SCIENTIFIC PRODUCTION IN ENVIRONMENTAL SCIENCES OF A PERUVIAN PRIVATE UNIVERSITY IN THE SCOPUS DATABASE

Producción científica en ciencias ambientales de una universidad privada peruana en la base datos scopus

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	ABSTRACT
Keywords: Bibliometrics, bibliography, environmental data, scientific publications.	The present study seeks to analyze the publications of articles in the Scopus database on environmental issues carried out by a private university in Peru between 2013 and 2024 through a review of bibliometric indicators in which 200 papers were selected and analyzed. The search was conducted by affiliation. The variables analyzed are: author, year, citations, journal, index, language and topics. The results allow us to see that the years 2022 and 2023 had a higher number of publications (n=54 and 52), 2017 reports a higher average total of citations per article (n=78.57), the journal with the most publications is "Marine pollution bulletin" from Switzerland with a Q2, SJR = 0.83, with 20 articles, the most relevant authors are: Alfaro-Shigueto (n=37) and Mangel JC (n=34), the clusters identified show words that are not normally associated with the field of environmental sciences such as: human, clinical study and non-human, the article with the greatest impact is "Microplastics in the Antarctic marine system: An emerging area of research", the countries in which they are published the most are Switzerland, the Netherlands, the United Kingdom, Germany and the USA. The impact level are between Q1 and Q2 with SJR = 0.39 up to 2.15.

	RESUMEN
Palabras clave: bibliometría, bibliografía, datos ambientales, publicaciones científicas.	El presente estudio busca analizar las publicaciones de artículos en la base de datos Scopus sobre temas ambientales realizadas por una universidad privada del Perú entre los años de 2013 al 2024 a través de una revisión de indicadores bibliométricos en las que se seleccionaron y analizaron 200 papers. La búsqueda se realizó por afiliación. Las variables analizadas son: autor, año, citas, revista, indizada, idioma y temas. Los resultados permiten ver que los años 2022 y 2023 tuvieron mayor número de publicaciones (n = 54 y 52), el 2017 reporta mayor media total de citas por artículos (n = 78.57), la revista con más publicaciones es "Marine pollution bulletin" de Suiza con un Q2, SJR = 0.83, con 20 artículos, los autores más relevantes son: Alfaro-Shigueto (n=37) y Mangel JC (n=34), los clústeres identificados muestran palabras

que normalmente no están asociadas al campo de ciencias ambientales como: humano, estudio clínico y no human, el artículo con mayor impacto es "Microplastics in the Antarctic marine system: An emerging area of research", los países en las que más se publican son Suiza, Países Bajos, Reino Unido, Alemania y EEUU. El nivel de impacto es entre Q1 y Q2 con SJR = 0.39 hasta 2.15.

Introduction

González (2022) mention that the lack of solid knowledge about the importance of scientific production limits the research skills of university students when carrying out their research project or case study. It can be said that there are two factors that negatively intervene in academic training: the first one responds to the internal motivating environment: it invokes the student's desire to excel, goals, and affective needs. The second responds to the external motivating environment: the lack of a sense of collaboration among teachers, lack of technological tools, lack of virtual teaching, absence of political factors, among others. These factors result in motivational and behavioral barriers.

For his part, Cortés (2007) states that science is not done in universities today as it was a few decades ago. The internationalization of research, i.e. the association of researchers from different parts of the world, is becoming the main strategy through which universities face the challenge of redefining their research tasks within a changing context that gives their activities a new dynamic, globalization. It is a fact that the phenomenon of globalization has brought about many changes in the work of universities, particularly in the sectors of research and technological production for industry.

Thus, the international dimension now plays a more significant role within university scientific communities, which is observed when, among their academic tasks, they have to identify their objects of study in an interdisciplinary manner, reorganize their ways of working, use new technologies, be more fluid in their communication, be attentive to new criteria for the evaluation of science or vary the origin of their funding resources (Cortés, 2007).

