STM JOURNALS

Authorship Patterns in Biodiversity Literature: A Scientometric Analysis

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Abstract

The study presents the authorship patterns in the field of Biodiversity Literature based on the publications indexed in the Web of Science Core Collection during the period from 1989 to 2016. Overall total 154654 records were retrieved. BibExcel toolbox and MS-Excel spreadsheet were used to analyze the data. Findings of the analysis revealed that the single author papers have declining trend and there by collective contributions have an increasing performance in scientific research activities. It is found that the degree of collaboration is an increasing and decreasing trend. The collaborative index for universal level value of 4.50 show popularity towards collaborative research pattern than single research in biodiversity literature. The Gaston KJ Published 257 papers with 83.863 fractional numbers an average of 0.33 got first position.

Keyword: *Authorship pattern, scientometric, bibliometrics, degree of collaboration, growth study*

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INTRODUCTION

Biodiversity is essential to global food security and nutrition. It serves as a safety-net to poor households during times of crisis. Increased diversity of genes within species, e.g., as represented by livestock breeds or strains of plants, reduces risk from diseases and increases potential to adapt to changing climates. More than 70,000 plant species are used in traditional and modern medicine. Any human activity that diminishes this biodiversity could therefore impoverish our own quality of life, reduce the resources available to us and ultimately jeopardize the survival of our descendants. Biodiversity loss has negative effects on our health and it largely limits our freedom of choice. As all cultures gain inspiration from or attach spiritual and religious values to ecosystems or their components, e.g., landscapes, trees, hills, rivers or particular species biodiversity loss also strongly influences our social relations.

In recent years, an increasing number of studies have focused on the importance of biodiversity in regulating the balanced lifestyles for us as well as generations to come. Hence the study of literature in the field of biodiversity and its scientific output, and its analysis and mapping will definitely help the information scientists as well as scientific community.

REVIEW OF LITERATURE

Biradar and Tadasad (2016) analyzed the trend in the authorship pattern and collaborative research in the subject of economics [1]. The research indicates that multi-authors are doing better than single authors. Ali and Kumari (2015) studied the biodiversity research output carried out during 2003–12 on different parameters [2] including share and citation impact, international collaborative papers, contribution of various subject fields, productivity and citation profile of top Indian institutions and authors. Ashok and Dalve (2016) studied the authorship pattern trend and collaborative research of Emergency Medicine Journal [3]. The results show that collaborative research was increased during the study periods. Navaneethakrishnan (2014) studied the authorship pattern in humanities and social science in Sri Lanka for the year of 1960–2012 [4]. The results show that single authored research work is relatively less compared to multi authored research publications. Abdullah

and Vaishali (2014) conducted the study on authorship trend in cloud computing research [5]. It identified mail domain used by authors and the rank of journals in cloud computing research publications. Velmurugan (2013) analyzed the collaborative authorship pattern of Library and information studies journal [6]. The results show that the multi-authors are contributing more than the single authors. Khaparde and Pawar (2013) explained the authorship pattern and research collaboration in field of information technology [7]. The contributions of multi-authorship are higher since past a decade over the single authorship in the scientific research in the field of information technology. Amsaveni et al. (2013) analyzed the authorship collaboration in all branches of science and technology for the present century [8]. The finding shows that two authors collaboration contributed more than single authorship research articles.

OBJECTIVES OF THE STUDY
- To examine the growth of biodiversity literature published during the period 1989–2016.
- To identify the most prolific contributors in the field of biodiversity literature.
- To examine the nature of authorship pattern in the biodiversity literature.
- To study the single: multi-authored papers and determine the degree of collaboration.
- To analyze author productivity.
- To know author wise fractional count on papers during the study periods.

METHODOLOGY
The data required for the investigation was downloaded from the Web of Science Core Collection database is a licensed fee-based database subscribed by the University of Mysore, Mysuru, was used for retrieving the data on Biodiversity literature for the period of twenty-eight years, i.e., from 1989 to 2016. The data augmented by using the seven search key terms, including "biodiversity", "biological diversity", "bio-diversity", "genetic diversity", "ecosystem diversity", "species diversity" and ''landscape diversity''. The time period considered in this study from 1989 to 2016. The data obtained finally resulted as of May 2017, a total of 1,54,654 publications were published during the period 1989–2016.

