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A BIBLIOMETRIC ANALYSIS OF HUMAN-WILDLIFE CONFLICTS IN EAST AFRICA

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Abstract

Literature appraisal reveals a sufficient number of studies (research productivity), which have been conducted in the field of human-wildlife conflicts. However, little is known about the evolution of knowledge generation in the field, trends in research output, countries of publication, and international collaborations and specifically statistical related data. To track research productivity of human-wildlife conflict in East Africa, the study examines literature growth, describes the country-wise production of literature and establishes the degree of collaboration by studying authorship patterns on human-wildlife conflicts for the last 20 years. Publish or Perish software was used, followed by the execution of the search via Google scholar database on 28 March 2019. Regarding the country-wise contribution of literature, Tanzania was found to contribute 46 (32.2%), Uganda 45 (31.5%), Kenya 44 (30.8%) and Rwanda 8 (5.6%) and none from Burundi and South Sudan. The overall research productivity in the field of human-wildlife conflicts for Tanzania, Kenya, Uganda and Rwanda is increasing. This study provides a fairly accurate representation of research productivity on human-wildlife conflicts in East Africa from Google scholar database.

Kewords: *Human-wildlife conflicts; Bibliometric analysis; East Africa*

Introduction

Despite the fact that human-wildlife conflict (HWC) occurs in all continents and countries, its impacts is more felt by the rural agrarian communities in developing countries than the developed world counterparts. The undesirable interactions between people and wild animals (HWC) occurs when wildlife encroaches human populations, which impacts people, wild life and their environment.[1]. Human-wildlife conflicts are common in many parts of Africa where wild animals such as elephants and lions wander in areas that are protected because of their natural, ecological or cultural values. Main problems caused by wildlife include crop damage, more pressure on water and food, , livestock predation, increased risk of some livestock diseases, various inconveniences such as when protecting crops, and even human fatalities. In some other instances, human-wildlife conflicts are often manifestations of underlying human-human conflicts, such as between authorities and local people, or between people of different cultural backgrounds. Mitigation of human-wildlife conflict is normally applied to these and other situations that involve any negative interactions between humans and wildlife [2].

To track research output regarding the human-wildlife conflict in East Africa, a bibliometric analysis was conducted from (1999-2018). Bibliometrics analysis sheds light on

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the process of written communication regarding HWC by counting and analysing publications within a discipline. A bibliometric analysis was chosen because there is a sufficient number of studies that have been completed, and there is a desire among conservation biologists to obtain an overview of the literature [3].

Bibliometrics refers to statistical analysis of publication such as articles, and books[4]. It is the scientific study of the literature of a given field by using various bibliometric methods such as descriptive analyses, measures of author productivity, scientific collaborations and research networks [5]. Bibliometric studies allow determination of research quality and quantity in a specific field by examining publication features [6, 7]. Accordingly, it provides researchers with an overview of the quantity and value of a research in a given field. [5] maintains that, bibliometric studies may be conducted by researchers from any field. Thus, bibliometric methods have been used to measure researchers' productivity and performance across disciplines around the world [8]. [9] cites three major types of bibliometric indicators namely quantity indicators (measure the productivity of a particular researcher, institution or country), quality indicators (measure the impact of a researcher's output) and structural indicators (measure connections between publications, authors, and research fields). Therefore, a researcher may opt to use one or more types of bibliometrics indicators based on the objectives of the research project. As for this study, the quantity indicators will be employed to determine the scientific literature production of human-wildlife conflicts in East Africa. According to [10] quantity indicators measure the number of publications produced by researcher regardless of their quality. This suggests that a researcher who intends to establish the quantity of scientific literature needs to do it with extra care.

Research productivity is one of the essential elements which can be used to measure researchers' effectiveness. It refers to the quantity of publications produced per researcher in a specified time [11]. Research productivity is also used to rank a particular institution in a given country or at a world level [12]. Therefore, knowing the status of one's research productivity will help to set a base for improvement from individual to the country level. [13] add that, knowing the research productivity of an institutional or national among other things it implies to the availability of funds from local and international funders. [14] agree and insists that, effective research productivity and scientific excellence on the African continent attracts international funders, increase visibility, and enhance local and regional education, research, and innovation. Besides research productivity as a general, there are other bibliometrics parameters such as collaboration patterns, popularity and impact of specific authors or publications can be measured to the research performance of an individual or institution [4]. Thus, the bibliometrics researcher chooses parameters based on the intended goal of the research project.