In a study conducted by Morales-Jasso et al. (2022) mention that environmental sciences combine different disciplines to generate comprehensive knowledge about us and the world around us. The natural and social sciences are not sufficient to address environmental issues; rather, environmental sciences are based on traditional disciplines. The environmental sciences are in search of their distinctive disciplinary matrix, as well as the ethical bases to which they will appeal as they face different environmental problems.

Environmental science publications are essential to advance the understanding of environmental problems, develop sustainable solutions and contribute to scientific knowledge. This allows the scientific community and the public to easily access up-to-date and relevant information on environmental issues.

Scientific publications provide an opportunity for researchers to communicate with each other and to share methods, results and conclusions. This ensures the validity and integrity of the research and the quality of the knowledge shared. New research often builds on the foundations of previous research, ensuring a continuous advancement of knowledge in the field of environmental sciences (Perez and Joaquin, 2024).

Research findings and conclusions can be used to support government decisions related to environmental protection, natural resource management and environmental impact mitigation. Shared knowledge can be disseminated through a variety of means and help raise society's awareness of important issues such as climate change, biodiversity and sustainability. The publication provides a platform to present these solutions and discuss their feasibility, thus promoting the application of science to solve real-world problems (Carden, 2009).

In summary, environmental science publications play an important role in advancing knowledge, fostering collaboration, supporting effective policies, and raising public awareness of environmental problems and solutions.

While environmental issues are important, they may present opportunities or challenges that need to be addressed. Identifying and addressing these areas is critical to a better and more accurate understanding of environmental problems. Although scientific literature is important for the dissemination of knowledge, access to these publications may be limited due to financial constraints. Limited accessibility prevents vulnerable groups and communities from obtaining important environmental information. Environmental research is sometimes fragmented, with different studies focusing on different aspects of the problem without a clear vision. This reduces the understanding of natural systems and the ability to solve problems effectively (Mastrángelo et al., 2019).

Addressing these gaps in environmental science publishing requires a multidisciplinary approach, information gathering, promotion of research diversity, and an emphasis on the validity of reported results to ensure positive outcomes.

Bibliometric analyses on environmental issues play an important role in research and decision making in the field of environmental science and management. On the one hand, it helps to identify trends and areas of emphasis in environmental research. This is critical to foster collaboration and address complex environmental problems that often require multidisciplinary approaches (Gil et al., 2021).

On the other hand, it helps to identify gaps in research by exploring areas that have received less attention or fewer publications. This may lead researchers and funders to areas where more research is needed to improve our understanding of environmental problems (Gil et al., 2021). In addition, information from bibliometric studies can be valuable for policy and decision makers (Gil et al., 2021). In conclusion, bibliometric studies provide a quantitative and objective view of the state of environmental research and can be crucial in determining research decisions and future directions in the field.

According to The Word Universities Insights Limited (2024) the Peruvian universities ranked by research on environmental issues are: Universidad Peruana Cayetano Heredia, Pontificia Universidad Católica del Perú, Universidad del Pacífico, Universidad Católica San Pablo, Universidad Científica del Sur and Universidad Nacional Agraria La Molina. The Universidad Científica del Sur has an 8% SRI ratio. Information Systems Research is a leading international peer-reviewed journal that focuses on the theory, research and intellectual development of information systems in organizations, institutions, economics and society.

Universidad Científica del Sur (UCSUR) is a private institution of higher education, accredited by the Peruvian Ministry of Education. Founded and recognized in 1998. It currently has 18 bachelor's and 13 master's degree programs for more than 2,000 students (The Word Universities Insights Limited, 2024).

Over the last decade, the world has been transformed by the need to find solutions to global problems, closer links between academia and industry, universities for research and the need to find more options for scientific training. Scientific knowledge has increased exponentially. New standards for the evaluation of research and the rapid dissemination of new knowledge through information technologies and the dissemination of research results in scientific journals. (Rodriguez, 2015).

Publication in leading journals is a key criterion for academic success in the competitive global higher education landscape. In addition, there is a growing need to evaluate the research results of countries and universities.

