

CITATION BEHAVIOR OF PHILIPPINE BIOLOGICAL SCIENTISTS

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ABSTRACT

The literature cited by Philippine biologists in two Philippine, refereed biological journals over a 10-year period compared favorably with some Asian newly industrialized countries in terms of age measured as proportion of citations five years old or less. The mean proportion of such references by Philippine authors in a national fisheries journal studied (33%) was close to that by Philippine authors in overseas journals (36%), but less than that of north American authors in one of the overseas journals (43%). However, pooling data over time was found to be inappropriate because the proportion of five-year-old or less citations in one Philippine journal decreased significantly over time while the other showed a marked significant increase over time. Also the proportion of recent foreign literature in the citations of one journal decreased markedly over time, while the reverse was true of the other. The journal exhibiting decline closed in 1983. It is suggested that these bibliometric parameters may thus be indicators of scientific endeavor in developing countries.

RESUME

L'âge des références, mesuré en pourcentage de références ayant cinq ans ou moins de cinq ans, citées par les biologistes philippins dans deux journaux locaux avec comité de lecture sur une période de dix ans se compare favorablement avec les pays asiatiques nouvellement industrialisés. La proportion moyenne de ces références (de cinq ou moins de cinq ans) par auteur philippin dans un journal des pêcheries étudié (33%), est proche de celle par auteur philippin dans des journaux étrangers (36%), mais moins élevé que celle d'auteurs d'Amérique du Nord dans un des journaux étrangers (43%). Cependant, des irrégularités ont été relevées au cours de la période étudiée, la proportion de références de cinq et moins de cinq ans diminuant significativement au cours des années dans un des journaux philippins alors qu'elle faisait preuve d'une augmentation marquée dans le second au cours de la même période. De la même façon, la proportion de références étrangères récentes a diminué de façon significative dans un journal alors qu'elle augmentait dans l'autre au cours de la même période. Le journal témoignant de ces signes de déclin a interrompu sa parution en 1983. Les auteurs suggèrent que ces paramètres bibliométriques peuvent être utilisés comme indicateurs d'activités scientifiques dans les pays en développement.

INTRODUCTION

The debate about the usefulness or otherwise of the Science Citation Index (SCI) of the Institute of Scientific Information as a measure of the value of developing-country science has been largely based on SCI itself (e.g., Calleja 1980; Garfield 1983; Yutharong 1983; Arunachalam and Garg 1985, 1986; Singh and Arunachalam 1990).

Davis and Eisemon (1989) gave the most recent summary of what they call "mainstream and non mainstream science" and analyzed the latter in four Asian newly industrialized countries (NICs), Korea, Taiwan, Singapore and Malaysia.

The Philippines clearly also represents the non mainstream case. However, this country hosts several international and regional research centers such as the International Rice Research Institute (IRRI), the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC), the International Center for Living Aquatic Resources Management (ICLARM), and regional education centers (such as the Diliman and Los Banos campuses of the University of the Philippines).

We examined two locally published vehicles for research dissemination: (i) the Philippines Journal of Biology (Kalikasan), which was published three times a year between 1972 and 1983. It was included in the abstracting and indexing coverage of Chemical Abstracts, Biological Abstracts, Guide to Botanical Periodicals, Agrindex, Flora Malesiana Bulletin, Abstracts Journal, Entomology Abstracts, Asia Science Research References, Microbiology Abstracts, Cambridge Scientific Abstracts, Current Advances in Plant Sciences, Current Advances in Ecological Sciences, and Current Contents; (ii) The Fisheries Research Journal of the Philippines (FRJP), a semi-annual publication of the Fisheries Research Society of the Philippines produced with support from the Philippine Council for Aquatic and Marine Research Development (PCMARD) and the Bureau of Fisheries and Aquatic Resources. It commenced publication in January 1976 and continues to the present. It is monitored by the FAO Aquatic Sciences and Fisheries Information System (ASFIS) which produces a globally used abstracts journal. Except for two Tagalog (Philippine national language) articles in Kalikasan, both journals publish in English and accept articles by non-Filipino authors.

METHODOLOGY

Articles by Filipino authors in Kalikasan and FRJP were examined. The numbers and ages of citations were collated. Citations were grouped into those by overseas authors published abroad, non-Filipino authors published in the Philippines, Filipinos published abroad, and Filipinos published in the Philippines.