This research was conducted to determine research productivity on human-wildlife conflicts in East Africa. Specifically, the study examines a 20 years' literature growth in human-wildlife conflicts, describe the country wise production of literature in human-wildlife conflicts and establish the degree of collaboration by studying authorship patterns. This study is unique as it focuses on the bibliometric analysis of human-wildlife conflicts in East Africa. Its importance lies on the fact that research productivity has the implications on research fund availability and visibility to both researchers, institution and region.

Several bibliometrics studies are available that determines research productivity and performance in various fields such as social science, biological science, medical sciences and agricultural sciences. For instance, a 10 (2003–2012) years bibliometric analysis that was sought to determine research productivity that relates to toxicology journals revealed an increase in research outputs for the specified period [15]. Another bibliometric analysis in microbiology revealed that research productivity increased mostly in Asia, Latin America, and Eastern Europe [16]. A bibliometric analysis of Norwegian microbiological research on the relationship between research group size and scientific productivity (research variables) within

biomedical science founded that, no correlation between the variables [17]. [18] examined the contribution of different world regions in respiratory research productivity and found that Western Europe and the United States were leading while Asia, Eastern Europe, Central and Latin America, and Africa was very low (approximately 8%). [19] analysed worldwide research productivity in the field of rheumatology from 1996 to 2010 and confirmed that the United States of America and Western Europe dominated the production of scientific publications in rheumatology with some smaller European countries contributed more relative to their size. A bibliometric analysis of global biodiversity research during 1900 - 2009 reported an increase in the number of publications from 117 in 1980 to 7,533 in 2009 [20]. [21] examined differences in research productivity of researchers in the scientific-technological disciplines of Italian universities. Their study revealed significant differences in productivity between men and women. A bibliometrics analysis of the global trends of forest fungal research during 1987-2008 reported a significant increase in the quantity of publications during 2004 – 2008 [10].

The literature reveals the growing use of bibliometric studies to assess research productivity in various fields. However, there is scarcity literature in the field wildlife and particularly human-wildlife conflicts in East Africa. An extensive literature search could only identify two studies. The first one was carried in 1994 investigating authorship trends in Indian wildlife and fisheries literature [22]. Another research was conducted 12 years later reflecting on the first decade of research in human-wildlife conflict [23]. The currect study aim to fill the gap by conducting a bibliometrics analysis of human-wildlife conflict focusing in East Africa region.

Material and Methods

Google scholar database was used to collect scholarly publications by using Publish or Perish software. Google scholar database was selected despite the presence of other databases like Scopus and Thomson ISI because it is free, relatively easy to use and quick in action ([24], [25]; [26]; [27]). [27] further adds that Google scholar is comprehensive in coverage for social sciences and humanities in particular thus, make it suitable for this study. To address the main objective of this study, search strategies consisted of the words ("*human wildlife conflict*", "*poaching*", "*crop raiding*", "*human carnivore*" and "*wildlife damage*") were entered into the Publish or Perish software search box, followed by the execution of the search via Google scholar database on 28 March 2019. Moreover, searches were restricted by years (1999-2018). The results obtained by using each search query were combined and yielded a total of 646 publications. Then a manual review of the title and abstract fields of the publications was conducted to remove irrelevant records such as multiple copies, commercial documents, slides, research publications from countries other than East African countries and documents which were written in a language other than English. The final results consisted of 143 scholarly/scientific publications. It was paramount to remain with scientific publications because it is one of the key indicators of research productivity [28]. Data were then analysed using Excel as per objectives.

Concerning research collaboration, [29] cites that most of the research projects are carried out collaboratively. The rationale behind it is that two or more people working together are stronger that one person. Thus, measuring research collaboration in a particular field is paramount. Therefore, the degree of collaboration in this study was computed by using the Subramanyam (1983) formula. The degree of collaboration refers to ratio of the number of collaborative research papers to the total number of research papers in the discipline in a specified period. It is expressed mathematically as $\boldsymbol{C=Nm/(Nm+Ns)}$ where; C stands for the degree of collaboration; Nm is the number of multi-authored research papers in the discipline published during a year and Ns is the number of single-authored research papers in the discipline published during a year.

