up 35.2 and 14.9 % of global articles. Out of top 30 countries, 19 are developed countries (USA, UK, Germany, France, Czech Republic, Denmark, Russia, Canada, Australia, Italy, Switzerland, Belgium, Norway, Spain, Japan, Saudi Arabia, Netherland, Poland and Austria) and remaining 11 are developing countries (South Africa, China, India, Brazil, Zimbabwe, Kazakhstan, Kenya, Zambia, Tanzania, Mexico and Uganda) actually involved in antelope research.

3.4. Benchmarking research performance of institutions

There are 1429 institutions engaged in Antelope research during 1989 – 2017. The publications profile of top 30 institutions along with their research output, citation received and *h*-index values are presented in Table 4, representing 791 records accounting for 41.85% of the total publication. University of Pretoria (South Africa) and University of the Witwatersrand (South Africa) were foremost among them, each with publications exceeding 60 papers with 7 *h*-indexes. In contrast, University of California, USA (36 papers; 910 citations), University of Cambridge, UK (21 papers; 906 citations) and University of Copenhagen, Denmark (17 papers; 825 citations) have highest score of citation with less number of publications. The average citations per paper registered by the total papers of these 30 institutions were 464.03 during the study period. The average *h*-index value of these 30 most productive institutions was 11.3 during 1989-2017. Nine institutions scored more than 15 *h*-index values compared to other institutions. Of this, the highest *h*-index value of 20 was achieved by University of California, USA. Among the top 30 institutions, 14 institutions are from the USA, 4 each from UK and South Africa, 2 institutions from Australia and one each from China, Switzerland, Russia, Denmark, France and Zambia.

3.5. Source-wise distribution of research output:

The list of top 30 sources preferred by antelope researchers is given in Table 5 provides the information of 1689 articles were published in 625 journals. Of the top 30, seven journals have registered highest number of papers published, of which *African Journal of Ecology* is shown to be the top journal with 72 publications and 847 citations followed *South African Journal of Wildlife Research* (35 articles; 356 citations), *Journal of Zoology* (34 articles; 802 citations), *Journal of Zoo and Wildlife Medicine* (33 articles; 161 citations), *Biological Conservation* (31 articles; 1190 citations), *Journal of Mammalogy* (31 articles; 612 total

citations) and *Oryx* (30 articles; 339 total citations). In terms of impact factor (IF), 18 out of 30 journals have IF more than 2 and remaining 12 journals have less than 2. Of these, *Molecular Ecology* has the highest IF of 6.01 followed by *Biological Conservation* (4.29), *Molecular Phylogenetics and Evolution* (4.27), *Plos One* (3.54), *Animal Behaviour* (3.43), *Biology of Reproduction* (3.43), *Oecologia* (3.22) and *Behavioural Ecology* (3.05). It is to be noted that the highest citations were received for *Biological Conservation* (1190) followed by *African Journal of Ecology* (847), *Journal of Zoology* (802) and *Animal Behaviour* (736).

3.6. Most prolific authors in the Antelope research:

Overall, 4356 authors contributed 1689 publications in Antelope research during the study period 1989 - 2017. Top 30 prolific authors along with their research output, citation received and h-index values are presented in Table 6. These 30 authors who have published 8 or more publications. These 30 authors published 387 (22.9 %) papers of the total publication. Eight of these prolific authors belonged to institutions from South Africa, seven authors from the USA, four authors from Germany, three authors from UK, two authors from Czech Republic, one author each from Switzerland, Mongolia, Kazakhstan, Denmark, China and France. Six authors have published more number of papers ranging from 16 to 36 papers, of which the most productive author is *Milner-Gulland* from University of Oxford, UK, who have published 36 papers followed by *Owen-Smith* with 33 papers from University of Witwatersrand, South Africa, *Robinson* with 22 papers from University of Stellenbosch, South Africa, *Bro-Jorgensen* (University of Liverpool, UK), *Plath* (Universitt Hamburg, Germany) and *Wronski* (Universitt Hamburg, Germany) having published 16 papers each.

The highest number of citations (1042) was received by *Milner-Gulland* papers who had average citation per paper (ACPP) of 28.94, followed by *Owen-Smith* with 671 citation (ACPP: 20.33), *Mascola* with 590 citations, (ACPP: 73.75) and *Arctander* with 583 citations (ACPP: 64.77). Considering, the *h*-index as a factor of quantitative measures of research output, it was found that *Milner-Gulland* has the highest *h*-index with the values of 16 followed by *Owen-Smith* (15), *Robinson* (11) and *Bro-Jorgensen* (10).

3.7. Highly cited articles in the Antelope research:

It has been shown that 1689 articles of 4356 authors from 100 countries were published in 623 different journals/proceeding/chapter books, etc and received 24781 citations in Web of Science database. The characteristics of highly cited papers are listed in Table 7. Citations received as on August 2017 by the top 10 authors' publications which accumulated to 2189 citations in *WoS* database were considered. It is interesting to note in regard to citations that two papers received more than 300 citations, four papers received more perthan 200 citation and four papers received more than 150 citations. All cited papers have more than one authors and it seems that the team contribution is more effective than the single author contribution. The top cited papers of *Seward et al* and *Kohn* have been published in *Journal of the American Medical Association* (IF: 44.40) and *Geochimica et Cosmochimica Acta* (IF: 4.60) respectively. This indicates that publishing article in the high impact factor (IF) journal is one of the major factor with respect to get more citation.

Table 1: Distribution of Antelope species in country-wise and their status

Regions	Country	TNAS	Status (No. of Species)							
			SA	IK	VU	IN	RA	EN	EX	EX/EN
East and Northeast Africa	1 Sudan	36	19	4	-	4	7	2	-	-
	2 Ethiopia	30	15	3	2	2	6	2	-	-
	3 Djibouti	11	1	-	1	3	3	1	2	-
	4 Somalia	22	8	2	4	3	1	4	-	-
	5 Uganda	30	8	3	4	3	5	2	3	2
	6 Kenya	37	22	2	3	1	7	1	1	-
	7 Tanzania	35	29	1	1	1	2	-	1	-
	8 Rwanda	15	7	2	4	-	-	1	-	1
	9 Burundi	17	2	4	-	3	1	-	1	6
Southern and South-Central Africa	10 Angola	26	11	-	2	4	5	4	-	-
	11 Zambia	22	20	-	1	-	1	-	-	-
	12 Malawi	19	12	-	-	-	5	1	1	-
	13 Mozambique	22	12	1	5	-	1	2	1	
	14 Namibia	20	10	-	3	-	3	4	-	-
	15 Botswana	23	15	-	-	-	7	-	1	-
	16 Zimbabwe	24	14	-	2	1	6	1	-	-
	17 South Africa	30	22	-	2	-	5	-	1	-
	18 Swaziland	26	12	1	3	1	2	3	4	-
	19 Lesotho	13	1	2	-	3	2	1	4	-
West and Central Africa	20 Mauritania	11	-	1	-	1	-	6	3	-
	21 Mali	17	5	2	2	3	-	2	1	2
	22 Niger	17	2	-	5	-	3	5	1	1
	23 Chad	20	11	2	1	-	2	4	-	-
	24 Senegal	18	10	-	-	1	4	1	2	-
	25 Gambia	15	-	1	3	4	-	-	5	2
	26 Guinea Bissau	14	6	-	2	-	2	3	1	-
	27 Guinea	18	7	1	-	2	6	-	1	1
	28 Sierra Leone	20	2	2	1	5	1	7	2	-
	29 Liberia	9	5	-	-	4	-	-	-	-

