

CORAL REEF RESEARCH IN INDIA: A BIBLIOMETRIC ANALYSIS (PART I)

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ABSTRACT

The part-I of this paper attempts to evaluate the coral reef research in India using Bibliometric tools for the period 1900-2000. The data has been extracted from "Bibliography on Indian coral reefs". It highlights research productivity by subjects, domains, institutions (Research and Academic) etc. The study examines authorship pattern, productivity on individual scientists and also identified the various countries participation. It analyzes the forms of communication, journals productivity and identified criteria for selection of the core journals for library. Suggested to create a database on coral reefs and to develop marine science at national level that would facilitate easy use of all categories of people.

Keywords: Coral Reefs, Bibliometrics

INTRODUCTION

More than four decades ago Derek, J. de Solla Price¹ suggested studying science by using the scientific methods of science. Since then, research in Bibliometric and Scientometric study leads to develop tools to analyze scientific and research publications. It has been recognized by sociologists, economists, scientists, technologists and other groups of potential users throughout the world as it is an essential tool to study the development and the literature produced by the scientist of a specific institute, country or subjects. It helps in understanding the information transfer of institute and country.

A rapid progress has been made in all branches of science and technology over the past three decades. Due to the reason, the progress of the Marine Science also increased and inclination of most scientists to publish their research works in journals also increased. The number of such journals rose from more than 3500 in 1990 to more than 6000 in 2005. Thus bring more significance to the quantitative and qualitative evaluation of authors', journals, sources, subjects, institutions and countries productivity²⁻⁴. This Scientometric evaluation may be considered as standards for sustainable development of marine science research.

The Part-I of this paper is made an attempt to evaluate the Indian coral reef research for the period from 1900 to 2000 using bibliometric indicators. It analyses the performance of coral reef research in India, discussed subjectwise, sourcewise, statewise distribution of publication. Identified authorship pattern and also discussed the single authored publications on coral reef research in Indian context.

DATA SOURCES

The sample data on 577 records by Indian authors and foreign collaborative authors from various countries indexed in the "Bibliography on Indian coral reefs" (ENVIS⁵ Publication Series No. 2/2001), compiled and published by Environmental Information System Centre, CAS in Marine Biology in Annamalai University). The data was collected for the the period 1990 to 2000 and it is specifically confined that the bibliographical records cover mostly Indian seas and Ocean Region and do not cover the other seas and oceans.

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DATA ANALYSIS

Chronological distribution of coral reef literature

The results of research output are shown in **Fig.1**. For the period from 1900 to 2000, the researchers have been divided into four divisions by twenty-five year periods. The authors contributed 3% of the publication in the subjects such as Ecology, Taxonomy and Conservation and Management during the 1st twenty-five years period from 1900-1925. During the 2nd spell from 1926-1950 only 2% of the publications released. In the third twenty-five years period from 1951-1974 the scientist has performed by 16% and fourth 25 years period between 1976 and 2000 the research output has increased tremendously and productivity rate has gone up to 79% and also the Indian scientists covered all subjects. They have been concentrated on coral reef research mostly in Ecology and followed by biochemistry, conservation and management and so on

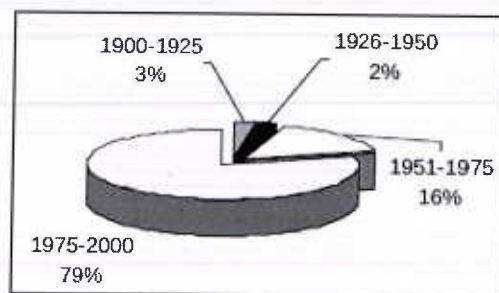


Fig. 1 Chronological distribution of coral reef literature

Indian Statewide Distribution of Publication

There were about 35 records in Bibliography which did not show any information related to author's affiliation or Organization. Since these authors have already published their articles before 1974 and the source of publication has also not been cited, thus only 542 out of 577 records have been considered for this study. Among these, 509 publications have been contributed by both academic and research Institutes from seventeen states of India. The remaining 33 articles have been contributed by various countries on Indian coral reef research were depicted in **Table 2, 2a**. Out of seventeen states, Kerala leading as top most state in coral reef research and followed by Tamilnadu, Goa, Andhra and so on (**Fig. 2**).

