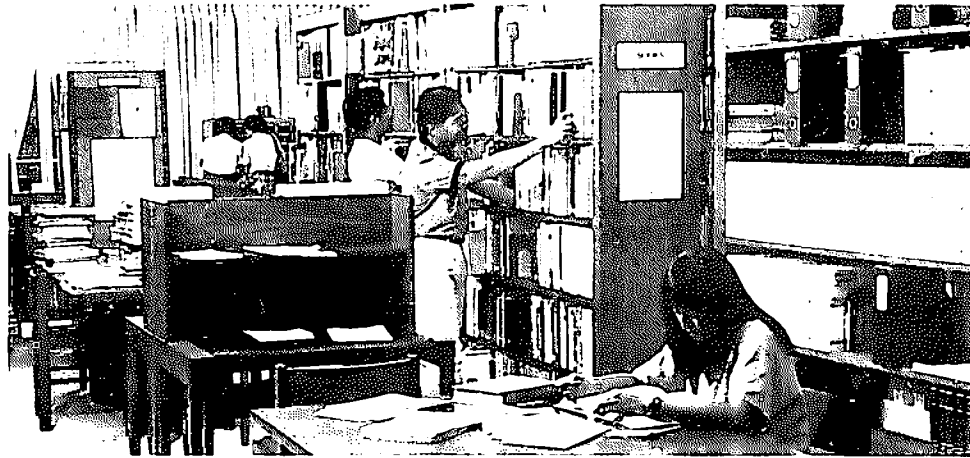


# Measuring ICLARM's Impact on Research and Researchers



**F**or a research organization such as ICLARM which carries out long-term basic research, justifying money spent can be a difficult exercise. The main output of ICLARM's work is a series of technical publications, the center's primary audience being the fisheries scientific community.

ICLARM is well aware that the results of research must be published and disseminated, otherwise the research may as well not have been done. The Center's staff produced over 500 contributions to the literature in the period 1979-1988. But once distributed, how do we know the results are being used? In other words, how do we assess their quality? In today's world, quality has always to be translated into numbers; the price on a painting, for example.

Scientists, as well as artists, tend to find their work becomes more valuable in the somewhat distant future, as more people come to appreciate it. Unfortunately while the artist has the satisfaction of seeing larger and larger price tags on his/her works, the scientist does not. Nevertheless, if the scientist's work is properly done and published, then more and more people may appreciate it over time, through the publication.

When ICLARM has decided upon a research field, the first move has usually been to bring together experts in related fields to review the field and recommend directions for future research. Alternatively, a review is made by a staff member or on commission. These syntheses are themselves important tools for present and future workers in these fields. The results are published in book form for the benefit of such researchers.

ICLARM's library. Newer books, journals and reports on the shelves contain more and more references to ICLARM's work. Photo by Ramon Estarez.

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ICLARM

ICLARM publishes nearly all its own conference and research results. We can measure the "appreciation" of our publications by the number sold. For instance, published results of the first two areas reviewed way back in 1979, stock assessment and small-scale fisheries, were sold to about 900 individuals and libraries, in addition to the 300 distributed free to various fisheries departments in developing countries and to publication exchanging institutions. These numbers are about average. The world market for most fisheries publications is probably less than 1,000 copies. Good aquatic journals maintain subscriptions of up to 1,500 addressees. Most of the market consists of libraries.

Remarkable then were the sales of the proceedings of ICLARM's 1980 conference which reviewed the Biology and Culture of Tilapias (ICLARM Conference Proceedings 7, 1982) of 3,700 copies after several reprintings. (It has now been allowed to run out of print, although we still receive orders for it). Some other books have not been reprinted; their sales have been of the order of 1,000 to 1,700

copies, depending on the numbers published.

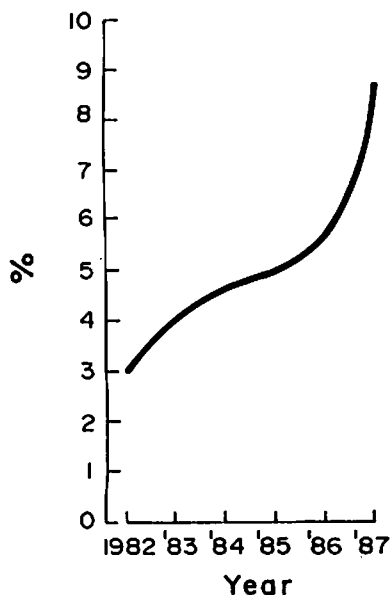
Distribution and sales as a measure of impact is rather unsatisfactory because, especially in developing countries, most copies of our publications probably reside in libraries. Are they read?

## Citation Analysis

One way to tell if the various publications are read is by citation analysis - counting the number of references to them in other persons' publications. This will not include all those persons who have read ICLARM articles, but at least those who have subsequently used the information in their own research and recorded the fact in the reference list of their research report. Finding out who cites ICLARM and where, however, is not an easy proposition.

In the western world, there is a bibliographic database, the Science Citation Index from the Institute for Scientific Information (ISI), USA, which includes all the references cited by each article in the database. Coverage of major journals of north America and Europe is apparently good. An enquirer can find out from these databases who has cited his or her article. Thus, authors in these regions can learn about research results in their field more recent than those they themselves published, as well as learning how "popular" their papers are.