Table 1. Proportion of citations by authors in different journals according to age and source of citation

Journal	Years covered	Total citations	Proportion 5 years old (%)	Proportion by citation type(%) ³				Mean Age (years) ³
				OO ⁴	OP	PO	PP	
FRJP all	1976-1986	1827	26	54	3	4	18	10.8
FRJP ¹ subset	1983-1986	550	33	54	7	3	22	9.2
<u>Kalikasan</u>	1972-1983	3135	28	70	1	2	10	10.1
Overseas ²	1983-1986	478	36	75	6	11	2	9.0
Aquaculture	1985	290	43	100	-	-	-	8.1

¹Fisheries Research Journal of the Philippines, subset for 1983-1986 to compare with the "Overseas" journal data

²Articles by Philippine scientist in Aquaculture, Aquaculture and Fisheries Management

³This part of the table excludes papers published before 1950 (16.6%)

⁴OO = overseas authors in overseas journals; OP = overseas authors in Philippine journals; PO = Philippine authors in overseas journals; PP = Philippine authors in Philippine journals.

For comparison, articles by Filipinos published abroad and by foreign (North American) authors were examined using the same parameters. The north American author data were from the journal *Aquaculture* (covered by SCI) 1983-1986. Filipino articles were found in the journals *Aquaculture*, *Journal of Fish Biology*, *Journal of Coastal Research*, *Fish Pathology*, *Marine Biology*, *Aquaculture and Fisheries Management*, and *Acta Biologica Hungarica*, all of which are covered by *Current Contents*. The journals were searched successively over the years 1983-1986 until 30 articles were found. Cited articles published prior to 1950 were lumped and excluded in the computations of mean citation ages. The cutoff was fairly arbitrary but was made to keep taxonomy, etc., references, some of which date to previous centuries, from biasing the results.

RESULTS

The proportions of Philippine authors in the two Philippine journals were: *Kalikasan* 75% (n = 147) and the fisheries journal 90% (n = 63). In both, north American authors were the largest foreign group, with 21 and 2 authors, respectively.

Number of citations

On average, authors in *Kalikasan* used 7.5 citations, while those in FRJP cited 16.3. This compares with 15.9 for Filipino authors published abroad. The number of citations used by *Kalikasan* and FRJP authors diminished over time. The decline was more drastic for the FRJP authors (Fig. 1).

Age of citations

Table 1 shows that the mean age of citations differed little amongst the publication types, from 8 years for north American authors in *Aquaculture* to 11 years for Philippine authors in the Philippine fisheries journal.

Using 5 years or less as an age yardstick (as used by Davis and Eisemon 1989), there is a separation of Philippine and overseas journals, the latter with a clearly higher proportion of citations in this "young" category (36-43%) than Philippine journals (26-28%). However, the proportion of "young" citations used by Philippine authors in the 1983-1986 subset of the Philippine fisheries journal (33%) was nearly the same as that in the overseas journals in which they published (36%) in the same time period. The proportion of citations five years old or less decreased over time in *Kalikasan* articles and increased in FRJP articles (Fig.2). Clearly, the Philippine journal data are not homogeneous.

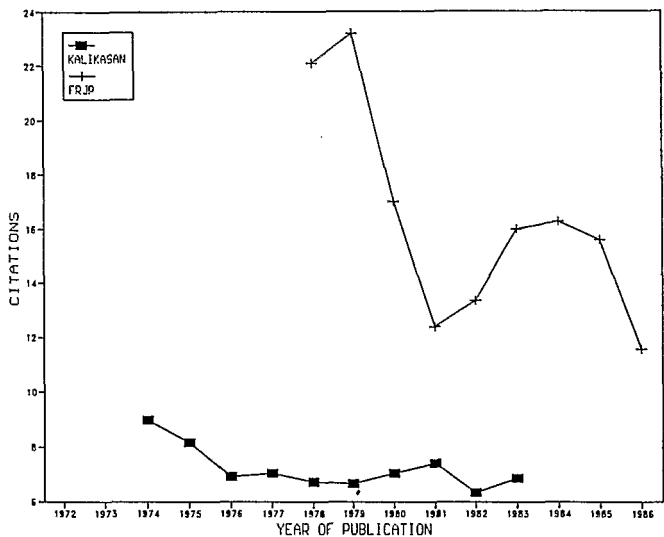


Fig. 1. Mean number over time of citations used per article for FRJP and Kalikasan. Points are 3-year running averages.

