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Scholarly Publication and Citation Trends in Animal Ecology: A Bibliometric Analysis

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Abstract

This bibliometric study investigates the literature on animal ecology from 2019 to 2023, focusing on trends, prolific contributors, and influential journals. By analysing 8942 articles sourced from the Web of Science database, this study identifies key patterns in annual publication growth, citation trends, and the most prolific countries, institutions, authors, and journals and most preferred keyword. The analysis reveals that the United States leads in both productivity and citations, with the University of California System as the most prolific institution. "Ecology and Evolution" emerged as the top journal, while "Ecology" was the most frequently used keyword. The study highlights the consistent output of research in animal ecology for the last five years, which indicates that how speedily bibliometric study in field of library science supports in contributing to scientific advancement.

Keywords: Animal, Bibliometric, Citations, Ecology, Environment

INTRODUCTION

Charles Elton laid foundation of Ecology and Animal Ecology is a sub-branch of discipline Science, and "this branch deals with the animal population, changes in population, their behaviour, and their relationships with the environment" (Balasubramanian A, 2019). It incorporates different qualities such as the natural habitat in which they live, their actions, bodily processes, adjustments with the environment as well as their position in ecosystem and connection with other animals. "It can also be defined as the scientific study of interactions that determine the distribution and abundance of organisms" (Zewdie and Awoke, 2015).

Animal ecology is explored at diverse points such as, population, community, landscape, and ecosystem. No doubt that the importance of animals in a life of a human beings is very great. Therefore, studying animal ecology give us perceptions into complexity of an animal life, it also helps human to understand the natural beauty of an animal and their connections with the environment. Hence, this present bibliometric study on literature related to animal ecology is contributing towards the research and science development and more advancement additionally, provides citations trends in animal

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ecology literature for past five years (2019 to 2023). The study highlights the consistent output of research in animal ecology for the past five years, which indicates that howspeedily bibliometric study in field of library science supports in contributing to scientific advancement.

REVIEW OF LITERATURE

A good review of literature helps a researcher to identify the structure and growth of a research topic. For the present study, a review of the literature would involve examining studies that use bibliometric approaches to analyse trends, patterns, and dynamics in the subject of animal ecology.

Trink Cem (2022), has done a bibliometric study on genome-wide association studies (GWAS) in animal sciencewith the help of Web of Science (WoS) database. He examined 379 studies published from 2007 to 2021.It was revealed that the 2021 was the most productive year and the annual scientific growth rate was 7.59. GWAS was identified as the most chosen keyword. The most productive author was 'Hayes B', and Genetic Selection Evolution was the most influential journal.In context of citations,'Yang ZW' was the most productive author, and the most cited country is China.

Another bibliometric study related to animal ecology was carried out by Onder and Trink (2022). They have studied 1293 articles published from 1995 to 2020 on the topic genomic selections in animal science and they have identified that annual scientific production was 7.13. The Journal of Dairy Science was the most influential journal, and the gnomic selection was the most chosen keyword. The most cited author was Vanraden PM, and the most influential country was USA.

In Yardibi and Firat (2021), conducted a bibliometric study on 10 years growth performance in animal science from the period 2010 to 2020. They have examined 10240 studies and find that 2019 was the most productive year. The average citation per document was 64.31. China and USAwere the most active countries whereas "L Yan" was the most productive author, and the most influential institute was North Corolina State University in terms of citations.

Additionally, bibliometric study on animal science was conducted byCelik Senol (2020) in animal husbandry, he has studied 500 documents published from 2002 to 2020, the average citation per document was 53.13 and "Small Ruminant Research" was the most productive journal. United Kingdom was the most active country, and the best author was "Festa Bianchet M". The most trending keywordswere Sheep, cattle and management.

OBJECTIVES

- To know the yearly growth and citation trends in the literature of animal ecology.
- To observe the most prolific country, authors and institutions in literature of animal ecology literature.
- To find out the most influential journal in literature of animal ecology.
- To knowmost preferred Keyword in literature of animal ecology.

METHODOLOGY

A bibliometric study was carried out with the help of Web of Science database (WoS), the data was gathered for the period of last five years (2019-2023). The term "Animal Ecology" was executed, and the total number of records obtained were 26543. However, after applying a year wise filter from 2019 to 2023, the final records were 8942. Furthermore, the downloaded records were analysed with help of Excel sheet and Biblioshiny software packages.