Likewise, Orozco et al. (2017) states that the evaluation of the academic excellence of a university takes into account several indicators, one of the most decisive is scientific research, generally indexed journals. Universities need to know where they stand in relation to the rest of the world in order to develop improvement. The dissemination of the results of scientific research is fundamental for the development of science, which is why the Open Access declaration (Budapest, 2002, Bethesda, 2003, Berlin, 2003, as cited in Aguado-López et al., 2009) mentions that and the consequent efforts around "open Access" are a base that drives universities to position themselves on the Internet.

Similarly, Albornoz and Osorio (2017), mention that university rankings have recently acquired great visibility and their impact not only reaches the actors directly involved in the management of higher education, but also public opinion, through their repercussion in the journalistic media. Analyzing university rankings raises theoretical and methodological challenges that include the objectives of the rankings, the definitions of quality adopted, the units of analysis, the dimensions and indicators chosen, the sources used, the weighting criteria, the way in which the results are organized and the methods of public dissemination of the results.

Therefore, in order to propose recommendations, adjustments and/or changes in the management and administration policies of the university, this research aims to identify the scientific publications indexed in Scopus published by researchers affiliated to the Universidad Científica del Sur (UCSUR) in the area of environmental sciences, through a bibliometric review in the Scopus database.

Method

The present research is based on a bibliometric approach, which is being widely employed in different areas (Aria & Cuccurullo, 2017), consisting of five precise steps according to Zupic & Čater (2015) the first step is study design, then bibliometric data collection, followed by data analysis and finally visualization and interpretation.

Study Design

Following the review of all the information, the questions for this study were asked. The first question was: What are the publications on environmental sciences by authors affiliated to the Universidad Científica del Sur (year, subject area, type of documents and citations? It is answered by means of an Excel chart showing the evolution by year of the publications that have been made, by subject, type of document and number of citations. As a second question, what are the topics most covered by the publications made by the affiliates of the Universidad privada de lima in terms of environmental sciences? Using the bibliometric method, a graph known as a thematic map of the topics most covered by the authors and the number of publications was considered. Finally, to answer the question: What are the topics that are least covered by the publications of the affiliates of the Universidad privada de lima on environmental issues? The keywords were taken into account and using the bibliometric method in the Vosviewer software, the cooccurrence analysis was performed.

Bibliometric Data Collection

Using the Scopus database, a search was first performed by affiliation by country, university and environmental sciences. We found 200 open access documents from the years 2013 through 2024. Documents with erroneous, repeated or missing data and environmental issues were excluded, leaving 200 documents. The following algorithm was used to search for AFFILCOUNTRY (peru) AND (LIMIT-TO (SUBJAREA , "envi")) AND (LIMIT-TO (AF-ID , "universidad científica del sur" 60078122)) titles and keywords of scientific articles published in Scopus on environmental topics were included. The software used for the analysis of all documents was Excel spreadsheet, Rstudio and Vosviewe. The variables analyzed are: author, year, citations, indexed journal, language, faculty and subject.

Analysis

At this stage of the study, after uploading the data and with the objective of maintaining the viability and quality of the information, it is downloaded from Scopus in a CSV format for Microsoft Excel, Rstudio, Vosviewer and then the analysis is performed.

Visualization

In order to follow the rigorous steps of the bibliometric method, we made use of our own strategies to report the evolution by year, subject, type of document and number of citations using an Excel chart. Likewise, through the Rstudy, a thematic map of the most covered topics within the environmental sciences is made. Finally, the keywords were taken into account and a cooccurrence analysis was performed using the Vosviewer software.

Interpretation

For this research process, we proceed to answer the questions that were posed as an objective, in other words, by means of the results obtained, the final report of everything obtained about the university's publications on environmental issues is elaborated.

Results

### Summary of Key Information

Table 1.
Summary of general information

Main data information	
Space of time	2013 - 2024
Articles	173
Review	14
Chapter of the book	4
Session document	4
Letter	2
Note	2
Errata	1

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Annual growth rate, %	6.5
References	11849
Keyword plus (ID)	1667
Author's keywords (DE)	812
Authors	1281
Single-authored documents	3
Co-authors per document	8.43
% of international co-authorships	66
Average citations per document	10.97

Production of Publications Per Year

Figure 1.

