Global Perspective of Research Productivity in Limnology: A Scientometrics Analysis

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Abstract

This study analyses the Global contributions of research papers related to Limnology was undertaken from Web of Science Databases has been used to retrieve the data for 32 years (1989-2020) by the searching the keyword "Limnology". The study reveals that, most of the researchers preferred to publish their research results in journals; as such 82.8% of articles were published in journals. More numbers of articles were published in the year 2020. The authorship trend shows that, out of total 1499 research literatures published, 81.5% of them or published under the joint author of publications in Limnology research output. It is observed that author productivity is not in agreement with Lotka's law. This study also identified to analyses coverage growth rates, Growth rate of production of literature areas of research concentration, Exponential growth rate, author wise, subject wise Journal wise, Institution wise and key word wise and Geographical distribution of the literature and citation analysis is also noted.

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Keywords

Limnology, Scientometrics, Exponential Growth Rate, Citation, Geographical,Global

Electronic access

The journal is available at www.jalis.in
DOI: 10.5281/zenodo.7801711

Journal of Advances in Library and Information Science
ISSN: 2277-2219 Vol. 12. No.1. 2023. pp.39-47

0. INTRODUCTION

The literature on the subject has been growing rapidly over the past three decades. Scientometric is the study and measurement of the patterns of all forms of recorded information and their Producers. Scientometric studies have been found very useful in assisting us to understand some of the characteristic of information as mentioned above. The results of investigations of these studies have been found to be very useful to solve some of the practical problems of libraries and information centres. These studies have been proved to be very useful in planning the budget for resource development, organizing effective services, exploiting all possible information resources for the benefit of users and to accelerate their activities. Numerous Scientometric studies have been reported in the literature of library and information science; but most of them have focused their attention on the literatures of more or less stable fields of science and technology and social sciences, which are universal in scope. Recently, only a few studies have been conducted on the subject of regional nature and a very few on relatively new areas of research. The results of investigations reported for newly emerging disciplines in science and technology have been found very fascinating and prompted me to study the characteristics and dynamics of growth and development of another emerging research specialty of Limnology, hence this study.

1.STATEMENT OF THE PROBLEM

The present study aims at analysing theGlobal Perspective of Research Productivity in Limnology: A Scientometric Analysis'. It aims to examine the emergence of research areas, research groups and countries with a view to map the cognitive or intellectual structure of research. This study attempts to analyses the performance and evaluation of Limnology research output in terms of its content and coverage growth rates, source wise Areas of research concentration, author productivity, authorship Pattern, word frequency and language wise and citation analysis is also noted.

1. OBJECTIVES

2.

1. To find out growth of Publications
2. To find out highly preferred journals
3. To identify the most productive authors in Limnology research output
4. To find out country-wise distribution of publications

5. To study the most productive institutions in this field of research
6. To identify the keywords in Limnology Research Output
7. To find out the Funding agencies in Limnology Research area

3.METHODOLOGY

This study is conducted with a view to analyse the trend in the development of Limnology in Scientometrics. It is also focused to trace the past trends in the area of research output on Limnology in scientometric based on the sample data; the study evaluates the contribution of the Growth pattern and development of research productivity in Limnology in the last few decades. This study attempts to find research publication published Limnology research in Web of Science database.

3.1 COLLECTION OF DATA

For this particular study, the data is collected from the "Web of Science" database from 1989 to 2020 using the string word "Limnology" with topic field. Records related to the Limnology were retrieved from 1499 publications. The researcher has downloaded the bibliographical data in the form of notepad files. The data has analyzed and classified into Histcite software. Then the bibliographical details are converted to the form of MS –EXCEL format. Finally, the unique data are rearranged in MS – EXCEL format to eliminate duplication from the downloaded data and to analyses the scattering of research in different dimensions

4. DATA ANALYSIS AND INTERPRETATION

4.1 Profile of the study

This study reveals that publication productivity of the outcome of Limnology literature has obtained optimum level with 1499 publications from 402 scholarly journals that received 39337 global citations and 2081 local citations, which are contributed by 4537 numbers of authors who are affiliated to 1648 number of institutions functioning from 94 countries across the globe. The h-index for the Limnology research literature published in scholarly journals for the past 32 years is 85 with average citation as 27.26. The researcher carried out during the study period on "limnology publications" was cited 78541 times as the number of references.