	30 Ivory Coast	20	10	-	1	3	2	2	2	-
	31 Burkina Faso	16	8	-	2	1	2	2	-	1
	32 Ghana	20	11	1	-	2	2	1	3	-
	33 Togo	18	8	2	1	4	2	-	1	-
	34 Benin	17	8	3	1	1	1	3	-	-
	35 Nigeria	25	2	-	7	-	-	14	2	-
	36 Cameroon	23	18	-	2	3	-	-	-	-
	37 Central Africa Republic	24	14	3	1	-	3	-	-	-
	38 Equatorial Guinea	10	6	1	-	3	-	-	-	-
	39 Gabon	14	8	1	1	1	2	-	-	1
	40 Congo	14	10	1	1	-	-	2	-	-
	41 Zaire	32	17	1	5	4	-	5	-	-
North Africa, the middle East and Asia	42 Morocco	6	-	-	2	-	-	1	3	-
	43 Algeria	8	-	-	1	-	-	3	4	-
	44 Tunisia	7	-	-	1	-	-	2	4	-
	45 Libya	6	-	-	-	1	-	1	4	-
	46 Egypt	6	-	-	1	-	-	1	4	-
	47 Saudi Arabia	5	-	-	2	-	-	1	2	-
	48 Yemen	5	-	-	-	2	-	-	3	-
	49 Omen	3	1	-	-	-	-	2	-	-
	50 United Arab Emirates	3	-	2	-	-	-	-	1	-
	51 Bahrain	1	1	-	-	-	-	-	-	-
	52 Qatar	1	-	-	-	-	-	-	1	-
	53 Kuwait	3	-	-	-	-	-	-	3	-
	54 Iraq	3	-	-	1	-	-	-	2	-
	55 Syria	4	-	1	-	1	-	-	2	-
	56 Lebanon	1	-	-	-	-	-	-	-	1
	57 Jordan	4	-	1	-	-	-	1	2	-
	58 Israel	4	1	-	-	-	1	2	-	-
	59 Turkey	1	-	-	-	-	-	1	-	-
	60 Iran	3	-	-	3	-	-	-	-	-
	61 Afghanistan	2	-	-	-	2	-	-	-	-
	62 Pakistan	4	-	-	-	-	-	3	1	-
	63 Azerbaijan	1	-	-	-	-	-	1	-	-
	64 Georgia	1	-	-	-	-	-	-	1	-
	65 Kazakhstan	3	-	-	2	-	-	-	1	-
	66 Uzbekistan	2	-	-	1	-	-	1	-	-
	67 Kyrgyzstan	1	-	-	-	-	-	-	-	1
	68 Tajikistan	1	-	-	-	-	-	1	-	-
	69 Turkmenistan	2	-	-	2	-	-	-	-	-
	70 Russia	2	-	-	-	-	-	2	-	-
	71 Mongolia	3	1	-	1	-	-	1	-	-
	72 China	6	1	-	2	-	-	2	1	-
	73 India	6	2	-	2	-	-	2	-	-
	74 Nepal	4	1	-	1	-	-	1	1	-
	75 Bangladesh	2	-	-	-	-	-	-	2	-
	76 Lao PDR	1	-	-	-	-	-	1	-	-
	77 Vietnam	2	-	-	-	1	-	1	-	-
	78 Cambodia	1	-	-	-	-	-	1	-	-

Abbreviation: TNAS: Total of Number of Antelope Species; SA: Satisfactory; IK: Insufficiently Known; VU: Vulnerable; IN: Indeterminate; RA: Rare; EN: Endangered; EX: Extinct

Table 2: List of Antelope species and Occurrences (East, 1988; 1989; 1990; Mallon and Kingswood, 2001)

#	Antelope (Common and Scientific name)	Occurrence of Country with their status	TNS
	1. Subfamily: Bovinae		
1	Bushbuck, *Tragelaphus scriptus*	1^{S}, 2^{S}, 4^{V}, 5^{S}, 6^{S}, 7^{S}, 8^{S}, 9^{S}, 10^{S}, 11^{S}, 12^{S}, 13^{S}, 14^{EN}, 15^{S}, 16^{S}, 17^{S}, 18^{S}, 19^{K}, 20^{I}, 21^{S}, 22^{V}, 23^{S}, 24^{S}, 25^{I}, 26^{S}, 27^{S}, 28^{S}, 29^{S}, 30^{S}, 31^{S}, 32^{S}, 33^{S}, 34^{S}, 35^{S}, 36^{S}, 37^{S}, 38^{I}, 39^{S}, 40^{S}, 41^{S}.	40
2	Sitatunga, *Tragelaphus spekii*	1^{S}, 5^{K}, 6^{R}, 7^{S}, 8^{V}, 9^{I}, 10^{R}, 11^{S}, 13^{R}, 14^{EN}, 15^{S}, 16^{R}, 22^{EX}, 23^{R}, 24^{EN}, 25^{I}, 26^{EN}, 27^{R}, 28^{EN}, 30^{EX}, 32^{EX}, 33^{K}, 34^{EN}, 35^{EN}, 36^{S}, 37^{S}, 38^{S}, 39^{S}, 40^{S}, 41^{S}.	30
3	Lesser Kudu, *Tragelaphus imberbis*	1^{R}, 2^{S}, 3^{I}, 4^{S}, 5^{R}, 6^{S}, 7^{S}.	7
4	Greater Kudu, *Tragelaphus strepsiceros*	1^{R}, 2^{S}, 3^{I}, 4^{EN}, 5^{R}, 6^{R}, 7^{S}, 10^{S}, 11^{S}, 12^{S}, 13^{S}, 14^{S}, 15^{S}, 16^{S}, 17^{S}, 18^{S}, 23^{V}, 37^{R}, 41^{V}	19
5	Mountain Nyala, *Tragelaphus buxtoni*	2^{R}	1
6	Nyala, *Tragelaphus angasii*	12^{S}, 13^{S}, 16^{R}, 17^{S}, 18^{S}	5
7	Common Eland, *Tragelaphus oryx*	1^{S}, 2^{R}, 5^{V}, 6^{S}, 7^{S}, 8^{V}, 9^{EX}, 10^{I}, 11^{S}, 12^{S}, 13^{V}, 14^{S}, 15^{S}, 16^{S}, 17^{S}, 18^{S}, 19^{I}, 41^{EN}	18
8	Giant Eland, *Tragelaphus derbianus*	1^{R}, $5^{EN/EX}$, $21^{EN/EX}$, 23^{EN}, 24^{R}, 25^{EX}, 26^{EN}, $27^{EN/EX}$, 28^{EX}, 30^{EX}, 32^{EX}, 33^{EX}, 35^{EX}, 36^{I}, 37^{S}, 41^{EN}	16