Publications per year, average total citations per article and per year.
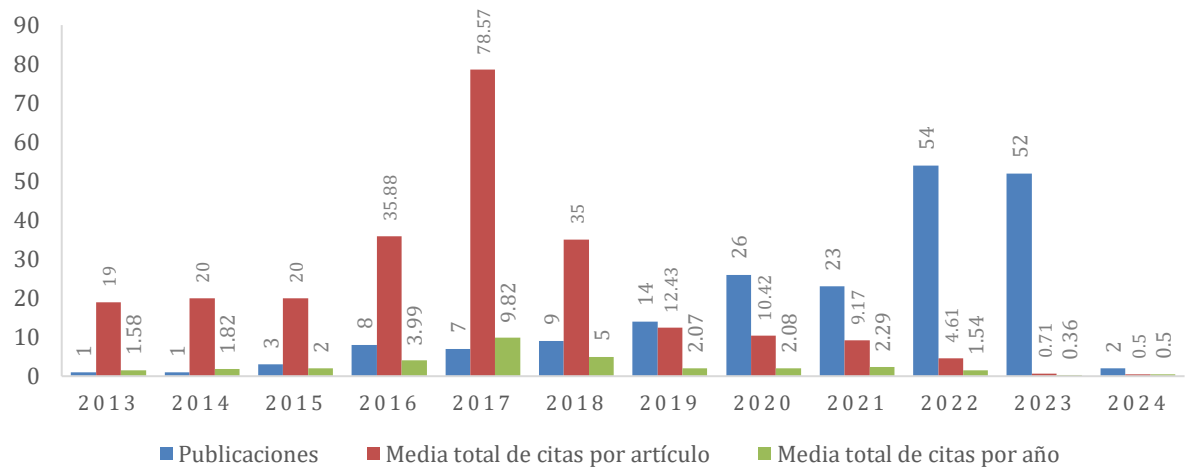
Most Relevant and High Impact Journals

Table 2.

10 journals with the most relevant sources and with the greatest local impact.

Rev. with most relevant sources	Art.	Rev. with greater local impact	H index	TC	NP	Q	Country	SJR
International journal of environmental research and public health	20	Frontiers in marine science	6	224	9	Q1	Switzerland	1.12
Frontiers in marine science	9	Biological conservation	4	139	5	Q1	Countries Low	2.15

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Marine pollution bulletin	8	International journal of environmental research and public health	4	59	20	Q2	Switzerland	0.83
Sustainability (switzerland)	7	Marine pollution bulletin	4	41	8	Q1	Reino United	1.49
Biological conservation	5	Sustainability (switzerland)	4	79	7	Q1	Switzerland	0.66
Marine and Coastal Research Bulletin	4	Endangered species research	3	109	4	Q1	Germany	0.94
Endangered species research	4	Marine ecology progress series	3	88	4	Q1	Germany	0.86
farm	4	Aquatic mammals	2	14	2	Q2	Countries Low	0.39
Journal of law and sustainable development	4	Carbon management	2	19	2	Q2	Reino United	0.64
Marine ecology progress series	4	Conservation science and practice	2	18	2	Q1	United States	0.98

Note: TC = total number of citations / NP = number of publications /

Table 3.

10 most relevant authors with the greatest local impact.

Most relevant authors	Art.	Fractional items	Authors with local impact	index_h	TC
Alfaro-Shigueto J	37	5.48	Alfaro-Shigueto J.	13	526
Mangel JC.	34	4.76	Mangel J.	12	506
Ladd B.	21	4.11	Ladd B.	11	261
Iannacone J.	15	4.4	Godley BJ.	8	322
Hernández-Vásquez A.	12	3.72	Peri Pl.	7	151
Godley BJ.	10	1.21	Amelung W.	5	84
Peri Pl.	10	1.6	Borchard N.	5	111
Aponte H.	9	2.22	Duarte-Guardia S.	5	74

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| Bendezu-Quispe G. | 9 | 1.73 | Moreno B. | 5 | 549 |
| Campbell E. | 8 | 0.87 | Aponte H. | 4 | 77 |

Note: Art: Articles

Table 4.