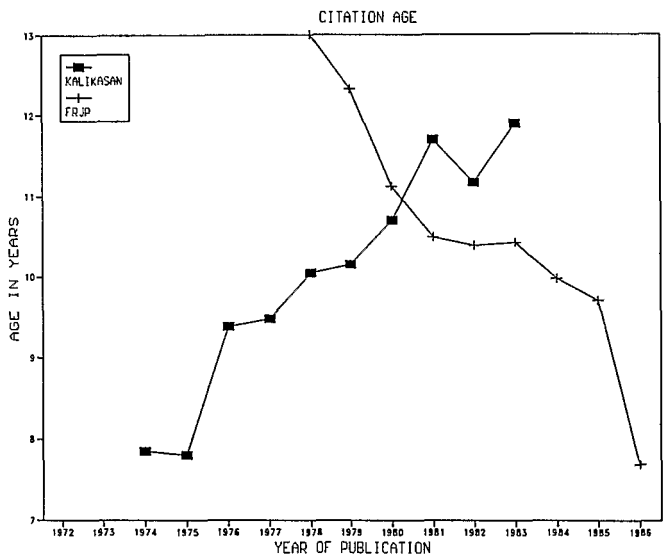


Fig. 2. Mean age over time of citations used for FRJP and Kalikasan. Points are 3-year running averages.

Citation types

The overall citation patterns of Philippine authors in the different publications exhibited some differences (Table 1). Nearly 70% of Kalikasan citations were to overseas authors in overseas articles while only around 50% of FRJP citations were in this category. FRJP authors cited more Philippine authors in Philippine journals. When publishing in overseas journals, Filipino authors used even higher proportions of overseas citations and almost no "home-grown" citations. However, some 11% of citations on average were to Philippine-authored articles in overseas journals.

The trend to younger citations in FRJP (Fig.2) was examined according to the categories of citation types in Table 1. The results (Fig. 3) show that citations to foreign authors in foreign journals is the dominant factor, in other words, FRJP authors are using more, more recent foreign materials. For Kalikasan the trend to increasing age of citations is similarly associated with a decline in the proportion of young foreign material (Fig. 4).

Interestingly for both journals, the proportions of other types of citations has varied little. It is only in the use of newer foreign articles in foreign journals where citation behavior has changed.

The overall temporal patterns of citation age by category are shown in Figs. 5 and 6. There is no discernible change in any category, not even in the use of foreign literature. Thus, Philippine fisheries scientists are not citing more foreign material by foreign authors, they are simply becoming more current.

DISCUSSION

The citation data on the two Philippine journals show that pooling results over time gave misleading impressions of the journals. Kalikasan showed a gradual decline in proportion of "young" overseas citations while the fisheries journal exhibited the opposite trend.

Some other interesting data, suggesting an overall decline in the usefulness of Kalikasan, were presented by Dizon (1990). Looking at a broad range of Philippine publications that cite Kalikasan, she found that the proportion of Kalikasan citations in Philippine primary literature declined from about 10% in 1972 to less than 3% in 1988 (Fig.7).

In another study of these two journals in our office, on the use of reprints, a questionnaire survey revealed that this aspect was apparently quite healthy. Most authors of both journals distributed all their free reprints (100 for Kalikasan; 25 for FRJP) (Carigma et al., unpublished data), and 94% of them used the "reprint system" (requested reprints) also. It might be noted that authors of Kalikasan, due to its international exposure via Current Contents, received twice as many reprint requests as FRJP. (Nearly 70% of Kalikasan reprint requests came from overseas, while only 40% of FRJP reprint requests were from overseas.)

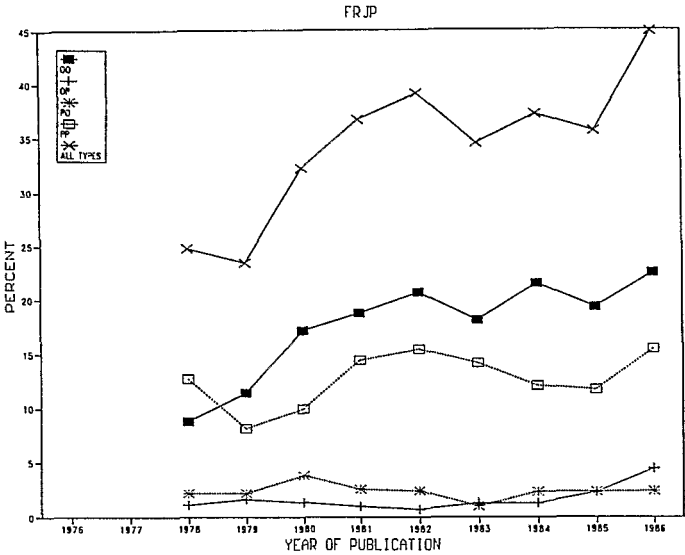


Fig. 3. Percentage over time of citations 5-years or less used in FRJP. Points are 3-year running averages.