Table 1: Profile of Limnology Publication Output for the period 1989 to 2020

S. No	Details about sample	Observed Value
1	Duration	1989-2020
2	Time Span	32 years
3	Total Publications	1499
4	Total No of Authors	4537
5	Total No of Journals	402
6	Contributing Countries	94
7	Contributing Institutions	1648
8	Total Cited Reference	78541
9	Total Local Citation Score	2081
10	Total Global Citation Score	39337
11.	H-index	85
12.	Average Citation	27.26

4.2 Growth of Publication

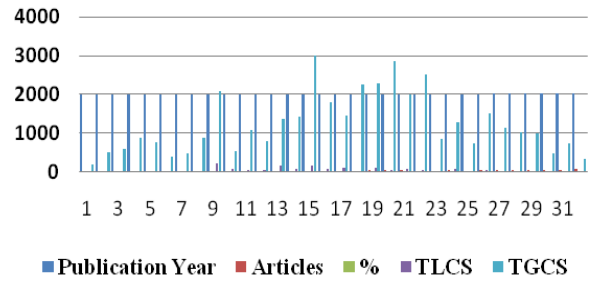
To analyse the year wise publication of research on Limnology, the data presented in table-2 shows that a total of 1499 publications were published between 1989 to 2020. The highest number of publications is 93 in 2020, with a Global Citation Score 341, followed by 78 article in 2019 with Global Citation Score 731 and 77 article in 2014 with Global Citation Score 1508. The lowest number of publications was 11 in 1989, with a Global Citation Score 205. It demonstrates that there is a healthy trend in citing references among global scientists who belong to the "Limnology" group.

Table 2: Year wise Distribution of Publications

S. No	Publication Year	Articles	%	TLCS	TGCS
1	1989	11	0.7	8	205
2	1990	15	1	44	512
3	1991	28	1.9	32	598
4	1992	27	1.8	48	891
5	1993	26	1.7	48	779
6	1994	35	2.3	50	406
7	1995	32	2.1	29	479
8	1996	27	1.8	48	886
9	1997	34	2.3	227	2076
10	1998	39	2.6	82	544
11	1999	31	2.1	51	1098
12	2000	31	2.1	59	808
13	2001	44	2.9	166	1362

14	2002	29	1.9	103	1423
15	2003	43	2.9	170	2989
16	2004	44	2.9	94	1786
17	2005	46	3.1	109	1468
18	2006	53	3.5	49	2255
19	2007	60	4	119	2288
20	2008	66	4.4	54	2843
21	2009	62	4.1	83	1995
22	2010	50	3.3	73	2510
23	2011	53	3.5	27	856
24	2012	54	3.6	84	1287
25	2013	51	3.4	31	742
26	2014	77	5.1	56	1508
27	2015	58	3.9	42	1155
28	2016	70	4.7	33	1016
29	2017	67	4.5	36	1011
30	2018	65	4.3	11	489
31	2019	78	5.2	15	731
32	2020	93	6.2	0	341
	Total	1499	99.8	2081	39337

Fig-1: Year-wise Distribution of Limnology Output



4.3 Exponential Growth Rate

The table-3 below reveals the Exponential Growth rate of overall publications on Limnology during the years. An exponential growth rate in number of publications was observed during 1989-2020. The highest growth rate (26) was found during 2014 with 77 publications. The lowest growth rate (-19) was found in the year of 2015 with 58 publications.