DATA ANALYSIS AND INTERPRETATION
Year-wise Distribution of Publications
Year-wise distribution of publications of biodiversity literature during the period 1989–2016 found that during this period of 28 years, a total of 1,54,654 publications were published in this field. The highest number of papers, i.e., 15,069 (9.74%) were published in 2015 and the lowest number of papers were found in 1989 with a percentage of 0.05. The average number of publications per year is 5523.36. The analysis of year wise research output shows till 2015 there an increasing trend in the publications and only in 2016 there is decrease in number of publications (Table 1).

Ranked List of Most Prolific Contributor
Table 2 shows the most prolific contributor in the field of biodiversity literature. Among the authors Gastone, KJ gets the first rank with 257 (0.17%) publications. The second rank goes to Possingham, HP with 249 (0.16%). The third rank goes to Li, Y with 238 (0.15%). The fourth rank goes to Zhang, Y with 227 (0.15%), followed by Wang, Y with 225 (0.15%), Tscharntke, T with 213 (0.14%) and the other ranks have been given in detail in Table 2.

Distribution of Authorship Pattern
Table 3 shows the authorship pattern of 1,54,654 publications over the study period. It could be noted that the three-authored papers rank first in order with 28,316 publications. The year wise analysis shows that the performance of three authored papers is better in almost all the years except in 2014 and 2015. The two-authored paper follows the second in order with 26,970 of the total contributions. The year-wise analysis reveals that the two-authored contributions have shown a considerable trend in 2011 and 2013 to 2006. The four author contributions take the third in order with 24,923 of the total publication. The five author contributions take the fourth in order with 18,654 of the total publication. The single author contributions take the fifth in order with 15,884 of the total publication during the study period. And the six author contributions with 13,034 publications, the seven author contributions with 8,538 publications, the eight author contributions

with 5,620 publications, the nine author contributions with 3,584 publications, the ten author contributions with 2,510 publications and above ten author contributions with 6,621 publications over the study period. It could be deducted from the above discussion the scientists intended to take collaborative participation in research activities. It has been proved from the analysis that single author papers have declining trend and there by collective contributions have an increasing performance in scientific research activities.

Table 1: Year-Wise Distribution of Publications.

S.N.	Years	Total Number of Publications	Cumulative Total Number of Publications	Percentage	Cumulative Percentage
1	1989	80	80	0.05	0.05
2	1990	140	220	0.09	0.14
3	1991	495	715	0.32	0.46
4	1992	732	1447	0.47	0.94
5	1993	813	2260	0.53	1.46
6	1994	1,078	3338	0.70	2.16
7	1995	1,326	4664	0.86	3.02
8	1996	1,504	6168	0.97	3.99
9	1997	1,727	7895	1.12	5.10
10	1998	2,088	9983	1.35	6.46
11	1999	2,308	12291	1.49	7.95
12	2000	2,640	14931	1.71	9.65
13	2001	2,980	17911	1.93	11.58
14	2002	3,330	21241	2.15	13.73
15	2003	3,916	25157	2.53	16.27
16	2004	4,319	29476	2.79	19.06
17	2005	5,231	34707	3.38	22.44
18	2006	5,878	40585	3.80	26.24
19	2007	6,899	47484	4.46	30.70
20	2008	7,910	55394	5.11	35.82
21	2009	8,775	64169	5.67	41.49
22	2010	9,971	74140	6.45	47.94
23	2011	11,308	85448	7.31	55.25
24	2012	12,172	97620	7.87	63.12
25	2013	13,192	110812	8.53	71.65
26	2014	14,101	124913	9.12	80.77
27	2015	15,069	139982	9.74	90.51
28	2016	14,672	154654	9.49	100.00
Total		1,54,654		100.00	

Table 2: Ranked list of Most Prolific Contributor.