9	Bongo, *Tragelaphus eurycerus*	1^{R}, 5^{EX}, 6^{R}, 27^{R}, 28^{EN}, 29^{I}, 30^{V}, 32^{EN}, 33^{R}, 34^{EN}, 36^{S}, 37^{S}, 39^{I}, 40^{S}, 41^{S}	15
10	Nilgai, *Boselaphus tragocamelus*	62^{EN}, 73^{S}, 74^{S}, 75^{EX}	4
11	Four-horned Antelope, *Tetracerus quadricorn*	73^{V}, 74^{V}	2
	2. Subfamil: Cephalophinae		
12	Blue Duiker, *Cephalophus monticola*	1^{S}, 5^{S}, 6^{R}, 7^{S}, 8^{K}, 9^{K}, 10^{S}, 11^{S}, 12^{R}, 13^{K}, 16^{I}, 17^{S}, 18^{I}, 19^{EX}, 35^{V}, 36^{S}, 37^{S}, 38^{S}, 39^{S}, 40^{S}, 41^{S}	21
13	Ader's Duiker, *Cephalophus adersi*	6^{V}, 7^{V}	2
14	Harvey's Red Duiker, *Cephalophus harveyi*	2^{K}, 4^{EN}, 6^{S}, 7^{S}	4
15	Natal Red Duiker, *Cephalophus natalensis*	7^{S}, 11^{R}, 12^{R}, 13^{S}, 16^{S}, 17^{S}, 18^{S}	7
16	Black-fronted Duiker, *Cephalophus nigrifrons*	5^{V}, 6^{R}, 8^{V}, 9^{I}, 10^{R}, 36^{S}, 37^{S}, 38^{I}, 39^{R}, 40^{S}, 41^{S},	11
17	Weyn's Duiker, *Cephalophus weynsi*	1^{R}, 5^{S}, 6^{R}, 7^{R}, 9^{K}, 41^{S}	6
18	Bay Duiker, *Cephalophus dorsalis*	5^{EX}, 10^{R}, 27^{R}, 28^{R}, 29^{S}, 30^{I}, 32^{S}, 33^{I}, 34^{I}, 35^{EN}, 36^{S}, 37^{S}, 38^{S}, 39^{S}, 40^{S}, 41^{S}	16
19	White-bellied Duiker, *Cephalophus leucogaster*	5^{EX}, 36^{S}, 37^{R}, 38^{I}, 39^{S}, 40^{S}, 41^{S}	7
20	Red-flanked Duiker, *Cephalophus rufilatus*	1^{S}, 5^{I}, 21^{S}, 22^{EN}, 23^{R}, 24^{S}, 25^{V}, 26^{S}, 27^{S}, 28^{I}, 30^{S}, 31^{S}, 32^{S}, 33^{S}, 34^{S}, 35^{V}, 36^{S}, 37^{S}, 40^{K}, 41^{I}	20
21	Yellow-backed Duiker, *Cephalophus silvicultor*	1^{R}, 5^{EN}, 6^{R}, $8^{EN/EX}$, 9^{K}, 10^{R}, 11^{S}, 23^{K}, 24^{R}, 25^{EX}, 26^{V}, 27^{R}, 28^{I}, 29^{I}, 30^{R}, 31^{R}, 32^{R}, 33^{I}, 34^{V}, 35^{EN}, 36^{S}, 37^{S}, 38^{I}, 39^{S}, 40^{S}, 41^{S}	26
22	Abbott's Duiker, *Cephalophus spadix*	6^{K}, 7^{I}	2
23	Maxwell's Duiker, *Cephalophus maxwellii*	24^{S}, 25^{V}, 26^{S}, 27^{S}, 28^{S}, 29^{S}, 30^{S}, 31^{I}, 32^{S}, 33^{V}, 34^{I}, 35^{V}	12
24	Peter's Duiker, *Cephalophus callipygus*	36^{S}, 37^{S}, 38^{S}, 39^{S}, 40^{S}, 41^{K}	6
25	Ogilby's Duiker, *Cephalophus ogilbyi*	28^{I}, 30^{I}, 32^{I}, 35^{EN}, 36^{V}, 38^{S}, 39^{R}	7
26	Zebra Duiker, *Cephalophus zebra*	28^{EN}, 29^{I}, 30^{EN}	3
27	Black Duiker, *Cephalophus niger*	27^{I}, 28^{I}, 29^{S}, 30^{S}, 32^{S}, 33^{K}, 34^{K}, 35^{EN}	8
28	Jentink's Duiker, *Cephalophus jentinki*	28^{EN}, 29^{I}, 30^{EN}	3
29	Grey Duiker, *Sylvicapra grimmia*	2^{S}, 4^{R}, 5^{S}, 6^{S}, 7^{S}, 8^{S}, 9^{S}, 10^{S}, 11^{S}, 12^{S}, 13^{S}, 14^{S}, 15^{S}, 16^{S}, 17^{S}, 18^{S}, 19^{EN}, 21^{S}, 22^{S}, 23^{S}, 24^{S}, 25^{I}, 26^{S}, 27^{S}, 28^{K}, 30^{S}, 31^{S}, 32^{S}, 33^{S}, 34^{S}, 35^{S}, 36^{S}, 37^{S}, 39^{K}, 40^{V}, 41^{S}	36
	3. Subfamily: Reduncinae		
30	Southern Reedbuck, *Redunca arundinum*	7^{S}, 9^{K}, 10^{S}, 11^{S}, 12^{S}, 13^{S}, 14^{V}, 15^{S}, 16^{S}, 17^{S}, 18^{V}, 19^{EX}, $39^{EN/EX}$, 40^{EN}, 41^{V}	15
31	Bohor Reedbuck, *Redunca redunca*	1^{S}, 2^{S}, 5^{V}, 6^{S}, 7^{S}, 8^{S}, 9^{I}, 20^{EN}, 21^{S}, 22^{R}, 23^{S}, 24^{S}, 25^{I}, 26^{R}, 27^{S}, 28^{EN}, 30^{I}, 31^{R}, 32^{I}, 33^{I}, 34^{R}, 35^{EN}, 36^{S}, 37^{S}, 41^{S}	25
32	Mountain Reedbuck, *Redunca fulvorufula*	1^{R}, 2^{R}, 5^{EN}, 6^{S}, 13^{EN}, 15^{R}, 17^{S}, 18^{V}, 19^{I}, 35^{EN}, 36^{I}, 37^{K}	12
33	Waterbuck, *Kobus ellipsiprymnus*	1^{S}, 2^{S}, 3^{EX}, 4^{V}, 5^{S}, 6^{S}, 7^{S}, 8^{S}, 9^{R}, 10^{EN}, 11^{S}, 12^{R}, 13^{V}, 14^{EN}, 15^{R}, 16^{S}, 17^{S}, 18^{V}, 21^{I}, 22^{V}, 23^{S}, 24^{S}, 25^{EX}, 26^{S}, 27^{S}, 28^{V}, 30^{S}, 31^{S}, 32^{S}, 33^{S}, 34^{S}, 35^{V}, 36^{S}, 37^{S}, 39^{V}, 40^{EN}, 41^{S}	37
34	Kob, *Kobus kob*	5^{S}, 6^{EX}, 7^{EX}, 22^{V}, 41^{S}	5
35	White-eared Kob, *Kobus kob leucotis*	1^{S}, 2^{R}	2
36	Uganda Kob, *Kobus kob thomasi*	1^{S}	1
37	Buffon's Kob, *Kobus kob kob*	20^{EN}, 21^{I}, 23^{S}, 24^{S}, 25^{EX}, 26^{V}, 27^{I}, 28^{EN}, 30^{S}, 31^{S}, 32^{S}, 33^{S}, 34^{S}, 35^{V}, 36^{S}, 37^{S}	16
38	Puku, *Kobus vardoni*	7^{S}, 10^{V}, 11^{S}, 12^{EN}, 14^{EN}, 15^{R}, 16^{R}, 41^{V}	8
39	Nile Lechwe, *Kobus megaceros*	1^{S}, 2^{R}	2
40	Red Lechwe, *Kobus leche leche*	10^{R}, 14^{V}, 15^{S}	3
41	Lechwe, *Kobus leche*	11^{S}, 41^{EN}	2
	4. Subfamily: Hippotraginae		
42	Roan, *Hippotragus equines*	1^{S}, 2^{V}, 5^{R}, 6^{V}, 7^{S}, 8^{V}, $9^{EN/EX}$, 10^{I}, 11^{S}, 12^{S}, 13^{EN}, 14^{R}, 15^{R}, 16^{V}, 17^{R}, 18^{EX}, 20^{EN}, 21^{V}, 22^{R}, 23^{S}, 24^{S}, $25^{EN/EX}$, 26^{S}, 27^{R}, 28^{I}, 30^{R}, 31^{S}, 32^{R}, 33^{S}, 34^{S}, 35^{EN}, 36^{S}, 37^{S}, 41^{V}	34
43	Sable, *Hippotragus niger*	6^{EN}, 7^{S}, 10^{V}, 11^{S}, 12^{S}, 13^{V}, 14^{R}, 15^{S}, 16^{S}, 17^{R}, 18^{R}, 41^{V}	12
44	Bluebuck, *Hippotragus leucophaeus*	17^{EX}	1
45	Scimitar-horned Oryx, *Oryx dammah*	1^{EN}, 20^{EX}, $21^{EN/EX}$, $22^{EN/EX}$, 23^{EN}, 24^{EX}, $31^{EN/EX}$, 35^{EX}, 42^{EX}, 43^{EX}, 44^{EX}, 45^{EX}, 46^{EX}	13
46	Gemsbok/Beisa Oryx, *Oryx gazelle*	1^{S}, 2^{S}, 3^{EN}, 4^{EN}, 5^{I}, 6^{S}, 10^{I}, 14^{S}, 15^{S}, 16^{R}, 17^{S}	11
47	Fringe-eared Oryx, *Oryx gazella callotis*	7^{S}	1
48	Arabian Oryx, *Oryx leucoryx*	47^{EN}, 48^{EX}, 49^{EN}, 50^{EX}, 53^{EX}, 54^{EX}, 55^{EX}, 57^{EX}, 58^{EN}	9
49	Addax, *Addax nasomaculatus*	1^{EN}, 20^{EN}, 21^{EN}, 22^{EN}, 23^{EN}, 42^{EX}, 43^{EX}, 44^{EX}, 45^{EX}, 46^{EX}	10
	5. Subfamily: Alcelaphinae		
50	Common Hartebeest, *Alcelaphus buselaphus*	6^{S}, 7^{S}, 23^{S}, 37^{S}	3
51	Bubal Hartebeest, *Alcelaphus buselaphus buselaphus*	42^{EX}, 43^{EX}, 44^{EX}, 45^{EX}, 46^{EX}	5
52	Lichtenstein's Hartebeest, *Alcelaphus lichtensteinii*	7^{S}, $9^{EN/EX}$, 10^{EN}, 11^{S}, 12^{R}, 13^{V}, 16^{EN}, 17^{R}, 18^{EX}, 41^{EN}	10
53	Lelwel Hartebeest, *Alcelaphus buselaphus lewel*	1^{S}, 5^{S}, 41^{S}	3
54	Tora Hartebeest, *Alcelaphus buselaphus tora*	1^{I}, 2^{I},	2
55	Swayne's Hartebeest *Alcelaphus buselaphus swaynei*	2^{V}, 3^{EX}, 4^{EX}	3
56	Red Hartebeest, *Alcelaphus buselaphus caama*	10^{EN}, 14^{S}, 15^{S}, 16^{R}, 17^{S}, 18^{S}, 19^{EX}	7
57	Western Hartebeest, *Alcelaphus buselaphus major*	21^{V}, 22^{V}, 24^{S}, $25^{EN/EX}$, 26^{EN}, 27^{R}, 28^{EX}, 30^{S}, 31^{S}, 32^{S}, 33^{S}, 34^{S}, 35^{V}, 36^{S}	14
58	Hirola, *Damaliscus hunter*	4^{I}, 6^{V}	2
59	Bontebok, *Damaliscus dorcas dorcas*	17^{R}	1
60	Blesbok, *Damaliscus dorcas phillipsi*	17^{S}, 18^{S}, 19^{R}	3
61	Topi, *Damaliscus lunatus jimela*	2^{I}, 4^{EN}, 5^{V}, 6^{S}, 7^{S}, 8^{S}, $9^{EN/EX}$, 41^{S},	8
62	Korrigum, *Damaliscus lunatus korrigum*	20^{EX}, 21^{EX}, 22^{EN}, 24^{EX}, 25^{EX}, 26^{EX}, 27^{EX}, 31^{V}, 32^{EX},33^{R}, 34^{EN}, 35^{EN}, 36^{V}	13
63	Tiang, *Damaliscus lunatus tiang*	1^{S}, 23^{S}, 37^{V}	3
64	Tsessebe, *Damaliscus lunatus lunatus*	10^{I}, 11^{V}, 13^{EX}, 14^{V}, 15^{S}, 16^{S}, 17^{R}, 18^{R}, 41^{I}	9
65	Blue Wildebeest, *Connochaetes taurinus*	6^{S}, 7^{S}, 10^{S}, 11^{S}, 12^{EX}, 13^{V}, 14^{S}, 15^{S}, 16^{S}, 17^{S}, 18^{S}	11