Table3: Exponential Growth Rate of Limnology Research Output

S. No	Publication Year	Publication	%	Exponential GrowthRate
1	1989	11	0.73	-
2	1990	15	1.00	4
3	1991	28	1.87	13
4	1992	27	1.80	-1
5	1993	26	1.73	-1
6	1994	35	2.33	9
7	1995	32	2.13	-3
8	1996	27	1.80	-5
9	1997	34	2.27	7
10	1998	39	2.60	5
11	1999	31	2.07	-8
12	2000	31	2.07	0
13	2001	44	2.94	13
14	2002	29	1.93	-15
15	2003	43	2.87	14
16	2004	44	2.94	1
17	2005	46	3.07	2
18	2006	53	3.54	7
19	2007	60	4.00	7
20	2008	66	4.40	6
21	2009	62	4.14	-4
22	2010	50	3.34	-12
23	2011	53	3.54	3
24	2012	54	3.60	1
25	2013	51	3.40	-3
26	2014	77	5.14	26
27	2015	58	3.87	-19
28	2016	70	4.67	12
29	2017	67	4.47	-3
30	2018	65	4.34	-2
31	2019	78	5.20	13
32	2020	93	6.20	15
			Mean	**2.64**

4.4 Document wise Distribution

A study of the data in table-4 shows the source wise distribution of research output in Limnology in over a thirty-two-year period from 1989 to 2020. Journal article that appeared in journals have shown a predominant contribution of 1241 and this source occupies the first position among various sources of publications in Limnology. The source of Article; Proceedings Paper ranked second in order 88 of total research output in Limnology during the analysis period. Review is ranked third order in 80 for total

output in "Limnology" research during the study period.

Table 4: Document wise Distribution of Publications

S. No	Document Type	Publications	%	TLCS	TGCS
1	Article	1241	82.8	1727	27715
2	Article; Proceedings Paper	88	5.9	188	3943
3	Review	80	5.3	133	7163
4	Editorial Material	64	4.3	25	361
5	Note	6	0.4	2	113
6	Biographical-Item	5	0.3	0	5
7	Book Review	5	0.3	0	0
8	Letter	3	0.2	4	11
9	Article; Early Access	2	0.1	0	10
10	Article; Data Paper	1	0.1	2	16
11	Correction	1	0.1	0	0
12	Correction, Addition	1	0.1	0	0
13	Meeting Abstract	1	0.1	0	0
14	News Item	1	0.1	0	0

4.5 Analysis the Ranking List of Journals and their Published Articles

The study discovered that the total research output of Limnology from 1989 to 2020 was published in 661 journals. Table-5 shows that the first 25 journals cover the majority of the research productivity (43.9%), which corresponds to the theory of Bradford's Law of journal scattering in research productivity. The top twenty journals accounted for 43.9% of research output. The journal "Hydrobiologia" ranked first with 146 publications and a Global Citation Score of 3884, followed by "Journal of Paleolimnology" has 41 publications with the Global Citation Score of 1641 and "Limnology and Oceanography" with 39 publications with the Global Citation Score of 2228 respectively. The "Hydrobiologia" has scored the highest Global Citation Score of 3884 with 146 publications out of twenty-five journals while "Bangladesh Journal of Botany" has scored a lowest Global Citation Score of 23 with 11 publications.

Table5: Distribution of ranking list of Journals and Published Articles

S. No	Journal	Article	%	TLCS	TGCS	TLCR
1	Hydrobiologia	146	9.7	404	3884	187
2	Journal of Paleolimnology	41	2.7	78	1641	72
3	Limnology and Oceanography	39	2.6	41	2228	40
4	Journal of Great Lakes Research	36	2.4	55	639	41
5	International Review of Hydrobiology	34	2.3	174	1024	92
6	Journal of Limnology	32	2.1	21	344	87
7	Revista De Biologia Tropical	29	1.9	22	261	15
8	Freshwater Biology	28	1.9	36	648	64
9	Science of the Total Environment	25	1.7	14	651	56
10	Aquatic Sciences	24	1.6	35	723	58
11	Archiv Fur Hydrobiologie	23	1.5	95	304	49
12	Brazilian Journal of Biology	20	1.3	12	394	9
13	Inland Waters	20	1.3	17	192	41
14	Ecological Modelling	18	1.2	12	379	16
15	Canadian Journal of Fisheries and Aquatic Sciences	17	1.1	170	813	45
16	Limnologica	17	1.1	21	174	12
17	Internationale Revue Der GesamtenHydrobiologie	14	0.9	7	80	1
18	Arctic Antarctic And Alpine Research	13	0.9	45	370	66
19	Environmental Monitoring and Assessment	13	0.9	2	132	9
20	Lake and Reservoir Management	13	0.9	26	229	27
Total		**602**	**40**	**1287**	**15110**	**987**