S.N.	Name of Author	Total Number of Contribution	Percentage (n = 1,54,654)
1	Gaston, KJ	257	0.17
2	Possingham, HP	249	0.16
3	Li, Y	238	0.15
4	Zhang, Y	227	0.15
5	Wang, Y	225	0.15
6	Tscharntke, T	213	0.14
7	Lindenmayer, DB	210	0.14
8	Li, J	188	0.12
9	Wang, J	185	0.12
10	Liu, Y	171	0.11

*Total no of contributor 2,74,232

Table 3: *Distribution of Authorship Pattern.*

Periods	No. of authors											Grand Total
	Single	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten	Above Ten	
1989	28	24	13	7	1	3	--	1	1	2	0	80
1990	59	33	28	9	6	2	3	--	--	--	0	140
1991	157	167	90	39	18	12	3	4	1	--	4	495
1992	300	195	116	58	43	6	6	2	2	--	4	732
1993	299	210	150	81	40	15	7	5	--	1	5	813
1994	359	297	197	112	57	26	17	2	3	1	7	1,078
1995	427	337	237	144	82	42	23	12	9	5	8	1,326
1996	479	413	279	146	85	32	31	13	10	4	12	1,504
1997	455	448	323	232	125	50	34	13	15	9	23	1,727
1998	545	560	354	271	146	77	44	33	19	13	26	2,088
1999	535	618	450	268	188	89	55	41	18	18	28	2,308
2000	517	656	554	385	203	109	70	48	42	12	44	2,640
2001	584	772	535	452	244	129	92	65	28	24	55	2,980
2002	592	801	700	481	254	190	105	64	48	38	57	3,330
2003	680	854	837	557	360	226	126	94	51	37	94	3,916
2004	572	1,016	850	702	419	275	181	90	61	46	107	4,319
2005	719	1,108	1,096	802	578	369	206	118	69	55	111	5,231
2006	645	1,230	1,190	1,002	655	438	235	141	93	71	178	5,878
2007	753	1,377	1,367	1,135	868	496	305	197	118	73	210	6,899
2008	808	1,489	1,564	1,289	930	647	395	265	164	108	251	7,910
2009	803	1,563	1,750	1,471	1,076	745	471	281	178	134	303	8,775
2010	914	1,687	1,823	1,699	1,267	853	573	361	242	165	387	9,971
2011	858	1,817	2,015	1,970	1,483	1,085	673	443	263	163	538	11,308
2012	791	1,798	2,229	2,120	1,657	1,145	763	516	310	235	608	12,172
2013	780	1,874	2,396	2,199	1,825	1,305	872	593	364	265	719	13,192
2014	769	1,903	2,431	2,446	1,927	1,419	990	677	447	308	784	14,101
2015	785	1,954	2,431	2,534	2,098	1,636	1,110	732	482	339	968	15,069
2016	671	1,769	2,311	2,312	2,019	1,613	1,148	809	546	384	1090	14,672
Grand Total	15,884	26,970	28,316	24,923	18,654	13,034	8,538	5,620	3,584	2,510	6,621	**1,54,654**

Table 4: *Block Year versus Co-Authorship Index (CAI)*

No. of authors	Block Periods				Grand Total
	1989–1995	1996–2002	2003–2009	2010–2016	
Single	340.07	217.73	112.95	59.91	15,884
Two	155.28	147.64	115.37	81.13	26,970
Three	97.31	105.27	110.10	94.38	28,316
Four	59.87	83.66	100.58	104.79	24,923
Five	43.91	62.27	94.36	112.48	18,654
Six	26.97	48.39	88.34	118.75	13,034
Seven	22.91	47.10	80.97	122.69	8538
Eight	15.34	45.98	76.03	125.63	5620
Nine	14.80	46.86	73.78	126.57	3584
Ten	11.89	43.86	75.21	126.59	2510
Above Ten	14.02	34.52	68.23	131.50	6621
Total	100	100	100	100	1,54,654

Co-Authorship Pattern

The formula stated by Garg and Padhi (2001) [9] for co-authorship pattern, and co-authorship index (CAI) has been employed. The CAI thus calculated for block year wise authorship pattern has been shown in Tables 4 and 5. CAI=100 implies that a country's co-authorship effort for a particular type of authorship corresponds to the world average, CAI>100 reflects higher than average co-authorship effort, and CAI<100 reflects lower than average co-authorship effort by that country for a given type of authorship pattern.