RESULTS

Yearly Growth and citation analysis

The data analysis of animal ecology literature from the period 2019 to 2023, shows that the total number of results were 8942. Maximum literature was published in the year 2021, and the total number of articles were 1902. This is followed by the year 2022 and 2023 with 1860 and 1817 number of articles respectively. Least number of articles i.e., 1730 and 1631 were published in the year 2020 and 2019 respectively. Below Figure1 is given which illustrating yearly growth in literature of animal ecology for the last 5 years (2019 to 2023).

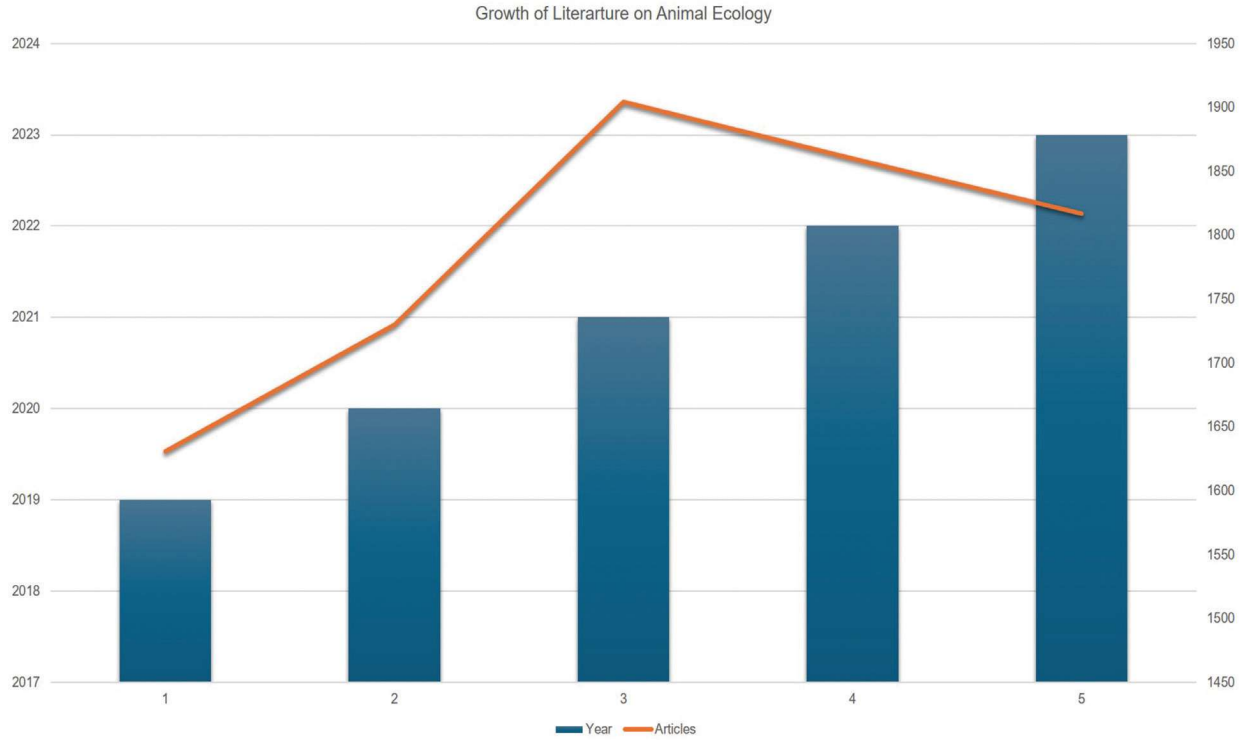

Fig. 1: Showing growth of literature on Animal Ecology from year 2019 to 2023.

The above *Fig. 1*, illustrating that the growth of literature was increased from the year 2019 to 2021, then there is decrease in activity from 2022 to 2023. The production of publication related to animal ecology was on climax in the year 2021.

Table 1: Showing information regarding citations received by the articles from year 2019 to 2023

Year	Mean Total Citation per Articles	No. of Articles	Mean Total Citation per Year
2019	20.85	1631	3.48
2020	16.43	1730	3.29
2021	10.14	1904	2.54
2022	6.18	1860	2.06
2023	2.04	1817	1.02

Citation analysis was done, and it was uncovered that mean total citation per article was highest in the year 2019 given in *table 1*. This is followed by the year 2020 with 16.43. Thirdly the year 2021 has got 10.14 mean total citation per article. In 2022 and 2023 the mean total citation was least i.e., 6.18 and 2.04.