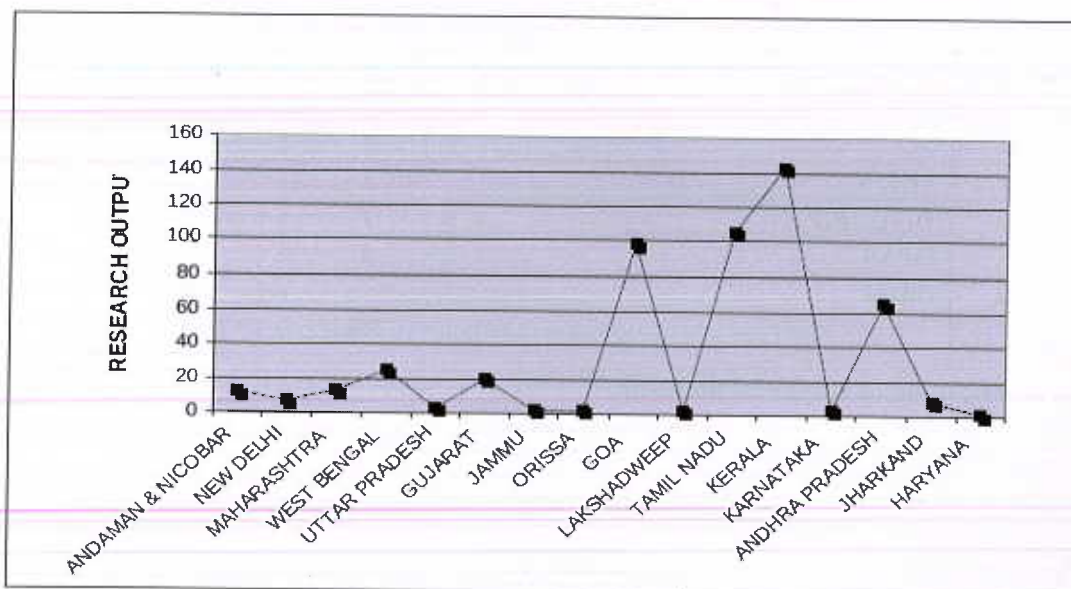


Fig. 2 State wise distribution of literature

Table 2 - India- State Wise Distribution

Sl.No	Name of the State	R & D Inst Productivity	Academic Inst Productivity	TOTAL
1	ANDAMAN & NICOBAR	12	0	12
2	NEW DELHI	7	0	7
3	MAHARASHTRA	12	1	13
4	WEST BENGAL	22	3	25
5	UTTAR PRADESH	3	0	3
6	GUJARAT	19	1	20
7	JAMMU	1	1	2
8	ORISSA	2	1	3
9	GOA	94	4	98
10	LAKSHADWEEP	2	0	2
11	TAMIL NADU	21	84	105
12	KERALA	143	0	143
13	KARNATAKA	3	0	3
14	ANDHRA PRADESH	3	62	65
15	JHARKAND	0	8	8
16	HARYANA	0	1	1
17	RAJASTHAN	0	1	
	Total	344	165	509

Table 2a: Works on Indian Coral Reefs by Various Countries

Sl.No	Country	Research Institution	Academic	Total
1	INDIA	344	165	2
2	PHILIPPINES	1	1	3
3	AUSTRALIA	2	1	1
4	CANADA	1	0	4
5	FRANCE	2	2	1
6	SRILANKA	1	0	8
7	USA	1	7	6
8	UK	1	5	1
9	KENYA	1	0	2
10	THAILAND	1	1	5
11	JAPAN	0	5	35
12	Others	355	187	577

Source wise distribution of coral reef literature

The sources are usually considered to be the most preferred form of scientific communication and they always preferred to publish their research output. Form wise distribution of literature gives directions for the investment on the type of documents to be procured in the libraries. **Figure 3** shows that the highest rate of the research papers on Indian coral reef has been published in Journals. No steady growth in the number of sources for the total period is noticed. The growth rate of the conference proceedings and reports is moderated and these are all considered as unpublished publications and therefore should not have found a

place higher than the journal article. A significant number of thesis are also noticed. It is observed that the majority of the thesis are submitted to CAS in Marine Biology, Annamalai University.