Block Year versus Co-Authorship

For the purpose of the analysis authorship pattern for 28 years are grouped in to four different blocks. The details of block year versus co-authorship are presented in the Table 5.

Tables 4 and 5 reveal the co-authorship effort which is identified from CAI of world biodiversity literature during 1989 to 2016. In first block (1989–1995), CAI is more than 100 for single and two authors, it reflects higher than average co-authorship effort; from three to above ten CAI is less than 100 it reflects lower than average co-authorship effort. In this case, it is inference that an increase in authors there is a decrease in CAI. In second block (1996–2002) CAI is more than 100 for single, two and three authors, it reflects higher than average co-authorship effort; from four to above ten CAI is less than 100 it reflects lower than average co-authorship effort. In this case it is inference that an increase in authors there is a decrease in CAI. In third block (2003–2009) CAI is more than 100 for single, two, three and four authors, it reflects higher than average co-authorship effort; from five to above ten CAI are less than 100 it reflects lower than average co-authorship effort. In this case it is inference that an increase in authors there is a decrease in CAI. In fourth block (2010–2016), single, two and three author CAI is less than 100 it reflects lower than average co-authorship effort, and from four to above ten CAI are more than 100 it reflects higher than average co-authorship effort. It is inference that higher the authorship patterns higher the CAI.

Degree of Collaboration

Multiple authorship of paper is used to measure the extent of research collaboration in research. The formula of Subramanyam helps to determine the degree of collaborations and the ratio of the number of collaborative research papers to the total number of research papers in the discipline during a certain period of time.

Table 5: Block Year versus Co-authorship.

No. of authors	Block Periods				Grand Total
	1989–1995	1996–2002	2003–2009	2010–2016	
Single	++	++	++	--	15,884
Two	++	++	++	--	26,970
Three	--	++	++	--	28,316
Four	--	--	++	++	24,923
Five	--	--	--	++	18,654
Six	--	--	--	++	13,034
Seven	--	--	--	++	8,538
Eight	--	--	--	++	5,620
Nine	--	--	--	++	3,584
Ten	--	--	--	++	2,510
Above Ten	--	--	--	++	6,621
Total	100	100	100	100	1,54,654

++CAI>100 reflects higher than average co-authorship effort
-- CAI<100 reflects lower than average co-authorship effort

Table 6: *Single versus Multi-Authored and Degree of Collaboration (Annual Distribution of Degree of Collaboration in Authorship).*

Period	Single Author (Ns)		Multi Author (Nm)		Total	Degree of Collaboration
	No. of Publication	Percentage	No. of Publication	Percentage		
1989	28	0.18	52	0.037	80	0.65
1990	59	0.38	81	0.058	140	0.58
1991	157	1.02	338	0.243	495	0.68
1992	300	1.94	432	0.310	732	0.59
1993	299	1.94	514	0.369	813	0.63
1994	359	2.32	719	0.517	1,078	0.67
1995	427	2.76	899	0.646	1,326	0.68
1996	479	3.10	1,025	0.736	1,504	0.68
1997	455	2.95	1,272	0.914	1,727	0.74
1998	545	3.53	1,543	1.108	2,088	0.74
1999	535	3.46	1773	1.274	2,308	0.77
2000	517	3.35	2,123	1.525	2,640	0.80
2001	584	3.78	2,396	1.721	2,980	0.80
2002	592	3.83	2,738	1.967	3,330	0.82
2003	680	4.40	3,236	2.325	3,916	0.83
2004	572	3.70	3,747	2.692	4,319	0.87
2005	719	4.65	4,512	3.241	5,231	0.86
2006	645	4.18	5,233	3.759	5,878	0.89
2007	753	4.87	6,146	4.415	6,899	0.89
2008	808	5.23	7,102	5.102	7,910	0.90
2009	803	5.20	7,972	5.727	8,775	0.91
2010	914	5.92	9,057	6.506	9,971	0.91
2011	858	5.55	10,450	7.507	11,308	0.92
2012	791	5.12	11,381	8.176	12,172	0.94
2013	780	5.05	12,412	8.916	13,192	0.94
2014	769	4.98	13,332	9.577	14,101	0.95
2015	785	5.08	14,284	10.261	15,069	0.95
2016	671	4.34	14,001	10.058	14,672	0.95
	15448	100	1,39,206	100	1,54,654	0.90

The annual distribution of degree of collaboration is presented in Table 6. It is identified that there is an increasing and decreasing trend in the degree of collaboration, i.e. 0.65 in 1989 to 0.95 in 2016. The average degree of collaboration is 0.90. Degree of collaboration is low in the year 1990 and degree of collaboration is high in the year 2016, when single authorship productivity is 4.34% and multiple authorship productivity is 10.05%.