66	Black Wildebeest, *Connochaetes gnou*	17^{S}, 18^{S}, 19^{R}	3
	6. Subfamily: Aepycerotinae		
67	Impala, *Aepyceros melampus*	5^{R}, 6^{S}, 7^{S}, 8^{S}, $9^{EN/EX}$, 10^{EN}, 11^{S}, 12^{S}, 13^{S}, 14^{R}, 15^{S}, 16^{S}, 17^{S}, 18^{S}, 41^{EN}	15
	7. Subfamily: Antilopinae		
68	Dibatag, *Ammodorcas clarkei*	2^{K}, 4^{I},	2
69	Gerenuk, *Litocranius walleri*	2^{S}, 3^{R}, 4^{S}, 6^{S}, 7^{S}	5
70	Dorcas Gazelle, *Gazella dorcas*	1^{K}, 2^{K}, 20^{EN}, 21^{K}, 22^{S}, 23^{S}, 24^{R}, 31^{EN}, 35^{EN}, 42^{V}, 43^{V}, 44^{V}, 45^{EN}, 46^{V}, 57^{EN}, 58^{R}	16
71	Slender-horned Gazelle, *Gazella leptoceros*	1^{I}, 20^{K}, 21^{K}, 22^{EN}, 23^{K}, 43^{EN}, 44^{EN}, 45^{I}, 46^{EN}	9
72	Red-fronted Gazelle, *Gazella rufifrons*	1^{K}, 20^{EN}, 21^{I}, 22^{V}, 23^{S}, 24^{I}, 25^{K}, 31^{V}, 32^{K}, 33^{I}, 34^{K}, 35^{EN}, 36^{I}, 37^{R}	14
73	Thomson's Gazelle, *Gazella thomsonii*	6^{S}, 7^{S}	2
74	Speke's Gazelle, *Gazella spekei*	2^{EN}, 4^{S}	2
75	Pelzeln's Gazelle, *Gazella dorcas pelzelni*	3^{V}, 4^{K}	2
76	Soemmerring's Gazelle, *Gazella soemmerringii*	1^{K}, 2^{S}, 3^{I}, 4^{V}, 6^{I}	5
77	Grant's Gazelle, *Gazella granti*	1^{S}, 2^{S}, 4^{V}, 5^{K}, 6^{S}, 7^{S}	6
78	Dama Gazelle, *Gazella dama*	1^{I}, 20^{EX}, 21^{EN}, 22^{EN}, 23^{EN}, 24^{R}, 31^{EN}, 35^{EN}, 42^{EN}, 43^{EN}, 44^{EX}, 45^{EX}	12
79	Saudi Gazelle, *Gazella saudiya*	47^{EX}, 48^{EX}, 53^{EX}, 54^{EX}, 55^{EX}	5
80	Palestine Mountain Gazelle, *Gazella gazella gazelle*	55^{K}, $56^{EN/EX}$	2
81	Mongalla Gazelle, *Gazella thomsonii albonotata*	1^{S}, 2^{R}	2
82	Chinkara/Indian Gazelle, *Gazella bennettii*	60^{V}, 61^{I}, 62^{EN}, 73^{S}	4
83	Mountain Gazelle, *Gazella gazelle*	46^{EX}, 47^{V}, 48^{I}, 49^{S}, 50^{K}, 57^{K}, 58^{S}, 60^{V}, 65^{EX}	9
84	Queen of Sheba's Gazelle/Yemen Gazelle, *Gazella bilkis*	48^{EX}	1
85	Arabian Gazelle, *Gazella Arabica*	47^{EX}	1
86	Arava Gazelle, *Gazella gazella acacia*	58^{EN}	1
87	Arabian sand Gazelle, *Gazella subgutturosa marica*	47^{V}, 48^{I}, 49^{EN}, 50^{K}, 51^{S}, 52^{EX}, 53^{EX}, 57^{EN}	8
88	Cuvier's Gazelle, *Gazella cuvieri*	42^{V}, 43^{EN}, 44^{EN}	3
89	Red Gazelle, *Gazella rufina*	43^{EX}	1
90	Goitered Gazelle, *Gazella subgutturosa*	54^{V}, 55^{I}, 59^{EN}, 60^{V}, 61^{I}, 62^{EN}, 63^{EN}, 64^{EX}, 65^{V}, 66^{EN}, $67^{EN/EX}$, 68^{EN}, 69^{V}, 71^{V}, 72^{V}	15
91	Tibetan Gazelle, *Procapra picticaudata*	72^{S}, 73^{EN}	2
92	Przewalski's Gazelle, *Procapra przewalskii*	72^{EN}	1
93	Mongolian Gazelle, *Procapra gutturosa*	70^{EN}, 71^{S}, 72^{V}	3
94	Tibetan Antelope, *Pantholops hodgsonii*	72^{EN}, 73^{EN}, 74^{EN}	3
95	Bate's Pigmy Antelope, *Neotragus batesi*	5^{I}, 35^{EN}, 36^{S}, 37^{K}, 38^{S}, 39^{S}, 40^{S}, 41^{S}	8
96	Royal Antelope, *Neotragus pygmaeus*	27^{K}, 28^{K}, 29^{S}, 30^{S}, 32^{S}	5
97	Suni, *Neotragus moschatus*	6^{S}, 7^{S}, 12^{S}, 13^{S}, 16^{R}, 17^{V}, 18^{EX}	7
98	Springbok, *Antidorcas marsupialis*	10^{S}, 14^{S}, 15^{S}, 17^{S}, 18^{EX}, 19^{EX}	6
99	Cape Grysbok, *Raphicerus melanotis*	17^{S}	1
100	Sharpe's Grysbok, *Raphicerus sharpie*	7^{K}, 11^{S}, 12^{S}, 13^{S}, 15^{R}, 16^{S}, 17^{S}, 18^{K}, 41^{I}	9
101	Steenbok, *Raphicerus campestris*	$5^{EN/EX}$, 6^{S}, 7^{S}, 10^{S}, 11^{S}, 13^{S}, 14^{S}, 15^{S}, 16^{S}, 17^{S}, 18^{S}	11
102	Piacentinis Dikdik, *Madoqua piacertinii*	4^{S}	1
103	Salt's Dikdik, *Madoqua saltiana*	1^{K}, 2^{S}, 3^{S}, 4^{S}, 6^{K}	5
104	Guenther's Dikdik, *Madoqua guentheri*	1^{S}, 2^{S}, 4^{S}, 5^{K}, 6^{S}	5
105	Kirk's Dikdik, *Madoqua kirkii*	4^{S}, 6^{S}, 7^{S}, 10^{S}, 14^{S}	5
106	Beira, *Dorcatragus megalotis*	2^{EN}, 3^{R}, 4^{K}	3
107	Oribi, *Ourebia ourebi*	1^{S}, 2^{S}, 4^{I}, 5^{S}, 6^{S}, 7^{S}, 8^{S}, $9^{EN/EX}$, 10^{S}, 11^{S}, 12^{R}, 13^{S}, 15^{R}, 16^{V}, 17^{V}, 18^{EN}, 19^{I}, 21^{S}, 22^{R}, 23^{S}, 24^{S}, 25^{V}, 26^{R}, 27^{S}, 28^{EN}, 30^{S}, 31^{S}, 32^{S}, 33^{S}, 34^{S}, 35^{V}, 36^{S}, 37^{S}, 41^{S}	34
108	Klipspringer, *Oreotragus oreotragus*	1^{R}, 2^{S}, 3^{R}, 4^{S}, 5^{R}, 6^{S}, 7^{S}, 8^{K}, $9^{EN/EX}$, 10^{S}, 11^{S}, 12^{S}, 13^{S}, 14^{S}, 15^{R}, 16^{S}, 17^{S}, 18^{EN}, 19^{K}, 35^{EN}, 37^{K}, 41^{I}	22
109	Blackbuck, *Antelope cervicapra*	62^{EX}, 73^{V}, 74^{EN}, 75^{EX}	
110	Saiga, *Saiga tatarica*	65^{V}, 66^{V}, 69^{V}, 70^{EN}	4
111	Mongolian Saiga, *Saiga tatarica mongolica*	71^{EN}, 72^{EX}	2
	9. Subfamily: Peleinae		
112	Grey Rhebok, *Pelea capreolus*	15^{EX}, 17^{S}, 18^{EN}, 19^{S}	4
	10. Subfamily: Uncertain		
113	Saola, *Pseudoryx nghetinhensis*	76^{EN}, 77^{EN}	2
114	Linh-duong/ Khting Vohr, *Pseudonovibos spiralis*	77^{I}, 78^{EN}	2