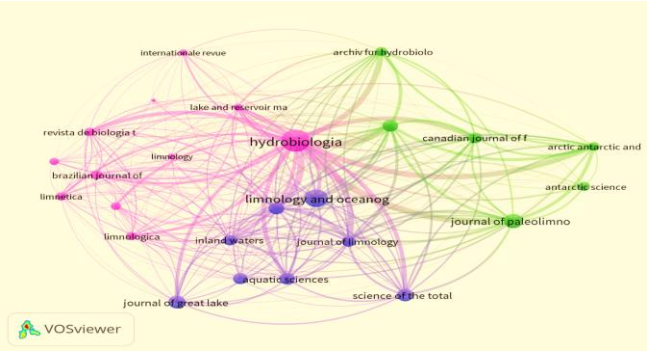


Fig-2: Network Visualization of Citation of Source in Journal

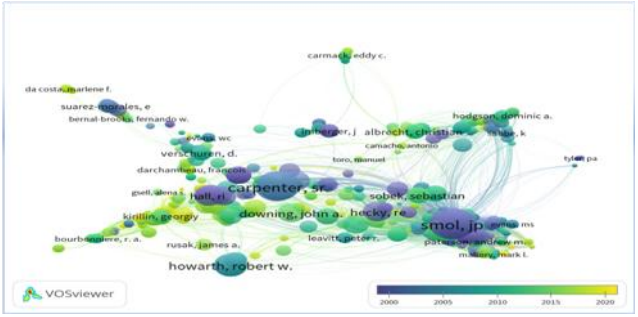


Fig-3: Overlay Visualization of Citation Per author

4.6 Author Collaboration

There were 4537 authors involved in the research on Limnology and published at least one publication. Among the author wise publication, multi authored documents has highest share with 1277 documents whereas single author shared publications 222 documents. "Smol JP" has 2742 global citation score with 64 publications, followed by "Douglas MSV" has 1614 global citation score with 32 publications and "Pientiz R" has 837 global citation score with 18 publications.

Table 6: Author wise Distribution of Publications

S. No	Author	Recs	%	TLCS	TGCS
1	Smol JP	64	4.3	727	2742
2	Douglas MSV	32	2.1	474	1614
3	Pienitz R	18	1.2	225	837
4	Vincent WF	14	0.9	49	627
5	Antoniades D	12	0.8	94	307
6	Blais JM	12	0.8	18	262
7	Hall RI	12	0.8	26	588
8	Michelutti N	11	0.7	111	321
9	Hutter K	10	0.7	16	135
10	Khondker M	10	0.7	7	23
11	Verschuren D	10	0.7	18	454
12	Vyverman W	10	0.7	26	219
13	Wolfe BB	10	0.7	18	232
14	Gajewski K	9	0.6	80	285
15	Hecky RE	9	0.6	61	618
16	Lean DRS	9	0.6	314	554
17	Verleyen E	9	0.6	20	197
18	Hansson LA	8	0.5	5	722
19	Hodgson DA	8	0.5	28	249
20	Jones JR	8	0.5	22	212

4.7 Single vs Multiple-Authored Research Output

Table-7 indicates the proportion of single author Vs Multi authored papers in research publication for the analysis during the study period on Limnology publications. It could be noted that out of the total 1499 publications, only (18.85%) of them single authored distribution and the rest (81.15%) of them are multi authored distribution on Limnology. Compared with the Single author works, multi authored contributions are superlatively high.