Author Productivity
The analysis carried out to identify the author productivity of biodiversity literature during the assessment years. It could be deduced from Table 7 discussion that when the number of published paper increases, the number of contributed author's decreases. More number of publications by scientists in any field requires high degree of inquisitiveness, efficiency, competencies and exposure to literatures. It is noteworthy that from one paper contributions constitute 1,65,411 (60.32%) of the total contributions. Followed by two papers contributions constitute 45,051 (16.43%) of the total contributions, three papers contribution constitute 20,503 (7.48%) of the total contributions, four papers

contributions constitute 11,734 (4.28%) of the total contributions, five papers contributions constitute 7,272 (2.65%) of the total contributions, the six papers contributions constitute 5,048 (1.84%) of the total contributions, seven papers contributions constitute 5,048 (1.32%) of the total contributions and The remaining constitute the less percent of 1% of the total contributions.

Table 7: *Author Productivity.*

S. N.	No. of Publications	No. of Author	Cumulative No of Author	Percentage	Cumulative Percentage
1	1	1,65,411	1,65,411	60.32	60.32
2	2	45,051	2,10,462	16.43	76.75
3	3	20,503	2,30,965	7.48	84.22
4	4	11,734	2,42,699	4.28	88.50
5	5	7,272	2,49,971	2.65	91.15
6	6	5,048	2,55,019	1.84	92.99
7	7	3,615	2,58,634	1.32	94.31
8	8	2,724	2,61,358	0.99	95.31
9	9	2,094	2,63,452	0.76	96.07
10	10	1,613	2,65,065	0.59	96.66
11	11	1,294	2,66,359	0.47	97.13
12	12	1,062	2,67,421	0.39	97.52
13	13	857	2,68,278	0.31	97.83
14	14	725	2,69,003	0.26	98.09
15	15	633	2,69,636	0.23	98.32
16	16	489	2,70,125	0.18	98.50
17	17	417	2,70,542	0.15	98.65
18	18	388	2,70,930	0.14	98.80
19	19	318	2,71,248	0.12	98.91
20	20	286	2,71,534	0.10	99.02
21	21	236	2,71,770	0.09	99.10
22	22	258	2,72,028	0.09	99.20
23	23	219	2,72,247	0.08	99.28
24	24	170	2,72,417	0.06	99.34
25	25	152	2,72,569	0.06	99.39
26	26	141	2,72,710	0.05	99.44
27	27	120	2,72,830	0.04	99.49
28	28	128	2,72,958	0.05	99.54
29	29	108	2,73,066	0.04	99.57
30	30	90	2,73,156	0.03	99.61
31	31	70	2,73,226	0.03	99.63
32	32	68	2,73,294	0.02	99.66
33	33	84	2,73,378	0.03	99.69
34	34	51	2,73,429	0.02	99.71
35	35	54	2,73,483	0.02	99.73
36	36	56	2,73,539	0.02	99.75
37	37	39	2,73,578	0.01	99.76
38	38	50	2,73,628	0.02	99.78
39	39	35	2,73,663	0.01	99.79
40	40	31	2,73,694	0.01	99.80
41	40>257	543	2,74,237	0.20	100.00
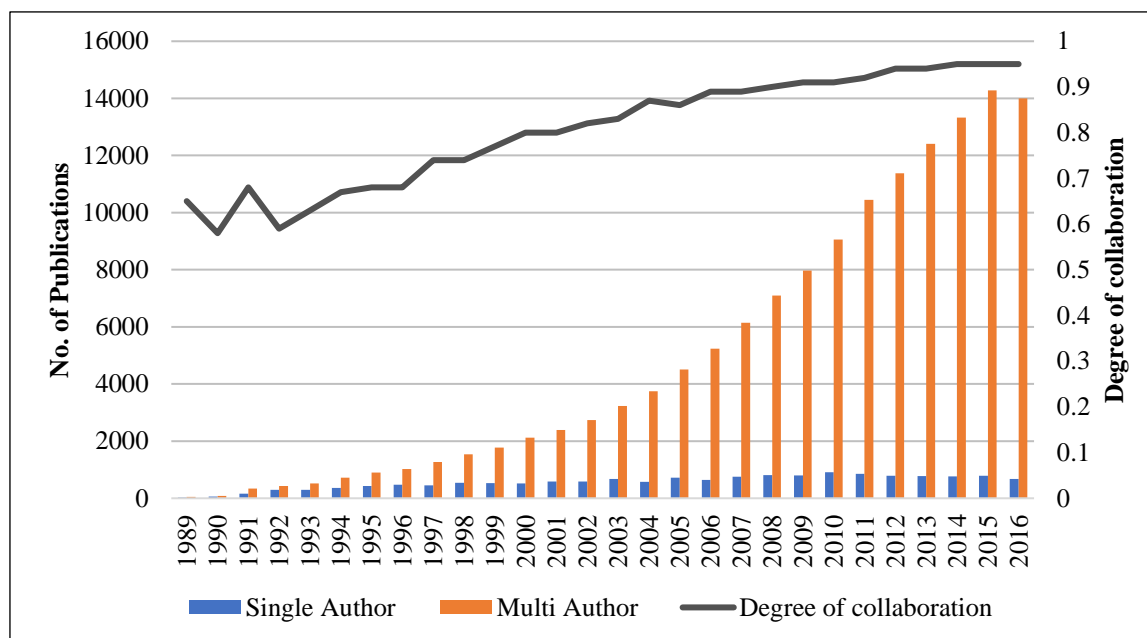
Fig. 1: *Degree of Collaboration.*