10 articles with the greatest impact.

Title of the paper	Authors	Quotations totals	CT year	CT norm.
Microplastics in the Antarctic marine system: An emerging area of research	Waller et al. (2017)	480	60	6.11
Main drivers of changes in CO2 emissions in the Spanish economy: A structural decomposition analysis	Cansino, Román & Ordóñez (2016)	163	18.11	4.54
Impacts of Marine Plastic Pollution from Continental Coasts to Subtropical Gyres-Fish, Seabirds, and Other Vertebrates in the SE Pacific	Thiel et al. (2018)	150	21.43	4.29
Binational survey of personal protective equipment (PPE) pollution driven by the COVID-19 pandemic in coastal environments: Abundance, distribution, and analytical characterization	De-la-Torre et al. (2022)	77	25.67	16.7
Reducing green turtle bycatch in small-scale fisheries using illuminated gillnets: the cost of saving a sea turtle	Ortiz et al. (2016)	65	7.22	1.81
Marine mammal conservation: over the horizon	Nelms et al. (2021)	63	15.75	6.87
Remote electronic monitoring as a potential alternative to on-board observers in small-scale fisheries	Bartholomew et al. (2018)	62	8.86	1.77
An illuminating idea to reduce bycatch in the Peruvian small-scale gillnet fishery	Bielli et al. (2020)	55	11	5.28
Charting the course for a blue economy in Peru: a research agenda	McKinley et al. (2019)	43	7.17	3.46

Testing a global standard for quantifying species recovery and assessing conservation impact	Grace et al. (2021)	42	10.5	4.58

Note: CT year = appointments per year / CT norm. = standardized quotations.

Figure 2.