Table 7: Single vs Multiple Author Research output

Year	Single Authors			Multiple Authors			Total
	No. of output	%	Total No. of output	No. of output	%	Total No. of output	
1989	3	27.27		8	72.73		11
1990	9	60.00		6	40.00		15
1991	12	42.86		16	57.14		28
1992	10	37.04		17	62.96		27
1993	10	38.46		16	61.54		26
1994	11	31.43		24	68.57		35
1995	17	53.13		15	46.88		32
1996	10	37.04	130	17	62.96	**366**	27
1997	9	26.47	(28.34)	25	73.53	**(71.66)**	34
1998	7	17.95		32	82.05		39
1999	7	22.58		24	77.42		31
2000	2	6.45		29	93.55		31
2001	7	15.91		37	84.09		44
2002	0	0.00		29	100.00		29
2003	10	23.26		33	76.74		43
2004	6	13.64		38	86.36		44
2005	9	19.57		37	80.43		46
2006	10	18.87		43	81.13		53
2007	4	6.67	92	56	93.33	**911**	60
2008	5	7.58	(9.35)	61	92.42	**(90.65)**	66
2009	4	6.45		58	93.55		62

2010	6	12.00		44	88.00		50
2011	4	7.55		49	92.45		53
2012	6	11.11		48	88.89		54
2013	2	3.92		49	96.08		51
2014	9	11.69		68	88.31		77
2015	3	5.17		55	94.83		58
2016	7	10.00		63	90.00		70
2017	3	4.48		64	95.52		67
2018	4	6.15		61	93.85		65
2019	6	7.69		72	92.31		78
2020	10	10.75		83	89.25		93
	222	**18.85**	**222**	1277	**81.15**	1277	1499

4.8 Most Productive Institutions

Among the highly productive institutions, top twenty most productive institutions contributed on Limnology research and publishing 1648 papers with 39337 citations. Table-8 shows that the "Queens University" contributed the most papers (76), garnered 2547 citations, followed by "University of Wisconsin-Madison" (38) with 3044 citations and "United States Geological Survey" (38) with citations 1205. The highest impact of citations was register by Queens University, with only 76 records.

Table 8: Most Productive Institutions

Sl. No	Institution	publications	TGCS
1.	Queens University	76	2547
2.	University of Wisconsin-Madison	38	3044
3.	United States Geological Survey	38	1205
4.	Laval University	35	1403
5.	University of Toronto	34	1115
6.	Environment and Climate Change Canada	30	1178
7.	University of Ottawa	27	768
8.	University of Waterloo	26	801
9.	Russian Academy of Science	24	562
10.	Ghent University	22	635
11.	University of Helsinki	20	763
12.	University of Alberta	19	654
13.	National Autonomous University of Mexico	19	414
14.	Leibniz Institute for Freshwater Ecology and Inland Fisheries(IGB)	18	986
15.	York University	17	439
16.	Chinese Academy of Science	16	548
17.	University of California, Davis	16	633
18.	University of Minnesota	16	516
19.	Uppsala University	16	723
20.	The University of British Columbia	14	358

4.9 Subject Wise Distribution of Publications

The subject wise productivity of Limnology research during the period under study is given in the table-9. The subject wise grouping of research papers published during the years 1989-2020 by researchers in the field of Limnology is shown in table-9. The analysis of data could find that majority of multidisciplinary and interdisciplinary areas of research on Limnology have been carried out across the globe. The analysis shows that a majority of the research contribution for the study period is on "Marine Freshwater Biology" with486 (4.86%) publications, with is followed by Web of Science subject categories of "Environmental Sciences" with 372 (3.72%) publications, 'Limnology' with 343 (3.43%), Ecology with 224 (2.24%) publications and followed by the other subjects.

Table 9: Subject Wise Distribution of Research Output

S.No	Subject	No. of.	Percentage
1	Marine Freshwater Biology	486	4.86
2	Environmental Sciences	372	3.72
3	Limnology	343	3.43
4	Ecology	224	2.24
5	Geosciences Multidisciplinary	176	1.76
6	Water Resources	145	1.45
7	Oceanography	120	1.2
8	Geography Physical	94	0.94
9	Biology	74	0.74
10	Fisheries	57	0.57
11	Plant Sciences	51	0.51
12	Multidisciplinary Sciences	43	0.43
13	Engineering Environmental	41	0.41
14	Biodiversity Conservation	37	0.37
15	Geochemistry Geophysics	33	0.33
16	Meteorology Atmospheric	32	0.32