Table 8: *Collaborative Index.*

S. N.	Year	No. of Papers	No. of Authors	Collaborative Index
1	1989	80	203	2.54
2	1990	140	308	2.20
3	1991	495	1,199	2.42
4	1992	732	1,646	2.25
5	1993	813	1,942	2.39
6	1994	1,078	2,704	2.51
7	1995	1,326	3,548	2.68
8	1996	1,504	3,975	2.64
9	1997	1,727	5,059	2.93
10	1998	2,088	6,220	2.98
11	1999	2,308	7,156	3.10
12	2000	2,640	8,745	3.31
13	2001	2,980	10,059	3.38
14	2002	3,330	11,433	3.43
15	2003	3,916	14,263	3.64
16	2004	4,319	16,221	3.76
17	2005	5,231	19,923	3.81
18	2006	5,878	23,741	4.04
19	2007	6,899	28,345	4.11
20	2008	7,910	33,686	4.26
21	2009	8,775	38,093	4.34
22	2010	9,971	45,049	4.52
23	2011	11,308	53,478	4.73
24	2012	12,172	59,586	4.90
25	2013	13,192	66,091	5.01
26	2014	14,101	72,304	5.13
27	2015	15,069	80,288	5.33
28	2016	14,672	81,379	5.55
Total		1,54,654	6,96,644	4.50

Collaborative Index

Table 8 reveals that the Collaborative Index (CI) values, it can be obtained by the total number of authors divided by the total number of published articles. Collaborative index = total number of authors/total number of articles, where, CI = the number of authors per paper.

The following results were, the below mentioned year productivity were earned the collaborative index value is between two and three; such that, 1989 has collaborative index value is 2.54; 1990 has collaborative index value is 2.20; 1991 has collaborative index value is 2.42; 1992 has collaborative index value is 2.25; 1993 has collaborative index value is 2.39; 1994 has collaborative index value is 2.51; 1995 has collaborative index value is 2.68; 1996 has collaborative index value is 2.64; 1997 has collaborative index value is 2.93 and the year of 1998 has collaborative index value is 2.98 respectively. The below mentioned year productivity were earned the collaborative index value is between three and four; 1999 has collaborative index value is 3.10; 2000 has collaborative index value is 3.31; 2001 has collaborative index value is 3.38; 2002 has collaborative index value is 3.43; 2003 has collaborative index value is 3.64; 2004 has collaborative index value is 3.76; and the year of 2005 has collaborative index value is 3.81 respectively. The below mentioned year productivity were