Abbreviation: TNS: Total Number of Species; S-Satisfactory; K-Insufficiently Known; V-Vulnerable; I-Indeterminate; R-Rare; EN-Endangered; EX-Extinct; 1-Sudan; 2-Ethiopia; 3-Djibouti; 4-Somalia; 5-Uganda; 6-Kenya; 7-Tanzania; 8-Rwanda; 9-Burundi; 10-Angola; 11-Zambia; 12-Malawi; 13-Mozambique; 14-Numibia; 15-Botswana; 16-Zimbabwe; 17-South Africa; 18-Swaziland; 19-Lesotho; 20-Mauritania; 21-Mali; 22-Niger; 23-Chad; 24-Senegal; 25-Gambia; 26-Guinea Bissau; 27-Guinea; 28-Sierra Leone; 29-Liberia; 30-Ivory Coast; 31-Burkina Faso; 32-Ghana; 33-Togo; 34-Benin; 35-Nigeria; 36-Cameroon; 37-Central Africa Republic; 38-Equatorial Guinea; 39-Gabon; 40-Congo; 41-Zaire; 42-Morocco; 43-Algeria; 44-Tunisia; 45-Libya; 46-Egypt; 47-Saudi Arabia; 48-Yemen; 49-Omen, 50-United Arab Emirates; 51-Bahrain; 52-Qatar; 53-Kuwait; 54-Iraq; 55-Syria; 56-Lebanon; 57-Jordan; 58-Israel; 59-Turkey; 60-Iran; 61-Afghanistan; 62-Pakistan; 63-Azerbaijan; 64-Georgia; 65-Kazakhstan; 66-Uzbekistan; 67-kyrgyzstan; 68-Tajikistan; 69-Turkmenistan; 70-Russia; 71-Mongolia; 72-China; 73-India; 74-Nepal; 75-Bangladesh; 76-Lao PDR; 77-Vietnam; 78-Cambodia.