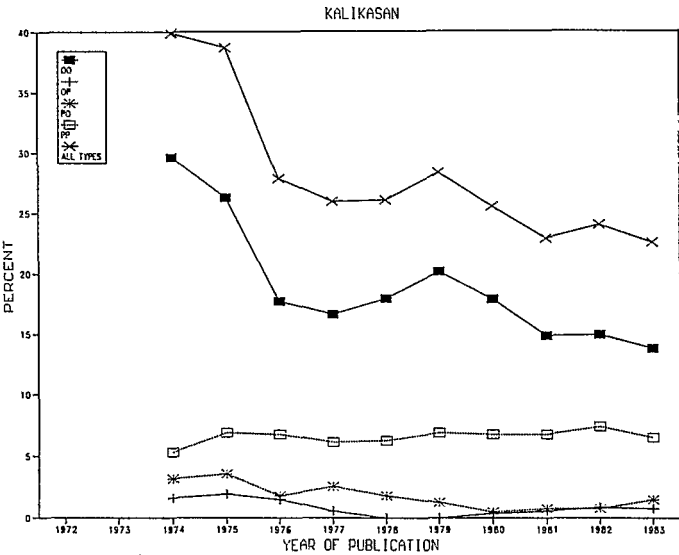


Fig. 4. Percentage over time of citations 5-years or less used in Kalikasan. Points are 3-year running averages.

Developing-country scientific literature is said to use older citations than its western counterpart. How old is old? Davis and Eisemon (1989) used the proportion of references five years old or less as a yardstick. They neglected to compare their data with mainstream articles in the same fields, so there was little to be gained in their analysis other than comparison across fields.

The proportion of "young" citations in 1985 biology articles of the four Asian newly industrialized countries (NICs) studied by Davis and Eisemon (1989) was only 15%, well below the lower value (26%) for the Philippine journals. Figures for overall proportions of "young" citations in the NICs ranged from 20 to 33% in the national (non mainstream) literature. The Philippine biological journals fared better than three of the four Asian NICs.

Table 1 contains comparative data from the (mainstream) journal *Aquaculture* using the 5-year yardstick. It shows that north American authors in that journal have a higher percentage of references in the 5 years or less category but the differences are not great. The data suggest that Filipinos publishing in such journals would cite on average 2 less "young" articles in a paper with 20 references.

The proportion of national scientists publishing in a (national) journal in developing countries was equated to degree of "parochialism" by Davis and Eisemon (1989). *Kalikasan*, with 75% local authors, compared favorably with three of the four NICs they studied, while *FRJP* at 90% was still about the average NIC value. However, parochial is a rather nonsensical term applied to NIC or developing-country journals. There are national and there are regional journals. For example, the Journal that one of us (JLM) edits, *Asian Fisheries Science*, has authors from 18 countries in its three volumes to date (Appendix I). The journal is published in and distributed from the Philippines by the Asian Fisheries Society. There are other "cosmopolitan" journals in the aquatic field published in Asia, for example, the annual *Asian Marine Biology* from Hong Kong and the *Journal of Aquaculture in the Tropics* from India. Our results indicate that Philippine fisheries science authors (of *FRJP*) are not very far behind their western counterparts in age of citations, and that they are "catching up" in the use of new overseas materials. That the proportions of overseas materials has remained steady probably reflects the continued use of local literature to provide the necessary perspective, appropriate methodologies and data sets suitable for local conditions.

Philippine fisheries scientists may also be making use of recently available technologies in literature searching and retrieval, such as computerized literature searches and document delivery systems of the regional and international fisheries informations systems established in the Philippines. These services generally provide access to a larger and more current pool of literature than what is available in many national research centers or personal reference collections. This is, of course, a more economically reasonable method to stay abreast of recent developments as few, if any, local fisheries scientists can afford to subscribe to abstracting and indexing services.