earned the collaborative index value is been between 4 and 5; 2006 has collaborative index value is 4.04; 2007 has collaborative index value is 4.11; 2008 has collaborative index value is 4.26; 2009 has collaborative index value is 4.34; 2010 has collaborative index value is 4.52; 2011 has collaborative index value is 4.73 and 2012 has collaborative index value is 4.90 respectively. The below mentioned year productivity were earned the collaborative index value is been between 5 and 6; 2013 has collaborative index value is 5.01; 2014 has collaborative index value is 5.13; 2015 has collaborative index value is 5.33 and 2016 has collaborative index value is 5.55 respectively. Result from the Table 8 shows authorship pattern and collaborative measures. The collaborative Index for universal level value is 4.50 which show popularity towards collaborative research pattern than single research in biodiversity literature.

Fractional Counting on Papers

Fractional counts are based on full counting of papers, as opposed to fractional counting sometimes used in bibliometric fractional count where each author is credited with 1/n in an n-authored publication. Figure 3 shows the author wise fractional count on papers during the study periods. The Gaston KJ Published 257 papers with 83.863 fractional number an average of 0.33 got first position, Lindenmayer, DB published 210 papers with
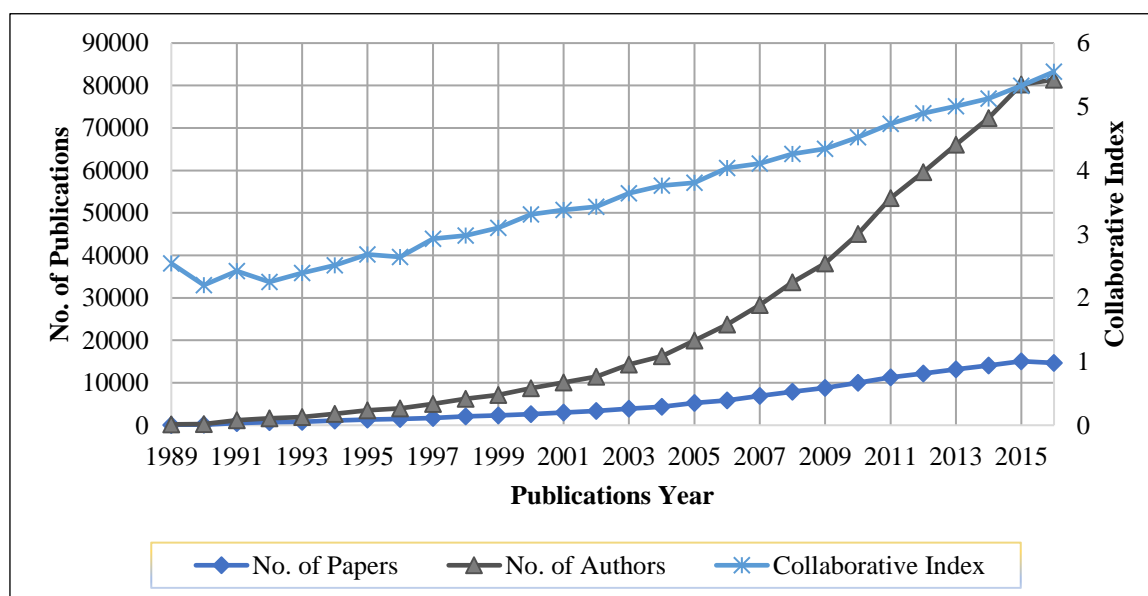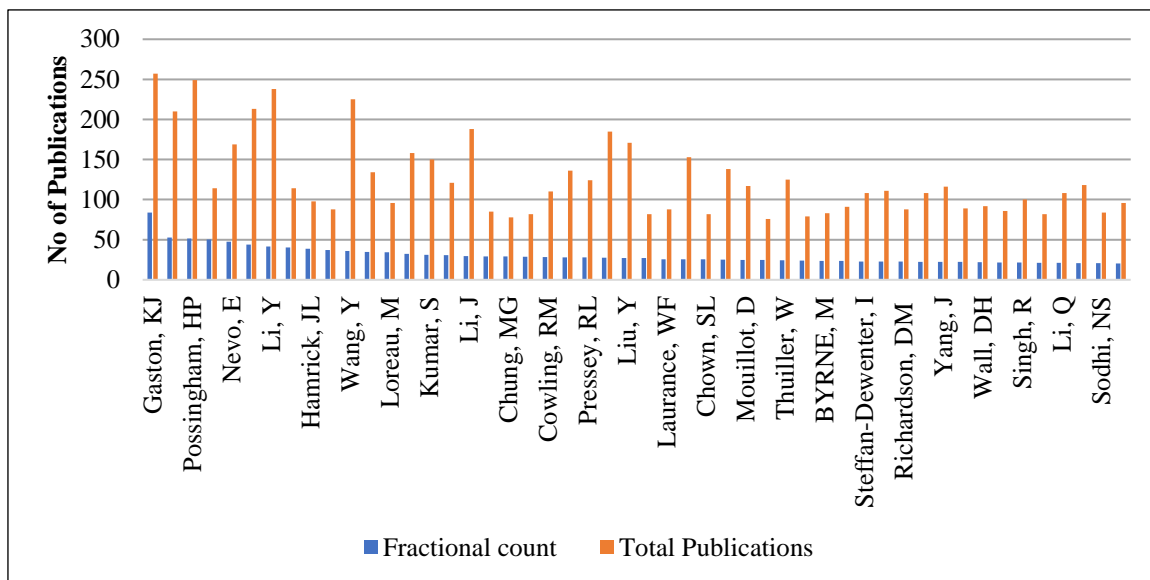