The above analysis revealed that over the years number of average citation of article is decreasing. However, it is also important to note here that despite the decline in average citation of articles, the number of articles remains moderately stable. This suggests that level of output of research over the years is consistent.

Most Prolific Country

According to the *Table 2*, the most prolific country in production of literature in animal ecology is USA with frequency 9289. Second position is occupied by UK with frequency 2532. Australia and China are at third and fourth position with frequency 2122 and 1901 respectively. Fifth rank is occupied by Germany and the frequency is 1897. A list of top ten countries is given in *table 2*.

Table 2: Showing list of top ten countries in literature production

Country	Frequency
USA	9289
UK	2532
Australia	2122
China	1901
Germany	1897
Brazil	1889
Canada	1778
France	1397
Spain	1013
Italy	833

In terms of citations, the most prolific country is again USA with 27029 citations. This is followed by UK and Australia with 10175 and 7288 citations respectively. Germany and China are at fourth and fifth position with 6624 and 6376 citations respectively. *Table 3* is demonstrating top ten prolific country in terms of citations.

Table 3: Showing top ten countries in terms of citations received by articles

Country	Total Citation	Average Article Citations
USA	27029	11.50
UK	10175	14.30
Australia	7288	12.30
Germany	6624	14.40
China	6376	11.00
Canada	5768	11.30
France	3413	11.80
Brazil	3257	7.40
Spain	2879	11.20
Italy	2371	10.50

Most Prolific Institution

The analysis of institutions was done, and it was revealed that the most prolific institution in animal ecology literature production is University of California System with 736 articles. Centre National De La Recherche Scientifique (CNRS) has captured second rank with 614 articles. This is followed by State University System of Florida and Chinese Academy of Sciences with 346 and 317 number of articles and at fifth position it is United States Department of The Interior 294 articles. A list of top ten institutions is given in *table 4*.

Table 4: Showing list of top ten Institutions

Affiliation	Articles
University Of California System	736
Centre National De La Recherche Scientifique (CNRS)	614
State University System of Florida	346
Chinese Academy of Sciences	317
United States Department of The Interior	294
Consejo Superior De Investigaciones Cientificas (CSIC)	250
United States Department of Agriculture (USDA)	238
Max Planck Society	235
University of California Davis	228
Inrae	227

The Most Prolific Author

According to the *table 5*, the most prolific author in animal ecology literature is Cooke, Steven J. with 24 number of articles. This is followed by Kays, Roland and Nathan, Ran with 22 and 17 number of articles respectively. Fourth and fifth ranks are captured by Wikelski, Martin and Wittemyer, George respectively and both has contributed 17 number of articles. A list of top ten authors is given in *table 5*.

Table 5: Showing top ten authors in terms of production of literature

Authors	No. of Articles	Articles Fraction
Cooke, Steven J.	24	2.65761863
Kays, Roland	22	3.05953836
Nathan, Ran	17	2.34421683
Wikelski, Martin	17	2.74249702
Wittemyer, George	17	3.27754647
Merkle, Jerod A.	16	2.9754329
Palme, Rupert	16	3.45456349
Wilson, Rory P.	16	1.81771649
Blumstein, Daniel T.	15	3.42559524
Lennox, Robert J.	15	1.88658688

The most prolific author in context of citations is Gaynor Kaitlyn M. with 618 citations. This is followed by authors Muller Thomas and Cooke Steven J. with 510 and 501 citations respectively. Fourth and fifth rank is occupied by Nathan Ran and Kays Roland with 495 and 473 citations respectively. List of top ten authors in context of citations is given below in *table 9.6*.

Table 6: Showing list of top ten authors in terms of citations.

Author	HIndex	GIndex	MIndex	Total Citation
Gaynor Kaitlyn M.	10	13	1.667	618
Mueller Thomas	10	14	1.667	510
Cooke Steven J.	12	22	2	501
Nathan Ran	11	17	1.833	495
Kays Roland	8	21	1.333	473
Wikelski Martin	10	17	1.667	421
Merkle Jerod A.	9	16	1.5	421
Abrahms Briana	8	10	1.333	405
Lennox Robert J.	9	15	1.5	381
Dingemanse Niels J.	8	12	1.333	376

*HIndex (Hirsch Index) *G Index (M Quotient) *M Index (Gini Index).