Table 3: Year wise distribution of research output on studies of Antelopes

#	Publication Year	No. of publications	Percent (%)	TLCS	TGCS	TCS
1	1989	13	0.8	20	79	99
2	1990	14	0.8	17	81	98
3	1991	41	2.4	100	582	682
4	1992	37	2.2	142	970	1112
5	1993	39	2.3	60	778	838
6	1994	39	2.3	101	1018	1119
7	1995	41	2.4	108	888	996
8	1996	50	3.0	88	1182	1270
9	1997	46	2.7	119	1240	1359
10	1998	55	3.3	145	1157	1302
11	1999	48	2.8	196	1048	1244
12	2000	39	2.3	117	816	933
13	2001	50	3.0	85	1177	1262
14	2002	52	3.1	89	1327	1416
15	2003	55	3.3	88	1502	1590
16	2004	52	3.1	92	1654	1746
17	2005	54	3.2	79	879	958
18	2006	58	3.4	103	936	1039
19	2007	61	3.6	111	1211	1322
20	2008	88	5.2	119	1488	1607
21	2009	79	4.7	115	1327	1442
22	2010	64	3.8	87	664	751
23	2011	102	6.0	90	805	895
24	2012	98	5.8	85	756	841
25	2013	75	4.4	49	593	642
26	2014	85	5.0	33	341	374
27	2015	106	6.3	17	197	214
28	2016	94	5.6	10	73	83
29	2017 up to August	54	3.2	1	12	13
Total		1689	100	2466	24781	27247

Table 4: Document wise distribution of research output on studies of Antelope

#	Document Type	No. of Publications	Percent (%)	TLCS	TGCS	TCS
1	Article	1460	86.4	2245	20955	23200
2	Review	53	3.1	109	2455	2564
3	Proceedings Paper	53	3.1	59	946	1005
4	Book Chapter	26	1.5	0	56	56
5	Abstract	24	1.4	15	191	206
6	Editorial Material	24	1.4	4	15	19
7	Notes	22	1.3	20	131	151
8	Letters	12	0.7	7	20	27
9	News Items	10	0.6	6	9	15
10	Others	5	0.3	1	3	4
	Total	1689	100	2466	24781	27247

Table 5: Top 30 most productive countries publishing articles on Antelope research from 1989 to 2017

#	Country	No. of publications	Percent (%)	TLCS	TGCS	TCS
1	USA	595	35.2	821	10980	11801
2	South Africa	252	14.9	489	3161	3650
3	UK	220	13.0	585	4894	5479
4	Germany	105	6.2	128	1142	1396
5	China	92	5.4	83	602	685
6	France	63	3.7	71	911	982
7	India	63	3.7	82	556	638
8	Canada	61	3.6	68	981	1049
9	Australia	47	2.8	51	1224	1275
10	Italy	31	1.8	34	505	539
11	Czech Republic	30	1.8	31	218	249
12	Switzerland	30	1.8	55	741	796
13	Russia	28	1.7	57	384	441
14	Norway	26	1.5	44	183	227
15	Spain	26	1.5	19	548	567
16	Zimbabwe	26	1.5	28	303	331
17	Kazakhstan	23	1.4	109	391	500

18	Kenya	23	1.4	31	203	234
19	Denmark	21	1.2	103	760	863
20	Japan	21	1.2	15	267	282
21	Belgium	20	1.2	12	219	231
22	Zambia	20	1.2	10	83	93
23	Tanzania	19	1.1	43	323	366
24	Saudi Arabia	18	1.1	15	178	193
25	Netherlands	16	0.9	33	391	424
26	Poland	15	0.9	9	41	50
27	Uganda	15	0.9	45	193	238
28	Brazil	14	0.8	14	128	142
29	Austria	13	0.8	7	52	59
30	Mexico	13	0.8	3	96	99

Table 6: Productivity and citation impact of top 30 major world institutions involved in Antelope research