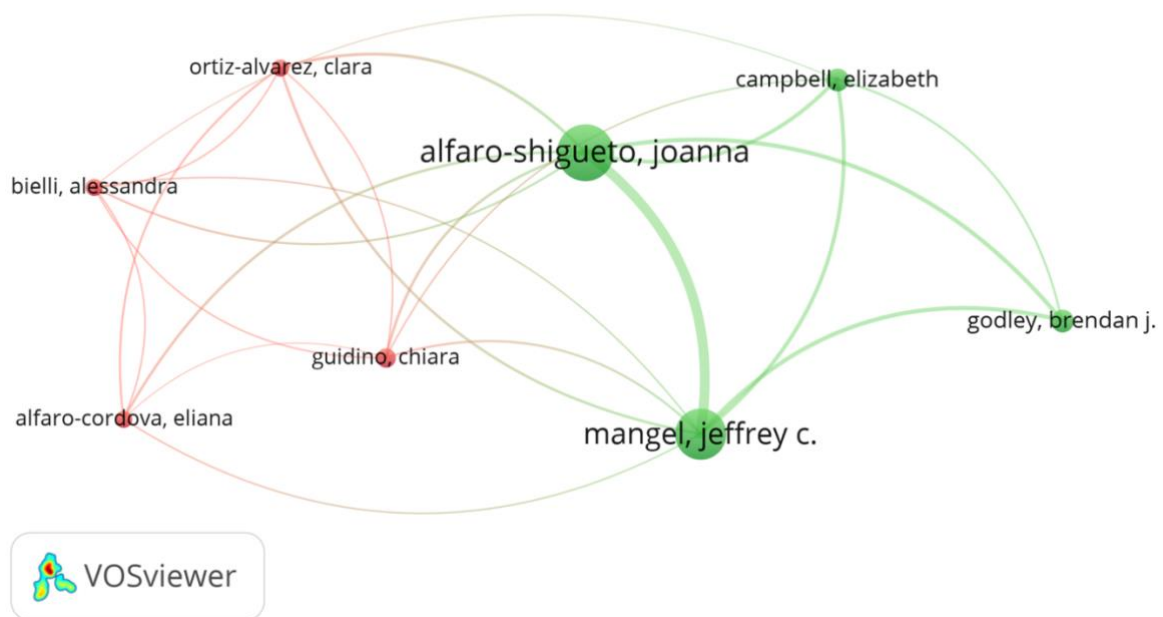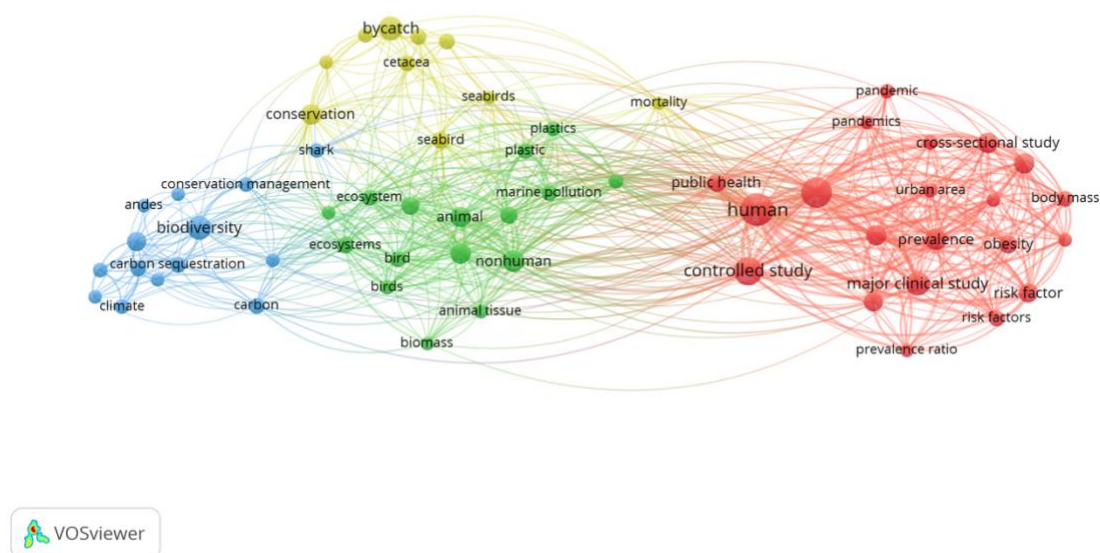*Bibliometric map by authors and citations*

Figure 3.

Bibliometric map by keywords of environmental sciences.

VOSviewer

Discussion and Conclusions

Table 1 presents the summary of publications in Scopus on environmental issues, in the years 2013 to 2024 and the total number of documents are 200 of which mostly are articles (173) and then review (14) and the annual growth is 6.5, the number of authors are 1281 and they managed to cite 11849 in their references (average of 10.97 per document), a total of 1667 keywords and co-authorship is 8.43.

Figure 1 shows that document publications by year from 2013 to 2024 have had an annual increase of 6.5%. The university has started publishing since 2013 and the significant increase has been in 2019 with 14 documents, for the following year 2020 it increased by 12 making a total of 26. However, in 2021, production decreased to 23 publications. By 2022, the authors reached 54 papers and by the following year they only reached 52, it is expected that by 2024 they will have the same results.

Regarding the average total citations per article, it is observed that since the beginning of the publications which was in 2013 until 2024 the growth has been progressive from 19 in 2013, 35.88 in 2016 and there was a rise of 78.57 in 2017 being this the year with more citations per article, despite the fact that that year there were only 7 publications. In 2018 the citations decrease to 35 and so it has been decreasing until 2023 that only 0.71 were cited.

For the average total number of appointments per year, it is observed that in 2013 it starts with 1.58 having a progressive growth until 2017 with 9.82 being this the year with more appointments. However, 2018 decreases to 5 and 2017 quotes remain between 2.07 to 2.29 in 2021, but by 2022 they decrease to 1.54 and 2023 to 0.36.