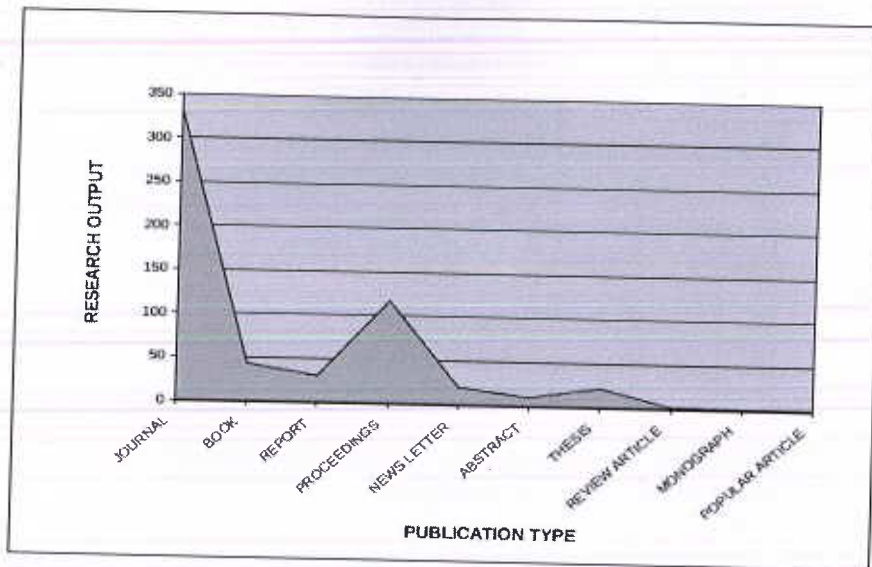


Fig. 3 Sourcewise distribution of coral reef literature

Rank list of journals

Table 3 exhibits the rank list of core journals in the field of coral reef research. The present study shows there are 79 journals which were preferred by the researchers to publish their 331 articles. Out of 79 journals, it is observed that total 48 foreign journals have published 76 article and the remaining 31 Indian journals have published 255 articles. As per this study, most of the Indian journals have published by their parental or their affiliated organizations. The data illuminates that the Indian Journal of Marine Science is secured the top position with 46 articles and followed by Journal of Marine Biological Association of India which covered 41 articles, Indian Journal of Chemistry 39 papers, Indian Journal of Fisheries was having 19 papers, Current Science has 15 papers, CMFRI Bulletin published 11 papers and "Journal of Bombay Natural History Society" and "Mahasagar" has published 10 paper each.

Table 3: Ranking list of core journals

Sl.No	Rank	Frequencies	Name of the Journal
1.	1	46	Ind.J.Marine Sci.,
2.	2	41	J.Marine Biological Ass Of India
3.	3	39	Ind Journal of Chem B.organic and Medical Chemistry.,
4.	4	19	Ind.J.Fish.,
5.	5	15	Current Science.,
6.	6	11	Bulletuin of Cent Marine Fish Res Inst.,
7.	7	10	J.Bombay Natural History Society
8.	7	10	Mahasagar.,
9.	8	9	J.Natural Products Lloydia.,
10.	8	9	Sea Food Expert Journal
11.	9	8	Bulletin of the Madras Govt Museum.,
12.	1	7	Marine Fisheries Information Service.,
13.	10	7	J.Andaman Sci Assoc
14.	10	7	Marine Geology.,

Table 3: Contd....

Sl.No	Rank	Frequencies	Name of the Journal
15.	11	6	Seaweed Research Utilization
16.	12	5	Chemical And Pharmaceutical Bull,Tokyo.,
17.	13	4	J.Geological Survey Of India
18.	13	4	Mem Ind Museum
19.	14	3	Atoll Research Bulletin.,
20.	14	3	Botanica Marina.,
21.	14	3	Limnology and Oceanigraphy.,
22.	15	2	Aquatic Botany.,
23.	15	2	Bulletin of Marine Science.,
24.	15	2	Coral Reef.,
25.	15	2	Deep Sea Research.,
26.	15	2	Indian Hydrobiology.,
27.	15	2	Madras Fisheris Department Bulletin
28.	15	2	J.Science And Industrial Research.,
29.	16	1	Ambio.,
30.	16	1	American science.,
31.	16	1	Applied Enviromental Microbiology.,
32.	16	1	Bulletin Of Botanical Survey of India.,
33.	16	1	Bulletin of Material Science.,
34.	16	1	CMFRI Special Publication
35.	16	1	Cytobios.,
36.	16	1	Environmental Geology.,
37.	16	1	Env Geology Water Science.,
38.	16	1	Enviroment And Conservation.,
39.	16	1	Ecology ,Environment And Conservation.,
40.	16	1	Geographical journal.,
41.	16	1	Hydrobiology.,
42.	16	1	Ind.Com Journal
43.	16	1	Ind. Journal of Botany.,
44.	16	1	Infofish International.,
45.	16	1	Inst Brit Geographers
46.	16	1	International Journal Of Nautical Archaeology
47.	16	1	J.Ecological Research And Bioconservation
48.	16	1	J.Geophysical Research.,
49.	16	1	J.Ecobiology
50.	16	1	J,Environmentl System.,
51.	16	1	J.Experimental Biology.,
52.	16	1	J.geology
53.	16	1	J.Indian Association Of Sedimentology
54.	16	1	J.Madras University (Bulletin)
55.	16	1	J.Paleontology
56.	16	1	Kavaka.,
57.	16	1	Madras Christian College Magazine.,
58.	16	1	Marine Ecology Progress Series.,
59.	16	1	Marine Biology.,
60.	16	1	Marine Chemistry.,
61.	16	1	MarineEcology.,