#	Institution	Country	h-index	No. of Publication	Percent (%)	No. of citation received
1	University of Pretoria	South Africa	17	76	4.5	**899**
2	University of the Witwatersrand	South Africa	17	62	3.7	**971**
3	Chinese Academy of Sciences	China	11	43	2.5	418
4	Stellenbosch University	South Africa	15	37	2.2	632
5	University of California, Davis	USA	20	36	2.1	**910**
6	Zoological Society of London	UK	15	31	1.8	677
7	Imperial College of Science, Technology and Medicine, University of London	UK	16	28	1.7	719
8	Wildlife Conservation Society, New York	USA	10	24	1.4	571
9	University of Wyoming	USA	9	23	1.4	316
10	University of Cambridge	UK	18	21	1.2	**906**
11	Agricultural Research Service, United States Department of Agriculture	USA	14	21	1.2	310
12	Smithsonian Institution	USA	15	20	1.2	700
13	University of Nevada, Reno	USA	12	19	1.1	696
14	University of Zurich	Switzerland	9	19	1.1	292
15	Russian Academy of Sciences, Moscow	Russia	9	17	1.0	256
16	University of Cape Town	South Africa	9	17	1.0	351
17	University of Copenhagen	Denmark	15	17	1.0	**825**
18	University of Oxford	UK	11	17	1.0	390
19	INRA - French National Institute for Agricultural Research	France	6	16	0.9	196
20	Louisiana State University	USA	7	16	0.9	115
21	Oregon State University	USA	10	16	0.9	365
22	Texas A&M University	USA	7	16	0.9	404
23	University of Nebraska–Lincoln	USA	7	16	0.9	154
24	University of Western Australia	Australia	9	15	0.9	205
25	University of Zambia	Zambia	6	15	0.9	84
26	United States Geological Survey	USA	10	15	0.9	477
27	University of Arizona	USA	8	14	0.8	273
28	United States Forest Service	USA	8	14	0.8	204
29	University of California, Los Angeles	USA	11	13	0.8	420
30	University of Queensland	Australia	8	13	0.8	185

Table 7: Top 30 leading Journals publishing work on Antelope research

#	Institution	Publisher	Impact Factor (JCR-2016)	No. of Paper	(%)	No. of citation received
1	African Journal of Ecology	Wiley-Blackwell	1.78	72	4.3	847
2	South African Journal of Wildlife Research	BioOne	1.46	35	2.1	356
3	Journal of Zoology	John Wiley & Sons. Inc.	2.13	34	2.0	802
4	Journal of Zoo and Wildlife Medicine	American Association of Zoo Veterinarians	0.58	33	2.0	161
5	Biological Conservation	Elsevier	4.29	31	1.8	1190
6	Journal of Mammalogy	Oxford University Press	1.94	31	1.8	612
7	Oryx	John Wiley & Sons, Inc.	1.64	30	1.8	339
8	Zoo Biology	John Wiley & Sons, Inc.	1.18	26	1.5	203
9	Animal Behaviour	Elsevier	3.43	23	1.4	736
10	Journal of Range Management (Currently Rangeland Ecology & Management)	Elsevier	2.15	20	1.2	260
11	Journal of Wildlife Diseases	BioOne	0.61	20	1.2	245

12	Onderstepoort Journal of Veterinary Research	AOSIS (Pty) Ltd	0.72	19	1.1	151
13	Plos One	PLOS	3.54	18	1.1	117
14	Mammalian Biology	Elsevier	1.84	15	0.9	106
15	European Journal of Wildlife Research	Springer	1.66	14	0.8	69
16	Biodiversity and Conservation	Springer	2.01	13	0.8	230
17	Journal of Arid Environments	Elsevier	2.15	13	0.8	371
18	Molecular Ecology	John Wiley & Sons, Inc.	6.01	12	0.7	441
19	Veterinary Microbiology	Elsevier	2.09	12	0.7	164
20	Behavioral Ecology	Oxford University Press	3.05	11	0.7	527
21	Molecular Phylogenetics and Evolution	Elsevier	4.27	11	0.7	448
22	Behavioral Ecology and Sociobiology	Springer	2.58	10	0.6	289
23	Quaternary International	Elsevier	2.19	10	0.6	145
24	Animal Reproduction Science	Elsevier	1.29	9	0.5	122
25	Applied Animal Behaviour Science	Elsevier	2.19	9	0.5	99
26	Biology of Reproduction	Oxford University Press	3.43	9	0.5	239
27	Ethology	Wiley-Blackwell	2.09	9	0.5	177
28	Journal of Wildlife Management	John Wiley & Sons, Inc	1.94	9	0.5	185
29	Oecologia	Springer	3.22	9	0.5	440
30	Veterinary Parasitology	Elsevier	2.69	9	0.5	189

Table 8: Top 30 leading authors in the area of Antelope research

#	Authors	No. of Publications	h-index	Percent (%)	No. of citation received
1	*Milner-Gulland EJ*, Tasso Leventis Professor of Biodiversity, University of Oxford, UK	36	16	2.1	1042
2	*Owen-Smith N*, Centre for African Ecology, University of the Witwatersrand, South Africa	33	15	2.0	671
3	*Robinson TJ*, Department of Botany and Zoology, University of Stellenbosch, South Africa	22	11	1.3	429
4	*Bro-Jorgensen J*, Institute of Integrative Biology, University of Liverpool, UK	16	10	0.9	268
5	*Plath M*, Zoologisches Institut und Zoologisches Museum, Universitt Hamburg, Germany	16	7	0.9	130
6	*Wronski T*, Zoologisches Institut und Zoologisches Museum, Universitt Hamburg, Germany	16	7	0.9	120
7	*Fuller A*, School of Physiology, University of the Witwatersrand, South Africa	15	8	0.9	183
8	*Apio A*, Zoologisches Institut und Zoologisches Museum, Universitt Hamburg, Germany	14	7	0.8	116
9	*Boomker J*, Faculty of Veterinary Science, University of Pretoria, South Africa	14	6	0.8	108
10	*Horak IG*, Department of Veterinary Tropical Diseases, University of Pretoria, South Africa	14	7	0.8	98
11	*Mitchell D*, School of Physiology, University of the Witwatersrand, South Africa	13	8	0.8	226
12	*Clauss M*, Clinic for Zoo Animals, Exotic Pets and Wildlife, University of Zurich, Switzerland	11	4	0.7	190
13	*Jiang ZG*, Institute of Zoology, Chinese Academy of Sciences, Beijing, China	11	5	0.7	76
14	*Dresser BL*, Audubon Center for Research of Endangered Species (ACRES), USA	10	6	0.6	105
15	*Gerard JF*, Institut National de la Recherche Agronomique (INRA), Wildlife Behaviour and Ecology (CEFS), France	10	4	0.6	114
16	*Penzhorn BL*, Department of Veterinary Tropical Diseases, University of Pretoria, South Africa	10	6	0.6	192
17	*Pope CE*, Audubon Center for Research of Endangered Species (ACRES), USA	10	6	0.6	73
18	*Thompson KV*, Conservation and Research Center, National Zoological Park, Smithsonian Institution, USA	10	6	0.6	186
19	*Vahala J*, Zoo Dvur KraloveDvur Kralove n. L. Czech Republic	10	4	0.6	72
20	*Wirtu G*, Audubon Center for Research of Endangered Species, USA	10	5	0.6	64
21	*Arctander P*, Department of Evolutionary Biology, Zoological Institute, University of Copenhagen, Copenhagen, Denmark	9	9	0.5	583