Fig. 2: Collaborative Index (CI).

Fig. 3: *Fractional Counting on Papers.*

52.741 fractional number an average of 0.25 got second position, Possingham, HP published 249 papers with 51.435 fractional number an average of 0.21. got third position, followed by Samways, MJ (114 papers, 50.272 and average 0.44), Nevo, E (169 papers, 47.621 and average 0.28). The remaining number of publications and fractional count presented in figure 3.

FINDINGS

The major findings of the study may be noted as under:

- Year-wise distribution of publications of biodiversity literature during the period 1989–2016 found that during this period of 28 years, a total of 1,54,654 publications were published in this field.
- The analysis of year wise research output shows till 2015 there an increasing trend in the publications and only in 2016 there is decrease in number of publications.
- The most prolific contributor in the field of biodiversity literature among the authors are Gastone, KJ gets the first rank with 257 (0.17%) publications.
- It has been proved from the analysis that single author papers have declining trend and there by collective contributions have an increasing performance in scientific research activities.
- It is found that the degree of collaboration is an increasing and decreasing trend i.e. 0.65 in 1989 to 0.95 in 2016 and also

found that the average degree of collaboration is 0.90 during the study period.

- The study reveals that one paper contributions constitute 165411 (60.32%) of total contributions followed by two papers contributions constituting 45051 (16.43%) of total contributions, three papers contributions constitute 20503 (7.48%) of total contributions.
- The collaborative Index for universal level value of 4.50 which show popularity towards collaborative research pattern than single research in biodiversity literature.
- The author wise fractional count on papers during the study periods. The Gaston KJ published 257 papers with 83.863 fractional numbers an average of 0.33 got first position.

CONCLUSION

Human health and biodiversity are indistinguishably related. Any ecosystem with a high biodiversity has the potential to have a relationship among predators, prey, hosts, vectors and parasites. Maintaining or restoring human health is directly proportionate with the naturally based medicines depends on the existence of the species from which they are derived. Changes in biodiversity and ecosystems cause both directly and indirectly affects the services provided by the ecosystem to the human beings which may prove to be dangerous when balance fluctuates with both

the sides. In addition to disciplines of measurement, scientometrics has strong connections with economics and sociology of science as well as science policy.

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Cite this Article
Hydar Ali, Adithya Kumari H. Authorship Patterns in Biodiversity Literature: A Scientometric Analysis. *Journal of Advancements in Library Sciences*. 2018; 5(2): 1–11p.