Table 3: Contd....

Sl.No	Rank	Frequencies	Name of the Journal
62.	16	1	Marine Georesources And Geotechnology.,
63.	16	1	Memories Aquatic Society Of Bengal.,
64.	16	1	Microbios
65.	16	1	Mitt.Zoological Museum Of Berlin.,
66.	16	1	ONGC Bulletin.,
67.	16	1	Opuscula Zoologia Fluinencia.,
68.	16	1	Phuket Mar Bio Cent Spec Pub.,
69.	16	1	Phykos
70.	16	1	Phytochemistry
71.	16	1	Precambrian Research
72.	16	1	Rec Zoological Survey Of India
73.	16	1	Rec Of Geological Survey Of India
74.	16	1	Science
75.	16	1	Territory Museum Of Art And Science
76.	16	1	Sunday
77.	16	1	Transaction Linnaeus Society Of Londen
78.	16	1	Thalassas
79.	16	1	Western Communication
		331	

Research and Academic Institution wise distribution of publications

There were 44 research institutions involved on coral reef research and these institutes have produced 344 publications. Among these, the Central Marine Fisheries Research Institute (CMFRI) has published 138 articles and bagged top rank in India and followed by National Institute of Oceanography (NIO) published 95 papers. The Geological Society of India (GSI), Calcutta has contributed 10 articles and stood on 3rd rank. The detailed list of prominent institutes is given in **Table 4**.

Table 4: R & D Institutions' Research Output

Sl.No	Rank	Frequencies	RESEARCH INSTITUTIONS IN INDIA
1.	1	138	Central Marine Fisheries Research Insitute, Cochin
2.	2	95	National Institute of Oceanography, Goa
3.	3	10	Geological Society of India, Calcutta
4.	4	9	Central Agricultural Research Institute, Port Blair, A&N.
5.	5	9	Zoological Society of India, Calcutta
6.	6	8	Central Salt, Marine Chemical Research Institute, Bhavnagar, Gujarat
7.	7	6	Marine Biological Station, Port Okha, Gujarat
8.	7	6	Physcal Research Laboratory, Ahamadabad
9.	7	6	Space Application Centre, Ahamedabad
10.	8	5	Oil, Natural Gas Company, Mumbai
11.	9	3	MSSwaminathan Research Foundation, Chennai
12.	9	3	Indian Institute of Chemical Technology, Hyderabad
13.	9	3	Centre for Earth Studies, Thiruvananthapuram
14.	9	3	WWF Centre, New Delhi
15.	10	2	Botanical Survey of India, Calcutta
16.	10	2	Centre for Ecological Research & Conservation, Mysore
17.	10	2	Environment Information System, (ENVIS), New Delhi
18.	10	2	Central Drug Research Institute, Lucknow

Table 4: Contd....