	Sciences		
17	Zoology	32	0.32
18	Evolutionary Biology	15	0.15
19	Microbiology	13	0.13
20	Computer Science Interdisciplinary Applications	12	0.12

4.10 Country wise Distribution of Publications

The study of the country wise distribution of research output is an important feature in highlighting the importance of research and development in any discipline of science. In this context, analysing scientist's performance is quite obvious in order to reflect their achievements in attracting the attention of researchers/scientists in the form of published research articles in journals from various countries. The United States has the most collaboration records with 395, followed by Canada with 280 and Germany with 120.

Table 10: Country Scientific production

S.No	Country	Recs	%	TLCS	TGCS
1	USA	395	26.4	424	15371
2	Canada	280	18.7	1140	9463
3	Germany	120	8	161	3520
4	Brazil	105	7	38	1608
5	UK	86	5.7	116	2862
6	Australia	73	4.9	122	1903
7	Spain	68	4.5	64	1564
8	Sweden	48	3.2	57	2034
9	Switzerland	46	3.1	25	1759
10	Belgium	44	2.9	65	1191
11	India	42	2.8	6	443
12	Italy	42	2.8	26	1055
13	Mexico	39	2.6	25	680
14	Netherlands	39	2.6	42	3216
15	Peoples R China	37	2.5	12	1768
16	Russia	35	2.3	54	929
17	France	32	2.1	10	740
18	Finland	30	2	73	962
19	Argentina	29	1.9	11	877
20	Norway	27	1.8	32	1065

4.12 Funding Agencies on Limnology Research Output

The table-12 below indicates top 20 funding agencies sponsored with publications on Limnology. The analyses evidences that the top 20 funding agencies sponsored 517(26%) number of publications across the globe there are also top 20 funding agencies sponsored publications 10 above on Limnology research, while there are 6 funding agencies that had sponsored more than 30 Limnology publications. The top three funding agencies during the study period which contributed highest number of publications are National Science Foundation (NSF) (88), Natural Sciences And Engineering Research Council of Canada (NSERC)(80) and UK Research Innovation (UKRI)(30).

Table 12: Funding Agencies on Limnology Research Output

Sl.No	Funding Agencies	Publication
1.	National Science Foundation NSF	88
2.	Natural Sciences And Engineering Research Council of Canada NSERC	80
3.	Uk Research Innovation UKRI	38
4.	Natural Environment Research Council NERC	37
5.	National Council for Scientific and Technological Development	32
6.	European Commission	30
7.	German Research Foundation DFG	25
8.	CGIAR	23
9.	National Natural Science Foundation Of China NSFC	21
10.	Fundacao De Amparo A Pesquisa Do Estado De Sao Paulo FAPESP	20
11.	Spanish Government	18
12.	NSF Directorate For Geosciences	17
13.	NSF Directorate For Biological Sciences	15
14.	Coordination Foundation for the Improvement of Higher Education Personnel (CAPES)	14
15.	Natural Resources Canada	14
16.	Northern Scientific Training Program	11
17.	Research Foundation – Flanders Fwo	9
18.	Polar Continental Shelf Program	9
19.	Belgian Federal Science Policy Office	8
20.	Canada Research Chairs	8
Total		**517**

4.14 Documentation of Keywords Appeared in the Publication

The table-14 below indicates the top twenty keywords that occupies Limnology Research. The important word called "key word" are one of the best indicators to understand and grasp instantaneously the though content of the papers, methodologies used and areas of research addressed. The high frequency keywords are "Lake" which is topped with 435 publications and first rank of the frequency. The next word that follows is "Lakes" with 316 publications and second rank of the frequency and the next word "Limnology" with 302 publications with third rank of frequency.