Most influential journal

The analysis for the most influential journal was done with the help of Bradfords Law of Scattering, the articles in this law are divided into three zones. Zone 1 contains highly productive articles, zone 2 contain moderate productive articles and zone 3 includes low productive articles.

According to the *Table 8*, which is given below showing list of top ten journals. The most influential journal in field of literature production of animal ecology is Ecology and Evolution with 240 articles. Rank two and three are occupied by the journals named as "Animal Behaviour" and "Scientific Reports" with 196 and 189 articles respectively. This is followed by Journal of Animal Ecology and Frontiers In ecology and Evolution with 179 and 168 articles respectively. In table 7 zone 1 indicating that all top twenty journals have highly productive articles.

Table 7: Showing list of top ten Influential journals.

Name of Journal	Rank	Freq of Articles	Cumulative Freq	Zone
Ecology and Evolution	1	240	240	Zone 1
Animal Behaviour	2	196	436	Zone 1
Scientific Reports	3	189	625	Zone 1
Journal of Animal Ecology	4	179	804	Zone 1
Frontiers in Ecology and Evolution	5	168	972	Zone 1
Animals	6	163	1135	Zone 1
Plos One	7	145	1280	Zone 1
Methods in Ecology and Evolution	8	131	1411	Zone 1
Proceedings of The Royal Society B-Biological Sciences	9	116	1527	Zone 1
Peerj	10	99	1626	Zone 1

Most Preferred Keyword

According to the *table 9.8*, the most preferred keyword by the authors in literature of animal ecology is Ecology and frequency of occurrence is 2429. Second and third preferred words are Evolution and Behavior and their frequency of occurrence are 876 and 869 respectively. This is followed by word Patterns and Diversity and their frequency of occurrence are 668 and 538 respectively. A list of top ten preferred keywords is given below in *table 9.8*.

Table 8: Showing list of top ten preferred words.

Words	Frequency of Occurrences
Ecology	2429
Evolution	876
Behavior	869
Patterns	668
Diversity	538
Conservation	449
Population	370
Selection	358
Dynamics	346
Climate-Change	320

DISCUSSION

The bibliometric study on literature of animal ecology from 2019 to 2023 has been done with

the help of Web of Science database. The past five years bibliometric study related to animal ecology has revealed that in total 8942 records has been collected and it was identified that in the year 2021 the maximum literature production was done. One of the bibliometric studies done by Trink Cem (2022) on genome-wide association studies (GWAS) in animal science, and he also find that 2021 was the most fruitful year. Study done by Yardibi and Firat (2021), have found that 2019 was the most productive year.

The present study has uncovered that USA is the productive country in terms of production of maximum number of articles as well as in terms of receiving of citations. Similar results were also retrieved by other authors in their study such as Onder and Trink (2022).

The present study also finds out that the most influential journal in production of literature in animal ecology is Ecology and Evolution. But for other studies the result was different. Study done by Celik Senol (2020) have shown in their work that the most productive journal is Small Ruminant Research and the Study done by Onder and Trink (2022) finds out the most productive journal was The Journal of Dairy Science.

The most chosen keyword for the present study was ecology, evolution and behaviour. Other studies show dissimilar results. Study conducted by Celik Senol (2020) shows that for their study the most preferred keywords were Sheep, cattle and management.

CONCLUSION

To conclude, it can be said that animal ecology is one of the worthiest branch of Science. That particularly deals with animals (mammals, fish, birds, reptiles and amphibians) and their interaction with the environment. The bibliometric study was done on literature in animal ecology from the period 2019 to 2023. The analysis shown that the most productive year in production of literature is 2021. USA is the country from where maximum literature is producing. The most productive institute is University of California System, and the most prolific author is Cooke, Steven J. It was retrieved that the most influential journal is Ecology and Evolution, and the most preferred keywords are ecology, evolution and behaviour. Therefore, this study highlights the consistent output of research in animal ecology for the past five years, which indicates that how speedilybibliometric study in field of library science supports in contributing to scientific advancement.

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