Sl.No	Rank	Frequencies	RESEARCH INSTITUTIONS IN INDIA
19.	10	2	Regional Research Laboratory, Bhubaneswar
20.	10	2	Gulf of Mannar Marine Biosphere Reserve, Ramnad
21.	10	2	Madras Government Museum, Tamil Nadu
22.	10	2	Natioal Environmental Engineering Research Institute, Nagpur
23.	10	2	Indian Institute of Technology, Chennai
24.	11	2	Department of Fisheries , Port Blair, Anadaman & Nicobar Islands
25.	11	1	Coastal and Oceanography Department, (DOD), Andaman & Nocobar Islands
26.	11	1	Bharat Gyan Vingyan Samiti, New Delhi
27.	11	1	Bay of Bengal Programm, Chennai
28.	11	1	Bombay Natural History Society, Mumbai
29.	11	1	Department of Ocean Development, New Delhi
30.	11	1	Central Institute of Medicine & Aromatic Plants, Lucknow
31.	11	1	Fishery Survey of India, Mumbai
32.	11	1	GB Pant Institute of Himalayan Environment & Development
33.	11	1	Gujarat Ecological Society, Vadodara
34.	11	1	Baba Atamic Research Centre, Mumbai
35.	11	1	Agharker Research Institute, Pune
36.	11	1	Madras Snake Park, Chennai
37.	11	1	Programme Community Organisation, Thiruvananthapuram
38.	11	1	Southern India Aquaculture, Chennai
39.	11	1	Trushna Exports Pvt Ltd, Mandya, Karnataka
40.	11	1	Central Institute of Fisheries Education, Mumbai
41.	11	1	Department of Chemistry, Bose Institute, Calcutta
42.	11	1	Department of Fisheries, Directorate of Fisheries, Tamilnadu
43.	11	1	Department of Fisheries, Directorate of Fisheries, Lakshadweep
44.	11	1	Lakshdweep Secretariat
		344	

It is clear from **Table 5** that **there are 28** academic institutes in India have involved in coral reef research and these institutions has contributed 165 publications. Among these the Andhra University has reached in top position and published 59 publications in different forms. The CAS in Marine Biology, Porto novo is a second most prolific publisher of coral reef research literature in India. It has distributed 52 publications in various forms. The PG Department of Zoology under the University of Ranchi, Bihar has reached at third rank and it was having eight papers. The Centre of Marine and Coastal Studies, Madurai Kamaraj University contributed 7 papers and secured 4th rank. The Department of Marine Science, Goa University and VOC College, Thoothukudi contributed 4 paper each and secured 5th rank. Three institutions were contributed 3 publications each and also three institutions published 2 papers each. Sixteen institutions having single publication each and secured 8th rank. 26 numbers of academic and R & D institutions from different countries have published 33 papers on Indian coral reefs (**Table 5a**).

Table 5: Academic Institution Wise Distribution

Sl.No	Rank	Frequencies	ACADEMIC INSTITUTION IN INDIA
1.	1	59	Andhra University, Vishakapatnam
2.	2	52	CAS in Marine Biology, Porto Novo
3.	3	8	PG dept of Zoology, University of Ranchi, Bihar
4.	4	7	Centre of Marine and Coastal Studies, Madurai Kamaraj University, Madurai
5.	5	4	Dept of Marine Science, Goa University

Table 5: Contd....

Sl.No	Rank	Frequencies	ACADEMIC INSTITUTION IN INDIA
6.	5	4	VOC College, Tuticorin
7.	6	3	Department of Chemistry, Venkateswara University, Tirupati
8.	6	3	Dept of Animal Science, Bharathidasan University, Trichy
9.	6	3	Fisheries College, Tuticorin
10.	7	2	Institute of Ocean Management, Anna University, Chennai
11.	7	2	Tamil Nadu Veterinary & Animal Science University, Chennai
12.	7	2	Dept of Geological Science, School of Oceanography, Jadavpur University
13.	8	1	Department of Zoology, New College, Chennai
14.	8	1	Dept. of Nuclear Physics and material Science, Univ. of Madras
15.	8	1	Dept. of Earth Science, Tamil University, Thanjavur
16.	8	1	Dept of Botany, Bharathiar University, Coimbatore
17.	8	1	Manonmaniam Sundaranar University, Tirunelveli
18.	8	1	Sri Paramakalyani Centre for Environmental Science, Tirunelveli
19.	8	1	Dept of Zoology, Krushetra University, Haryana
20.	8	1	Marathwada University, Aurangabad
21.	8	1	Dept of Marine Science, Calcutta University
22.	8	1	Dept of Geology, University of Jammu
23.	8	1	Dept of Geology, MS University of Baroda, Vadodara
24.	8	1	Jamal Mohamed College, Trichy
25.	8	1	St. Marys College, Tuticorin
26.	8	1	PG dept of Life Science, Regional College of Education, Bhubaneswar
27.	8	1	Dept of Geology, University of Rajasthan
28.	8	1	Madras Christian College, Chennai
		165	