22	*Cernohorska H*, Veterinary Research Institute, Brno, Czech Republic.	9	5	0.5	94
23	*Grachev IA*, Institute of Zoology, Ministry of Education and Science, Kazakhstan	9	8	0.5	451
24	*Skinner JD*, Department of Tropical Diseases, Faculty of Veterinary Science, South Africa	9	5	0.5	91
25	*Bowkett AE*, Field Conservation and Research Department, Whitley Wildlife Conservation Trust, Paignton Zoo, UK	8	4	0.5	94
26	*Buuveibaatar B*, Wildlife Conservation Society, Mongolia Program, Ulaanbaatar, Mongolia	8	5	0.5	50
27	*Cain JW*, Wildlife and Conservation Ecology, New Mexico State University, USA	8	6	0.5	232
28	*Frey R*, Department of Reproduction Management, Leibniz Institute for Zoo and Wildlife Research (IZW), Germany.	8	5	0.5	152
29	*Godke RA*, Department of Animal Science, Louisiana State University, USA	8	5	0.5	64
30	*Mascola L*, Centers for Disease Control and Prevention, Georgia, USA	8	5	0.5	590
	Total Authors (Total Authors contributed 4356)	1689		100	2466

Table 9: Highly cited top 10 papers in the area of Antelope research

#	Title of the Papers	Authors	Journal	Year	Impact factor (2016)	No. of citation received	Country of the author(s)
1	Varicella disease after introduction of varicella vaccine in the United States	Seward, J.F. *et al.*	*Journal of the American Medical Association*	2002	44.40	338	USA
2	Predicting animal delta O-18: Accounting for diet and physiological adaptation	Kohn, M.J.	*Geochimica et Cosmochimica Acta*	1996	4.60	313	USA
3	Polymerase chain reaction restriction fragment length polymorphism analysis: A simple method for species identification in food	Meyer, R. *et al.*	*Journal of Aoac International*	1995	1.05	226	Switzerland
4	Effectiveness of alternative heuristic algorithms for identifying indicative minimum requirements for conservation reserves	Pressey, R.L. *et al.*	*Biological Conservation*	1997	4.29	220	Australia
5	Detection of aquifer system compaction and land subsidence using interferometric synthetic aperture radar, Antelope Valley, Mojave Desert, California	Galloway, D.L. *et al.*	*Water Resources Research*	1998	4.39	208	USA
6	Scent-marking by male mammals: Cheat-proof signals to competitors and mates	Gosling, L.M. and Roberts, S.C.	*Advances in the Study of Behavior*	2001	1.56	205	UK
7	The management of wild large herbivores to meet economic, conservation and environmental objectives	Gordon, I.J. *et al.*,	*Journal of Applied Ecology*	2004	5.30	192	UK
8	Molecular and morphological phylogenies of Ruminantia and the alternative position of the Moschidae	Hassanin, A and Douzery E.J.P.	*Systematic Biology*	2003	8.91	174	France
9	The expansion of grassland ecosystems in Africa in relation to mammalian evolution and the origin of the genus Homo	Bobe, R and Behrensmeyer, A.K.	*Palaeogeography Palaeoclimatology Palaeoecology*	2004	2.57	158	USA
10	An analysis of the factors that influence the level and scaling of mammalian	Mcnab, B.K.	BMR *Comparative Biochemistry and Physiology A-Molecular & Integrative Physiology*	2008	1.81	155	USA

4. Discussion

Web of science (*WoS*) is a unique database for the collection of data from any field for Scientific Information and is an analytical tool used in many researches to evaluate the scientific outputs with high accuracy (Chuang *et al*., 2012; Fu *et al*., 2013) [3,9]. The Scientometric study on Antelope research based on Web of Science online database reveals that the USA (595 papers with 11801citation) is the major country involved in scientific antelope research output at global level followed by South Africa (252 papers with 3650 citations), UK (220 papers with 5479 citations) and Germany (105 papers with 1396 citations). The other interesting fact is that the most prolific author in antelope research is *Milner-Gulland* with 36 papers and scores the highest *h*-index value, who is from UK. Hirsch (2007) [14] reported that the *h*-index track the careers of researchers and found a close correlation between the early and late career; he found that the index increases linearly with the number of years of productive activity and thus is a good predictor of the prominence of a career. Roya *et al* (2009) [31] found that the *h*-index is insensitive to uncited papers as well as highly cited papers.

It is also important to know that out of the top 30 authors who contributed more papers in antelope research, eight authors belonged to institutions from South Africa, seven authors from the USA, four authors from Germany, three authors from UK, two authors from Czech Republic, one author each from Switzerland, Mongolia, Kazakhstan, Denmark, China and France. The global antelope research output came from 1429 organizations, among the top 30 institutions, 14 institutions are from USA, 4 each are from UK and South Africa, 2 institutions from Australia and one each from China, Switzerland, Russia, Denmark, France and Zambia. Based on the scientometric analysis, it is observed that the developed countries like USA, UK, Germany, France, Russia, and Switzerland produced highest quality publications in antelope research. Further, South Africa, China, Denmark, Mongolia, Kazakhstan and Zambia are also having a substantial impact in the antelope research with equal values for citation score. It is reported that the developed countries are well known for their numerous and high-quality institutions and scientists in order to publish numerous papers in any field in the world (Sun *et al*., 2013) [33].

The study revealed that out of top 30 most preferred journals by the Antelope researchers, seven journals *viz*., *African Journal of Ecology* with 72 papers followed by *South African Journal of Wildlife Research* with 35 papers, *Journal of Zoology* with 34 papers, *Journal of Zoo and Wildlife Medicine* 33 papers, *Biological Conservation* 31 papers, *Journal of Mammalogy* with 31 papers and *Oryx* with 30 papers have been published by Antelope researchers which clearly indicates that the above leading journals are more suitable for antelope research. Further, the study sought to highlight the citation characteristics of top 10 highly cited papers, out of the total 1689 papers with 27247 citations. Papers of *Seward et al* and *Kohn* have been highly cited and have been published in high impact factor journals (*Journal of the American Medical Association* and *Geochimica et Cosmochimica Acta* respectively). It is reported that the paper/document has been frequently cited by other authors, providing one way to calculate the relevance and importance of an author, an idea or a particular paper/document (Bornmann and Daniel, 2008; Kinshuk *et al*., 2013; Ho, 2013) [2,17,15]. Mofrad *et al* (2017) [20] reported that percentage index of citation is an indicator of how the scientific output represent to an institution/or individual/ or, country, etc. has quality stability.

5. Conclusion

Antelopes play key roles in ecosystems as part of the food chain, consuming plant matter and in turn being prey for a variety of wild animals. So, much research work is being carried out on antelope species with a view to conservation and management in order to increase the antelope production in their habitat. The greatest number of antelope species is found in Africa and few are found in southwest and central Asia. The non-habitat countries of Antelope (i.e., USA, UK, Germany, France, etc.) are actually involved in leading Antelope research based on the number of publications compared to antelope habitat counties, it is because the antelope non-habitat countries have high-quality institutions and scientists by which it could publish numerous papers on antelope research. On the other hand, countires such as South Africa, China and India are the antelope habitat countries, which have considerable accountability for antelope research. The largest scientific manpower engaged by the organizations in antelope in habitat countries need to be motivated to do more scientific research on antelope species. At the outset, researchers should be motivated to publish quality papers in journals so that the future of Antelope research can be strengthened. In this context, the International Union for Conservation Nation (IUCN), Species Survival Commission (SSC) and Antelope Specialized Group (ASG) need to initiate to motivate antelope research work through funding to support the Research Institutes/Universities/Zoo/Animal Conservation centre, etc. globally.

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