To determine the scientific productivity Price's index was used. [24] assert that Price's index is the most widely used bibliometric indicator of productivity within a given discipline or country, which reflects an exponential growth of scientific production. This study agrees with other bibliometric studies which employed Price's index as a measure of scientific productivity [30, 31, 24, 32]

To determine the growth of scientific literature in human-wildlife conflicts in East Africa an exponential and linear adjustments of the data were conducted in the Excel according to the equations $y= 4.3375e^{0.2141x}$ $(R^2 = 0.6669)$ and $y= 2.4182x + 3.4182$ $(R^2 = 0.7052)$ respectively.

This study may not be a comprehensive analysis of all literature published on human-wildlife conflicts in East Africa because its data is taken from only one database. Arencibia Jorge, Perezleo Solórzano and Araújo Ruiz (2004) in [18] agree and maintain that the quantity of scientific literature in any given area exceeds the database(s) chosen. Similarly, [33] asserts that every type of analysis including bibliometric have its limitations. Nevertheless, this study provides a fairly accurate representation of the quantity of literature on human-wildlife conflicts in East Africa in the Google scholar database.

Results and discussion

After manual review of the title and abstract fields to remove irrelevant records such as multiple copies, commercial documents, slides, research publications from countries other than East African countries and documents written in language other than English, the final results consisted of 143 scholarly/professional publications. The publications were then analysed based on year-wise distribution. The result in Table 1 shows that the years 2017-2018 30 (21%) and 2013-2014 25 (17.5%) had a high number of publications. The year 1999-2000 3 (2.1) and 2003-2004 3 (2.1) had the lowest number of publications.

Table 1: Year-wise distributions of publications

Year	Number of publications	Percent
1999-2000	3	2.1
2001-2002	8	5.6
2003-2004	3	2.1
2005-2006	13	9.1
2007-2008	14	9.8
2009-2010	17	11.9
2011-2012	18	12.6
2013-2014	25	17.5
2015-2016	12	8.4
2017-2018	30	21.0

Source: Google Scholar

Literature growth in human-wildlife conflicts in East Africa

With respect to literature growth in human-wildlife conflicts in East Africa, the mathematical adjustment to exponential curve as shown in Figure 1 creates a correlation coefficient of 0.6669, indicating 33.31% of unexplained variance by the model fitting. Conversely, a linear adjustment of the measured values creates 0.7052 and therein 29.48 % unexplained variance. Therefore, these data better align with a linear fit rather than an exponential one, and therefore contrary to the postulates of Price's law.

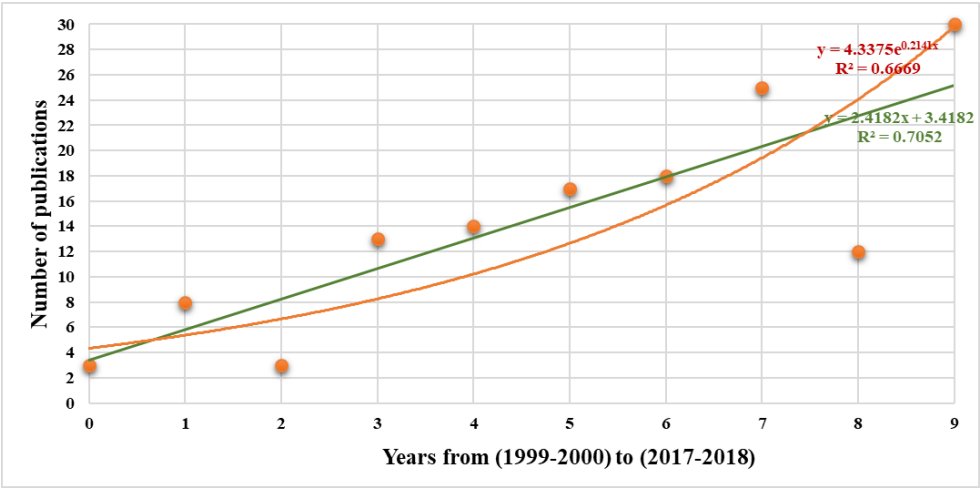

Fig. 1. Literature growth in human-wildlife conflicts in East Africa. Source: Google Scholar

Country wise production of literature in human-wildlife conflicts in East Africa

The contribution of each country was determined by counting the number of scientific publications in human-wildlife conflicts. The results show that Tanzania had contributed 46 (32.2%), Uganda 45 (31.5%), Kenya 44 (30.8%) and Rwanda 8 (5.6%) and none from Burundi and South Sudan. A combination of factors may contribute to the low or none literature production, such as political stability, research funding, sex, government policies, professional experience and academic rank [10, 22, 25, 32, 38].