Table 5a: Contribution of various countries in Indian coral reef research

Sl.No	Rank	Frequencies	NAME OF THE INSTITUTIONS
1.	1	4	Faculty of Pharmacheutical Science, Hokkaido University, Kitaku Sapporo Japan
2.	2	3	Cambridge University, UK
3.	3	2	Department of Chemistry, University of Puerto Rico, USA
4.	3	2	Department of Biological Science, University of Southern California, Los Angels, CA
5.	4	1	Ruhr. Uni. Bochum, Lehrstune Spez Zool, Germany
6.	4	1	Usa Marine Biology Institute, Kochi University, Japan
7.	4	1	Department of Microbiology, Michigan State University USA
8.	4	1	Dept of Chem and Chemical Engg, Strerens Institute of Technology, Hobken, NJ, USA
9.	4	1	Depaartment of Marine Science & Coastal Management, University of New Castle, UK
10.	4	1	Department of Chemistry & Biochemistry, James Cook University, Australia
11.	4	1	Marine Science Institute University of the Philipines, Quezon city, Philippines.
12.	4	1	Justus Lieblg Uni. Giessen Zool Institute, Germany
13.	4	1	College of Charleston, USA
14.	4	1	Coastal Resource Management Project, Philipines
15.	4	1	CSIRO, Marine Laboratory, Australia
16.	4	1	Australian Institute of Marine Science, Townsville, Australia
17.	4	1	Redford Institute of Oceanography, Canada
18.	4	1	Lab de Biolog i.e. Animale Uni de Prorence, France
19.	4	1	Hessian State Musuem, Darmstadt, Germany

Table 5a: Contd....

Sl.No	Rank	Frequencies	NAME OF THE INSTITUTIONS
20.	4	1	National Aquatic Resources Research and Development Agency, Srilanka
21.	4	1	United Nations Development Programme
22.	4	1	Marine Conservation Society, UK
23.	4	1	IUCN World Conservation Union, Kenya
24.	4	1	Phuket Marine Biology Centre, Thailand
25.	4	1	East Marine Fisheries Development Centre, Thailand
26.	4	1	Dept. Biological Science, University of Warwick, UK
		33	

Authorship Pattern wise distribution of publication

The publishing pattern by authors is shown in Fig.4. It is found that out of 245 papers, 136 papers were published single authors, out of 161 papers there are 110 papers written by two authors, out of 104 papers published in Coral reefs, there were 75 articles were contributed by three authors and out of 36 publication there are 34 papers written by four authors and 20 papers were published by five authors. The remaining 11 papers were published by 11 corporate authors. The Table 6 reveals that the frequencies of authorship pattern in subject wise.

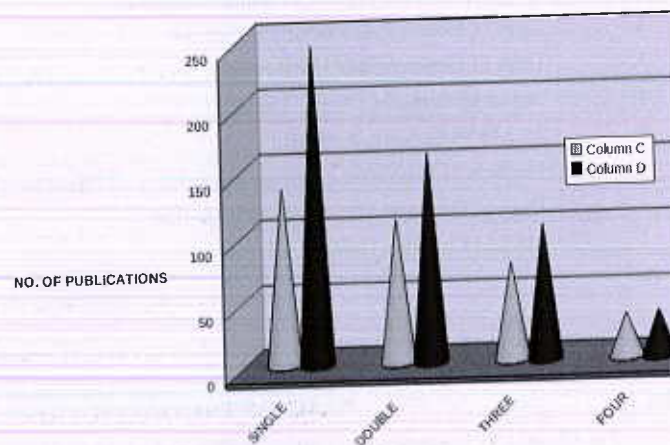


Fig. 4 Authorship pattern wise distribution of publication

Table 6: Subjectwise Authorship Pattern

Sl.No	Subjects	Single	Double	Three	Four	Five & Above	Corporate Authors	Total
1	GEOLOGY	14	10	5		3		32
2	HYDROBIOLOGY	4	12	3	1			20
3	ECOLOGY	84	37	22	5	3	6	157
4	TAXONOMY	20	9	1				30
5	TOXICOLOGY	4	3		4			11
6	BIOCHEMISTRY	4	24	23	13	11		75
7	MICROBIOLOGY	10	6	4	2			22
8	PLANKTON	13	6	3	2	1		25
9	FLORA (BOTANY)	15	16	8	4		1	44
10	FAUNA (ZOOLOGY)	40	27	26	4	1	2	100
11	CONSERVATION MANAGEMENT	37	11	9	1	1	2	61
	Total	245	161	104	36	20	11	577