Table 14: Words wise Distribution

S. No	Word	Recs	%	TLCS	TGCS
1	Lake	435	29	546	8672
2	Lakes	316	21.1	977	9586
3	Limnology	302	20.1	793	5148
4	Water	167	11.1	84	2221
5	Limnological	99	6.6	283	2092
6	Arctic	94	6.3	727	3565
7	Reservoir	93	6.2	44	932
8	High	92	6.1	465	2483
9	Phytoplankton	81	5.4	62	1732
10	Tropical	79	5.3	67	1683
11	Environmental	72	4.8	126	2659
12	River	72	4.8	53	1249
13	Freshwater	70	4.7	97	3361
14	Canada	65	4.3	416	2029
15	Chemical	64	4.3	428	1381
16	Aquatic	62	4.1	44	1757
17	Quality	60	4	13	951
18	Climate	56	3.7	110	2488
19	Dynamics	55	3.7	51	731
20	Physical	53	3.5	460	1504

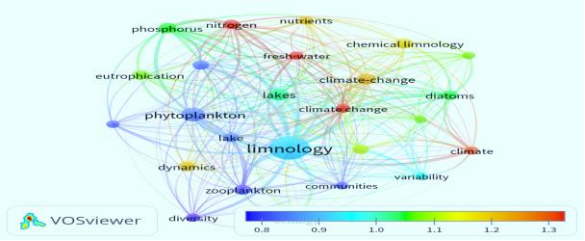


Fig-4: Overlay Visualization of Co-occurrence with Keyword

5.Major Findings

Based on the analysis undertaken the present study, the following findings are drawn.

1. The finding of growth of publication of Limnology research output brings out the research paper published trend in increasing trend. The overall study period the highest percentage publication published in 2020.
2. The highest growth rate (26) was found during 2014 with 77 publications. The lowest growth rate (-19) was found in the year of 2015 with 58 publications.
3. The finding of Document wise publication of research output in Limnology examines the following facts. The journal article form of research output in Limnology in Scientometrics occupies the first in order Article, Proceedings Paper from the second, Review the third, Editorial Material the fourth, Note the fifth place.
4. The journal "Hydrobiologia" ranked first with 146 publications and a Global Citation Score of 3884, followed by "Journal of Paleolimnology" has 41 publications with the Global Citation Score of 1641 and "Limnology and Oceanography" with 39 publications with the Global Citation Score of 2228 respectively.
5. The Author "Smol JP" has 2742 global citation score with 64 publications, followed by "Douglas MSV" has 1614 global citation score with 32 publications and "Pientiz R" has 837 global citation score with 18 publications.
6. The findings the authorship pattern of research publication in Limnology, Single author publication contribution is less and followed in multi author contribution are highly.
7. Top twenty most productive institutions contributed on Limnology research and publishing 1648 papers with 39337 citations. The "Queens University" contributed the most papers (76), garnered 2547 citations, followed by "University of Wisconsin-Madison" (38) with 3044 citations and "united States Geological Survey" (38) with citations 1205.
8. The analysis shows that a majority of the research contribution for the study period is on "Marine Freshwater Biology" with486 (4.86%) publications, with is followed by Web of Science subject categories of "Environmental Sciences" with 372 (3.72%) publications and followed by the other subjects.
9. The United States has the most collaboration records with 395, followed by Canada with 280 and Germany with 120.
10. The top three funding agencies during the study period which contributed highest number of publications are National Science Foundation NSF (88), Natural Sciences and Engineering

Research Council of Canada NSERC (80) and UK Research Innovation UKRI(30).

11. The English language is dominated with the stake of 1442 records of the total Limnology literature, which followed by Spanish (29 records), Portuguese (15 records), German (7 records), French (5 records) and Malay with stake of 1records
12. The high frequency keywords are "Lake" which is topped with 435 publications and first rank of the frequency. The next word that follows is "Lakes" with 316 publications and second rank of the frequency and the next word "Limnology" with 302 publications with third rank of frequency.

6. CONCLUSION

This study has highlighted quantitatively the contributions made by the scientists during 1989-2020 as reflected in Web of Science database. During 32years' period (1989 –2020) global contributions in terms of number of publications is significant. Though the records available in the Web of Science database reveal a small number, it is important that the Web of Science covers only the Impact factor journals. If a broader coverage database is available, it may provide a reasonable number of papers. Researcher suggest for tracking citation record of papers so that the impact of publications in Limnology may be visible.

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