This system, however, does not work in fields like tropical fisheries where the primary outlets are not major western journals but conference and report



This graph shows the proportion of ICLARM citations in reference lists of articles that cite at least one ICLARM article, over time.

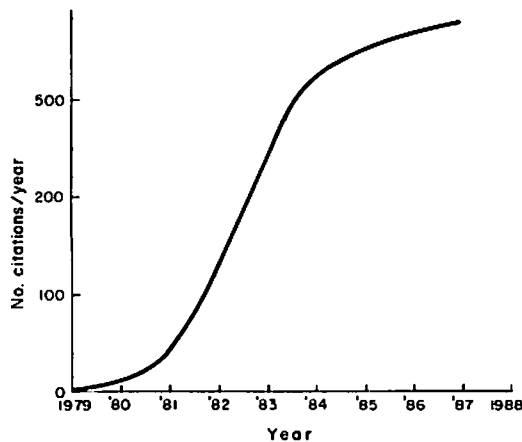
The graph shows that researchers using ICLARM publications have tended to use relatively more of them over time, suggesting an increase in the impact of ICLARM's work in these fields over time.

literature published by national organizations, often in very small numbers, and by regional/international organizations with wider audiences (like ICLARM and especially FAO).

### Counting the References

ICLARM's library has grown up with the Center and has specialized in ICLARM's areas of expertise. Many articles/books citing ICLARM are "on site". Since 1984, library staff have checked various incoming material for references to ICLARM contributions to the literature. One of our scientific staff, Daniel Pauly, had been gathering his own citations even longer (see ICLARM Newsletter, April 1984, p.6 for his findings). In February 1988, we made a pulse of additional citation searching over two weeks to cover material not previously checked and to browse through personal collections of staff in an attempt to find as many citations to ICLARM material as possible.

We found a total of 2,130 citations and, since we don't have even the majority of the world's recent literature on fisheries (the library specializes mainly in tropical fisheries), it is assumed that there were even more citations.



The graph above shows the overall growth in number of citations per year to ICLARM items. The increase is the result not only of increased publishing rate (there is also a decay rate for citations of individual articles) but also the increasing proportion of ICLARM citations in authors' reference lists.

The major kinds of publication in which ICLARM citations were found were technical reports (28%) of which FAO was the main publisher, followed by conference proceedings/papers (23%). ICLARM citations in the primary literature comprised 22%.

Some individual ICLARM articles were found to have been cited many times, the highest being 152! Our major best-selling conference proceedings volume mentioned above, on biology and culture of the freshwater fish tilapia, has been cited at least 285 times.

These citations are quite high when compared to those of the average scientific article which is only cited once, while about half of all the primary scientific literature (i.e. that in refereed journals) never gets cited at all! ICLARM is no exception to this rule. As far as we can determine, 53% of our journal articles had not been cited; the same was true even of conference proceedings papers.

An interesting feature was the growing proportion of ICLARM references cited by authors in their reference lists. For example in 1982, ICLARM articles constituted on average 4% of all papers cited in conference papers citing ICLARM. By 1987, the proportion had more than doubled. This figure was true of primary literature and theses/dissertations citing ICLARM, while in the technical report literature in which our articles were cited, the proportion increased from 3% in 1982 to 15% in 1987.

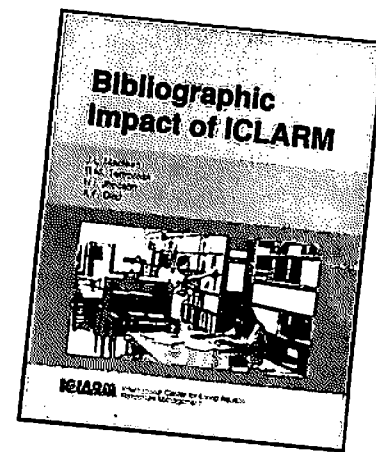
The geographic spread of citations of ICLARM's contributions shows that over half (58%) were in developing-country publications. In all we found references to ICLARM material in publications from 52 countries.

### Impact

ICLARM's major audience is intended to be the researchers who work in the applied fisheries and aquaculture fields in tropical, developing countries. Through them the Center seeks to further the science of fisheries and hence to improve management of fisheries resources and aquaculture. It would appear that ICLARM has been successful in impacting upon research and researchers, both in western and developing countries.

Many future documents that add to our knowledge of fisheries and which lead to better management practices, may perhaps not bear any further reference to ICLARM articles, but the Center is proud that its publications and other contributions have been useful, in some cases we believe critical, in the process of gaining this knowledge.

We learned much about the usefulness of our activities through this exercise, which can be done by any organization with access to good library in its field. Further details are available in the report "Bibliographic Impact of ICLARM", available from ICLARM and its distributors in Europe and the USA for US\$3.00 including airmail.



Jay Maclean is ICLARM's Acting Director General and the Editor of *Naga*; Linda Temprosa is the Center's Chief Librarian; Norma Jhocson is our Associate Librarian; and Fred Diaz is ICLARM's Systems Specialist.