Single Authored publications

The Table 7 depicts that 136 single authors have published 245 papers. Among the 136 authors we find C.S.G. Pillai alias '*Coral Pillai*' from CMFRI at the top, one of the founder and pioneer of coral reef research in India who has published 31 papers individually and followed by P.A. Thomas from the same institute published 9 papers and reached 2nd Rank. M.V.M. Wafer from NIO, Goa contributed 8 papers in the field with 3rd rank. Asir Ramesh from Annamalai University has published 6 papers and he reaches the fourth rank. S.Z. Qasim and three more authors were published 5 papers each and they have reached 5th rank. Six authors including P.S.B.R. James were contributed 4 papers each and they have reached 6th Rank. Three authors having 7th rank and they were published 3 papers each. Eighteen authors were published 2 papers each and they were reached 8th rank. 114 authors were published single publication and reached 9th rank.

Table 7:- Single Authors' Productivity

Sl.No	Rank	Authors	Research Output
1.	1	PILLAI, C.S.G.	31
2.	2	THOMAS, P.A	9
3.	3	WAFAR, M.V.M.	8
4.	4	ASIR RAMESH, D	6
5.	5	GARDINER, J.S.	5
6.	5	MALIK, T.K.	5
7.	5	MUKHERJEE, B.	5
8.	5	QASIM, S.Z.	5
9.	6	GOSWAMI, S.C	4
10.	6	JAMES, D.B.	4
11.	6	JAMES, P.S.B.R.	4
12.	6	KUMARAGURU, A.K.	4
13.	6	MATTHAI, G.	4
14.	6	PATEL, M.I.	4
15.	7	PRASAD, RR	3
16.	7	SEWELL, R.B.S	3
17.	7	UMAMAHESWARA RAO, M	3
18.	8	ANAND, P.E.V.	2
19.	8	APPUKUTTAN, K.K.	2
20.	8	ARTHUR, R.	2
21.	8	BAKUS, G.J.	2
22.	8	DEVARAJ, M.	2
23.	8	GRAVELY, F.H.	2
24.	8	HORNELL, J.	2
25.	8	JAGATAP, T.G.	2
26.	8	JEYABASKARAN, R	2
27.	8	KALADHARAN, P.	2
28.	8	KANNAN, L.	2
29.	8	RAGHU KUMAR, C.	2
30.	8	RAMACHANDRAN, KK	2
31.	8	REDDIAH, K.	2
32.	8	RODRIGUEZ, C.L.	2
33.	8	SIVADAS, P.	2
34.	8	STODDART, D.R.	2
35.	8	VAZ, G.G.	2
36.	9	144Authors	1 each

Authors' productivity in coral reef research

The number of most cited authors are listed in **Table 8**. The most prominent authors have been listed based on their productivity. The table shows that there are total 283 authors published 566 papers as first authors. Among these, the author C.S.G. Pillai contributed 48 papers and secured top most rank in Indian coral reef research and followed by A.S.R. Anjaneyulu significantly contributed 18 papers and secured 2nd rank. P.A. Thomas produced 13 papers and reached third rank. S.Z. Qasim and M.V.M. Wafer have contributed 10 papers each and secured 4th rank. D. Asir Ramesh and R. Jayabaskaran secured 5th rank. Four authors including P.S.B.R. James secured sixth rank. Two scientists were occupying 7th rank. Six authors were occupying eighth rank and contributed 5 papers each. 14 authors contributed 4 papers each and placed ninth rank. 19 authors produced 3 papers each and reached 10th rank. 35 authors contributed 2 papers each. 196 authors contributed single publication and secured 12th rank