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In Table 2. The analysis of the extracted documents shows a ranking of the 10 journals with the most relevant sources, of which "International journal of environmental research and public health" stands out with 20 articles, followed by "Frontiers in marine science" with only 9 documents and the last on the list is "Marine ecology progress series" with 4 undecided products.

In reference to the 10 journals with the highest local impact, "Frontiers in marine science" tops the list with a 6 H index and a total number of citations of 224, followed by 4 journals with the same scores (4) "Biological conservation" with TC=139, "International journal of environmental research and public health", "Marine pollution bulletin" and "Sustainability (switzerland)". It is observed that the journal "Endangered species research" has a total number of citations of 109, but with less local impact and "Conservation science and practice" is the journal with less local impact in the list with 2 documents and a TC=18.

Similarly, the journal with the highest number of publications is "International journal of environmental research and public health" from Switzerland with a Q2 and an SJR=0.83. However, it does not have much local impact; it is third on the list. The countries in which they are published are Switzerland, the Netherlands, the United Kingdom, Germany and the USA. The impact level is between Q1 and Q2 with SJR = 0.39 to 2.15.

Table 3 presents the list of the 10 most relevant authors from which it is observed that Alfaro-Shigueto occupies the first place with the highest production of 37 publications between the years 2013 to 2024, followed by Mangel JC with 34 publications and Ladd B with 15 and the last in the list with 8 articles is Campbell E.

The 10 authors with the highest local impact are Alfaro-Shigueto with an index_h of 13 total citations 526, followed by Mangel J with an index-H of 12 and a TC = 506, Ladd B with an index_h of 11 and TC=261, the last in the list is Aponte H. with an index_h of 4 and total citations of 77.

When an analysis of the total number of citations is made, Moreno B has the highest impact 549 with an H-index of 5, this is due to the fact that the published topic has attracted the attention of other authors and that is why he has been cited, followed by Alfaro-Shigueto J. with 526 and an H-index of 13, then Mangel with 506 and an index of 12. Last on the list is Duarte-Guardia S. with an h-index of 5 and 74 total citations.

In the ranking of the 10 articles with the greatest impact, the one that stands out is "Microplastics in the Antarctic marine system: An emerging area of research" by Waller, C., Griffiths, H., Waluda, C., Thorpe, S., Loaiza, I., Moreno, B., Pacherres, C., & Hughes, K. published in 2017(Waller et al., 2017) has come to be cited by 480 studies, which ranks second is the 2016 article entitled "Main drivers of changes in CO2 emissions in the Spanish economy: A structural decomposition analysis" by authors Cansino, J. M., Román, R., & Ordóñez, M. (Cansino et al., 2015) which has had an impact on 163 studies and is followed by the work of Thiel, M., Luna-Jorquera, G., Álvarez-Varas, R., Gallardo, C., Hinojosa, I. A., Luna, N., Miranda-Urbina, D., Morales, N., Ory, N., Pacheco, A. S., Portflitt-Toro, M., & Zavalaga, C. from 2018 on "Impacts of Marine Plastic Pollution from Continental Coasts to Subtropical Gyres-Fish, Seabirds, and Other Vertebrates in the SE Pacific" (Thiel et al., 2018) with total citations of 150.

Another study that has had an impact with 77 times cited was "Binational survey of personal protective equipment (PPE) pollution driven by the COVID-19 pandemic in coastal environments: Abundance, distribution, and analytical characterization" by authors De-la-Torre, G. E., Dioses-Salinas, D. C., Pizarro-Ortega, C. I., Fernández Severini, M. D., Forero López, A. D., Mansilla, R., Ayala, F., Castillo, L. M. J., Castillo-Paico, E., Torres, D. A., Mendoza-Castilla, L. M., Meza-Chuquizuta, C., Vizcarra, J. K., Mejía, M., De La Gala, J. J.