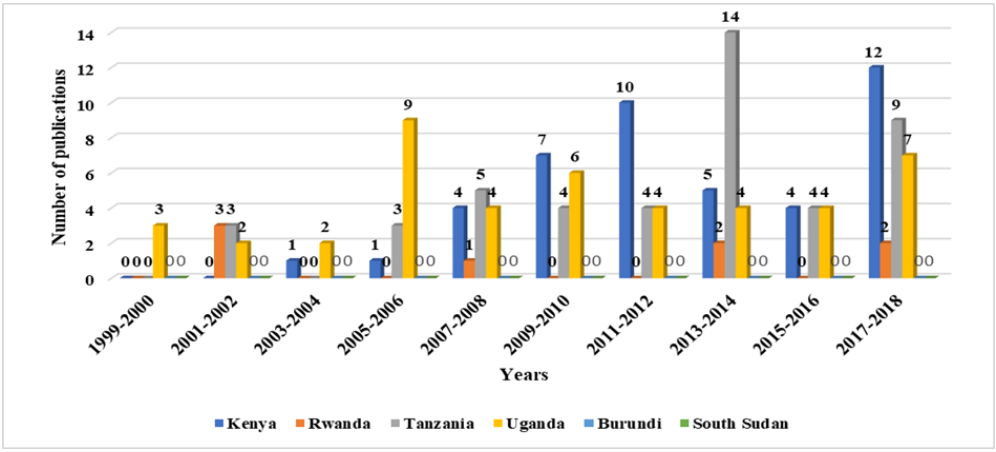

Fig. 2. Country-wise production of literature in human-wildlife conflicts in East Africa. Source: Google Scholar

Collaboration among scholars

The extent of collaboration among scholars for each county and later for East Africa as a whole was calculated as the ratio of the total number of collaborative publications (Nm) to the total number of publications (Nm+Ns) [39]. The findings show that the degree of collaboration for Kenya, Rwanda, Tanzania and Uganda were 0.55, 0.5, 0.63 and 0.44 respectively. The results further tell that Tanzania had a relatively higher level of collaboration while Uganda had a low level of collaboration. Most of the publications in Uganda were single-authored. The

degree of collaboration among scholars in East Africa was 0.54 which is attributed to a moderate level of teamwork. However, this result is contrary to [35] and [40] who reported weak research collaboration in Africa. [41] insists that collaboration is one of the key factors that will enhance research relevance and excellence in Africa. Table 2 show the degree of collaboration among scholars in the field of human-wildlife conflicts in East Africa.

Table 2. Degree of collaboration among scholars

Authorship/Countries	Kenya	Rwanda	Tanzania	Uganda	Total publications
Single authored publications	20	4	17	25	66
Two authored publications	7	1	12	6	26
Three authored publications	4	1	4	3	12
Four or more authored publications	13	2	13	11	39
Total-country wise	**44**	**8**	**46**	**45**	**143**
Degree of collaboration	**(24/44)**	**(4/8)**	**(29/46)**	**(20/45)**	**(77/143)**
(C=Nm/Nm+Ns)	**0.55**	**0.5**	**0.63**	**0.44**	**0.54**

Source: Google Scholar

Conclusions

In conclusion, the research productivity in the field of human-wildlife conflicts for Tanzania, Kenya, Uganda and Rwanda is increasing in a linear fashion. Each country contributed as follows; Tanzania 46 (32.2%), Uganda 45 (31.5%), Kenya 44 (30.8%) and Rwanda 8 (5.6%) and none from Burundi and South Sudan. Furthermore, most of the researchers were working together as reflected in the degree of collaboration except in Uganda where most of the publications were single authored. This study recommends further research to establish the extent of collaboration according to institutions and countries. Furthermore, lack of publications from Burundi and South Sudan pose a serious concern which requires further investigation.

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