Table 8: First Authors' (Multiple Authors) Distribution of Publications

Sl.No	Rank	Frequencies	Name of the Author
1.	1	48	PILLAI, C.S.G.
2.	2	18	ANJANEYULU, A.S.R.
3.	3	13	THOMAS, P.A.
4.	4	10	QASIM, S.Z
5.	4	10	WAFER, M.V.M
6.	5	9	ASIR RAMESH, D.
7.	5	9	JEYABASKARAN, R.
8.	6	7	ANJANEYULU, V.
9.	6	7	JAMES, P.S.B.R.
10.	6	7	PRASAD, R.R.
11.	6	7	SUBRAMANYAM,C
12.	7	6	KUMARAGURU, A.K.
13.	7	6	MUKHERJEE, B
14.	8	5	GARDINER, J.S.
15.	8	5	GOSWAMI, S.G.
16.	8	5	JAMES, D.B
17.	8	5	KALADHARAN, P.
18.	8	5	MALIK, T.K.
19.	8	5	PATEL, M.I.
20.	9	4	ANAND, P.E.V.
21.	9	4	CHKRABORTY, S.
22.	9	4	DORAIRAJ, K.
23.	9	4	JAGATAP, T.G
24.	9	4	KOBAYASHI, M
25.	9	4	MAHADEVAN, S.
26.	9	4	MATTHAI, G
27.	9	4	RAGHUKUMAR, C
28.	9	4	RAGHUKUMAR, S
29.	9	4	RAMANUJAM, N.
30.	9	4	RODRIGUES, C.L.
31.	9	4	STODDART, D.R.
32.	9	4	SURESH, V.R.
33.	9	4	UMAMAHESWARA RAO, M
34.	10	3	CHACKO, P.I
35.	10	3	CHANDRAMOHAN, D
36.	10	3	JAYASREE, V.
37.	10	3	KANNAN, L.

Table 8: Contd....

Sl.No	Rank	Frequencies	Name of the Author
38.	10	3	KANNAPIRAN, E.
39.	10	3	KRISHNAMURTHY, V.
40.	10	3	NAQVI, S.A.S
41.	10	3	PARULEKAR, A.H
42.	10	3	RAJU, B.L
43.	10	3	RAMACHANDRAN, K.K.
44.	10	3	RAMAIYAN, V
45.	10	3	RAO, CH.B
46.	10	3	RAO, D.V
47.	10	3	REDDIAH, K
48.	10	3	SARMA, N.S.
49.	10	3	SEWELL, R.B.S.
50.	10	3	VENKATARAMANUJAM, R
51.	10	3	VINITHKUMAR, N.V
52.	10	3	WAFER, M.
53.	11	2	ADIGA, K.S.
54.	11	2	ANJALI BAHUGUNA
55.	11	2	APPUKUTTAN, KK.
56.	11	2	ARTHUR, R.
57.	11	2	BAKUS, G.J.
58.	11	2	BALASUBRAMANIAN, T.
59.	11	2	DAS, K.C.
60.	11	2	DEVERAJ, M.
61.	11	2	GRAVELY, F.H
62.	11	2	GULSHAD MOHAMMED
63.	11	2	HARDAS, M.G.
64.	11	2	HORNELL, J
65.	11	2	JAYASEELAN, M.J.P
66.	11	2	KALIAPERUMAL, N
67.	11	2	KRISHNAMOORTHY, P
68.	11	2	KRISHNAMOORTHY, R.
69.	11	2	KUMARESAN, S
70.	11	2	MAIRH, O.P
71.	11	2	MERGNER, H
72.	11	2	MOHAN, M
73.	11	2	MUSTAFA, A.M.
74.	11	2	NAIR, P.V.R.
75.	11	2	PARAMESWARNA, P.S
76.	11	2	PATTERSON EDWARDS, J.K.
77.	11	2	RAO, P.S.
78.	11	2	RAO, T.S.S.
79.	11	2	RODRIGUEZ, A.D
80.	11	2	SANTHANAM, R
81.	11	2	SEENA RAGHUNATHAN
82.	11	2	SILAS, E.G.
83.	11	2	SIVADAS, P.
84.	11	2	VAZ, G.G.
85.	11	2	VENKATARAMAN, K
86.	11	2	VORA, K.H.
87.	11	2	WILSANAND, V.
88.	12	1	First Authors

CONCLUSION

The study brings out the need for database on Indian coral reef research to follow a standard format, which would facilitate easy use of all categories of people. Institutions such as CMFRI, NIO and NISCAIR are to be taken initiation to create a database on coral reefs to develop in the field of marine science in India. The authors are taken initiation to bring out updated publication activities on coral reef literature of Indian Ocean region (India and other countries) for the period 2001 2010 in part -II.

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