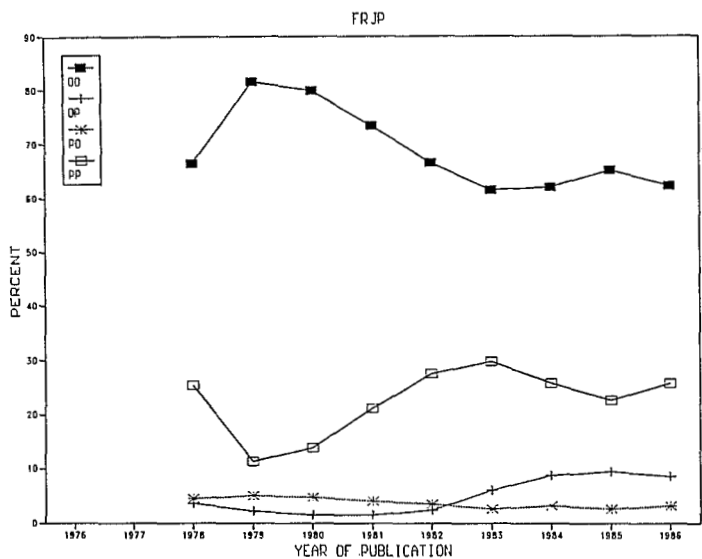


Fig. 5. Proportions over time of the different citation types used in FRJP. Note this includes citations prior to 1950. Points are 3-year running averages.

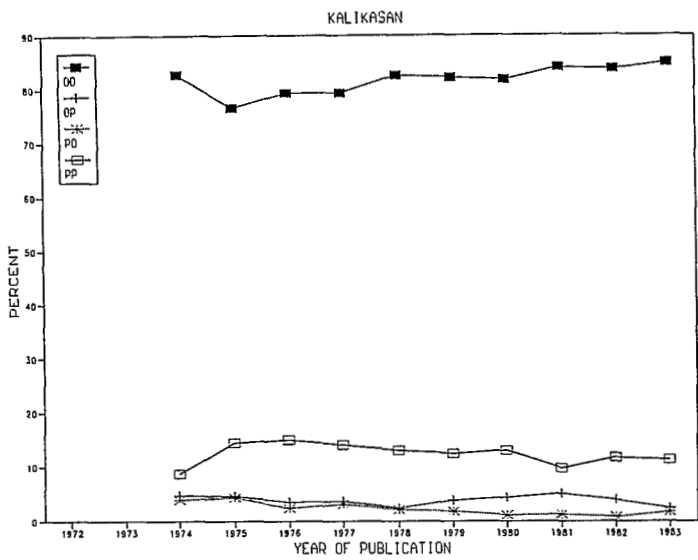


Fig. 6. Proportions over time of the different citation types used in Kalikasan. Note this includes citations prior to 1950. Points are 3-year running averages.