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V., Ninaja, E. A. S., Calisaya, D. L. S., Flores-Miranda, W. E., Rosillo, J. L. E., ... Santillán, L. of the year 2022 (De-la-Torre et al., 2022). The last on the list is the article entitled "Testing a global standard for quantifying species recovery and assessing conservation impact" by authors Grace, M. K., Akçakaya, H. R., Bennett, E. L., Brooks, T. M., Heath, A., Hedges, S., Hilton-Taylor, C., Hoffmann, M., Hochkirch, A., Jenkins, R., Keith, D. A., Long, B., Mallon, D. P., Meijaard, E., Milner-Gulland, E. J., Rodriguez, J. P., Stephenson, P. J., Stuart, S. N., Young, R. P., ... Young, S. published in 2021 has come to be cited in total by 42 publications (Grace et al. 2021).

Figure 2 shows a map of authors and the first red cluster shows that Alfaro-Cordova, Eliana has published with Alessandra Bielli, Chiara Guidino and Ortiz-Alvarez, Clara. In Alfaro-Shigueto green cluster 2, Joanna has the most publications with Elizabeth Campbell, followed by Brendan J. Godley and Jeffrey C. Mangel.

The relationship between the keywords is presented in graph 2, in which it is observed that cluster 1, which is red, has 21 items of which the most worked are body mass, body mass index, controlled study, cross-sectional, epidemiology, health survey, human, etc. In cluster 2 of green color there are 16 items and the key words are animals, animal tissue, biomass, bird, ecosystem, environmental monitoring, fish, environmental pollution, etc. In cluster 3 of blue color there are 14 items that covered about words: andes, biodiversity, carbon sequestration, climate, climate change, conservation management, etc. Finally, in cluster 4 in yellow, there are 10 items on the words bycatch, cetaceans, conservation, dolphins, gillnets, mortality, etc.

Conclusions:

UCSUR's scientific production shows a growth trend, achieving 200 publications from 2013 to 2024. The years 2022 and 2023 were the years with the highest number of publications 54 and 52 respectively. The year 2017 reports the highest total mean number of citations per article (78.57).

The journal with the most publications is "Marine pollution bulletin" from Switzerland with a Q2, SJR = 0.83, with 20 articles. However, it does not have much local impact, it is third on the list (TC=59). The journal with the highest local impact is "International journal of environmental research and public health" with 6 H index, Q, SJR= 1.12 and with a total number of citations of 224.

In the 200 publications, 1281 authors were found, of which 161 are affiliated to UCSUR. The most relevant authors are: Alfaro-Shigueto ranks first with 37 publications, index_h of 13 total citations 526, Mangel JC with 34 publications, with an index-H of 12 and a TC = 506, and Ladd B with 15, with an index_h of 11 and TC=261. Similarly, E. Moreno B. with an index h 5 is the author with the most citations, 549. Two groups of authors have been identified. The first, with more publications, is composed of Alfaro-Shigueto, Manguel, Campbell and Godley; the second, with fewer publications, is composed of Ortiz, Bielli, Alfaro-Córdova and Guidino.

In terms of keywords, the four clusters identified show words that are not normally associated with the field of environmental sciences such as human, clinical study, and non-human. While, in the less relevant clusters, words associated with the field of environmental sciences can be found such as: conservation, ecosystem and pollution. This situation is in agreement with those mentioned by Morales-Jasso et al. (2022) who says that environmental sciences combine different disciplines to generate comprehensive knowledge.

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The article with the highest impact is "Microplastics in the Antarctic marine system: An emerging area of research" by Waller, C., Griffiths, H., Waluda, C., Thorpe, S., Loaiza, I., Moreno, B., Pacherres, C., & Hughes, K. published in 2017 (Waller et al., 2017) has gone on to be cited by 480 publications.

The countries in which they are published are Switzerland, the Netherlands, the United Kingdom, Germany and the USA. The impact level is between Q1 and Q2 with SJR = 0.39 to 2.15.

Limitations:

The present research only includes the Scopus database.

Only publications since 2013 have been included.

The area of environmental sciences is too broad a term to serve as a reference for certain types of research.

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