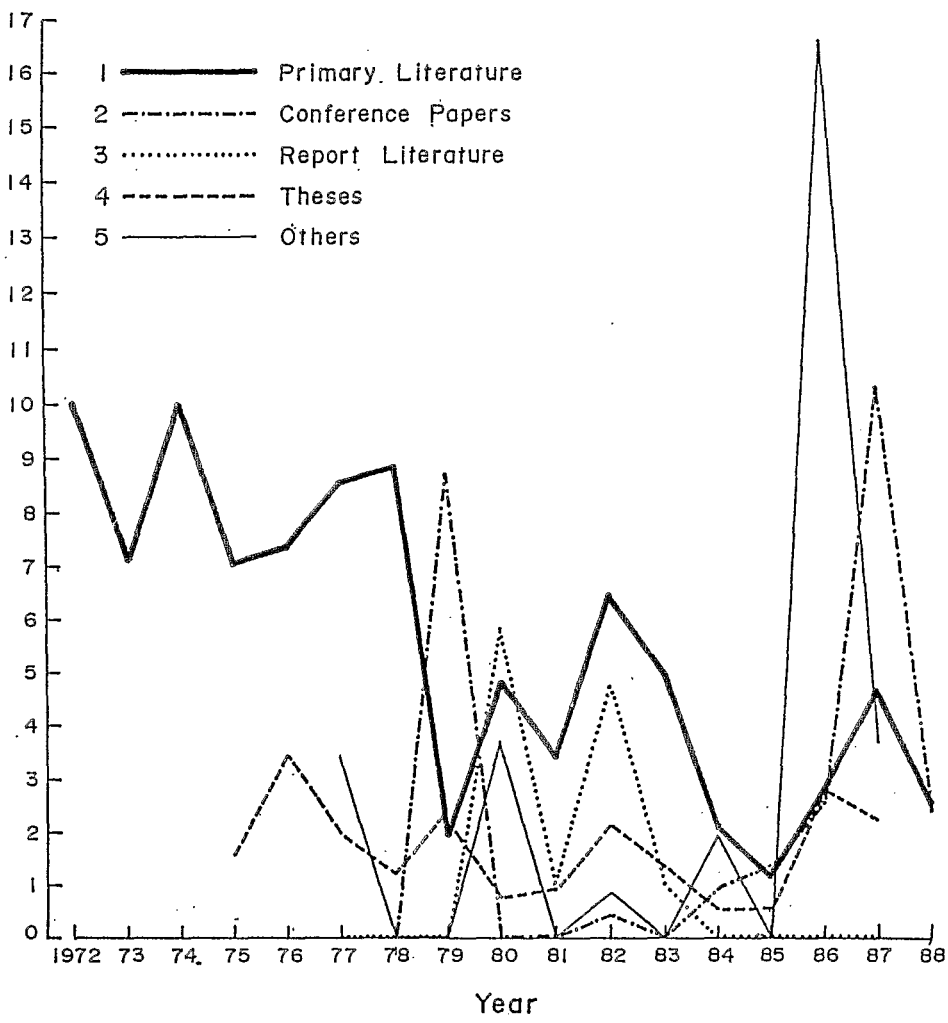


Fig. 7. Proportion over time of Kalikasan citations in reference lists of articles that cite at least one Kalikasan item.

ICLARM has been running an international information service, sponsored by the International Development Research Centre (IDRC) of Canada, for the past 7 years. From 1988, IDRC changed its policy to requiring or at least promoting a user-pays approach to make such services self-financing. Our subsequent experience was that developing-country researchers cannot afford to pay for information, while the number of donor-financed researchers is also inadequate to sustain an information service.

Finally, the demise of Kalikasan in 1983 officially due to lack of funding support, was in spite of its more international character - less parochialism; high proportion of overseas reprint requests; and covered by Current Contents. However, the journal's death may also have been associated with authors' declining use of recent overseas literature; increasing age of citations; and declining numbers of citations in the Philippine primary literature. Perhaps these are some of the parameters that, taken together with others, provide indicators of scientific endeavor in developing countries.

REFERENCES

- Arunachalam, S. and K.C. Garg. 1985. A small country in a world of big science: a preliminary bibliometric study of science in Singapore. *Scientometrics* 8:301-313.
- Arunachalam, S. and K.C. Garg. 1986. Science on the periphery - a scientometric analysis of science in the ASEAN countries. *J. Info. Sci.* 12: 105-117.
- Calleja, G.B. 1980. Science in the boondocks. *Filipinas, the Journal of Philippine Studies* (Kalamazoo, Michigan), 1:21-43.
- Davis, C.H. and T.O. Eisemon. 1989. Mainstream and nonmainstream scientific literature in four peripheral Asian scientific communities. *Scientometrics* 15: 215-239.
- Dizon, L.B. In press. An analysis of citations to Kalikasan, the Philippine Journal of Biology and Fisheries Research Journal of the Philippines. Master of Library Science Special Problem. Institute of Library Science, University of the Philippines, Diliman, Quezon City, Philippines.
- Garfield, E. 1983. Third world research. Part I. Where it is published and how often it is cited. *Current Contents* 33: 5-15.
- Singh, U.N. and S. Arunachalam. 1990. Sophisticated science in middle-level countries: Publication and citation patterns in superconductivity research in Canada, India, and Australia in the pre-high T_c superconductivity era. *J. Sci. Ind. Res.* 49:53-60.

Appendix I. Countries of authors publishing in Volumes 1-3 (1987-1990) of Asian Fisheries Science, showing number of authors from each country with number of papers of which they are authors, in parenthesis.

Australia	17	(11)
Bangladesh	13	(7)
China	3	(1)
France	2	(2)
Germany (West)	1	(1)
India	25	(9)
Iraq	1	(1)
Japan	3	(1)
Kuwait	4	(2)
Malaysia	8	(4)
Nepal	1	(1)
Philippines	22	(12)
Singapore	2	(2)
Sri Lanka	14	(9)
Taiwan	10	(5)
Thailand	2	(1)
UK	5	(4)
USA	6	(4)