WHERE IS MOSQUITO RESEARCH PUBLISHED?

VINCENT H. RESH,[1] NORMA G. KOBZINA,[2] FERENC DE SZALAY[1] AND DAROLD P. BATZER[1]

ABSTRACT. To identify the core journals that publish articles on mosquito research, the *Agricola* database (covering 1985–89 citations) was analyzed. This source contained 3,007 citations to mosquito research, and the citations were found in 404 different serials. Whereas 10 serials (2.5% of total serials) in *Agricola* produced 50% of the citations, almost one-half of the serials in this source contained only one citation to mosquito research. Fifteen journals (the core journals) contained >1% of total citations. The number of citations found among 126 different databases and abstracting services that were examined varied: 39 had no citations to mosquitoes, but 13 (including life-sciences, medical and even popular-literature databases) had >100 citations. The choice of core journals will be an increasingly important decision by biological libraries as costs for journal subscriptions rise.

The challenge that all scientific researchers and managers that implement mosquito research continually face is how to keep abreast of the immense volume of literature that is published. For example, every week thousands of scientific papers are published that could be of potential interest and importance; these articles are published in an estimated 30,000–100,000 different scientific publications (Kronick 1985). The number of indexes and abstracting services that attempt to include these papers in their databases has grown rapidly.

The purpose of this paper is to present information on where mosquito-research literature is currently published. Similar studies in a number of other scientific fields have shown that there is a core of literature that appears in a relatively small number of journals (which are usually referred to as "core journals"), so that despite the proliferation of papers and scientific journals it is still possible to maintain current awareness by scanning these key journals. This paper presents a list of core journals for mosquito research. However, for a complete survey of the literature, there are other journals with proportionally few citations on a topic but contain articles that may prove to be especially important. These references in non-core journals are generally found through specialized indexes and abstracting services, which this paper examines as well.

To develop a list of core journals, we examined the *Agricola* database, which is produced by the National Agricultural Library, and is the online equivalent of the *Bibliography of Agriculture*. The *Agricola* database, which indexes 2,120 journals, was searched using a CD-Rom (which stands for Compact Disk—Read Only Memory) disk on the SilverPlatter system; the dates covered on the disk were 1985–89 inclusive. Terms used for the search were: "mosquito," "anopheles," "aedes," "culex" and "culicidae." No attempt was made to combine these words with any other concept or key word (e.g., "control" or "disease").

The citation characteristics of the database surveyed are as follows: In *Agricola*, from 1985 to 1989, there were 3,007 citations appearing on mosquitoes. The total number of serials containing these citations was 404. The mean number of citations per specific serial was 7.4, and only 10 serials (2.5% of total) produced 50% of the total citations; in contrast, 190 serials (47.2% of total) had only one citation to mosquitoes.

The above characteristics are similar to the results of other citation studies previously done on aquatic insects (Resh 1985, 1988). Not surprisingly, the analysis of the citations in *Agricola* also showed that a series of core journals did contain a major share of the scientific literature on mosquitoes. For example, there were only 15 serials that had more than 1% of the total number of citations in *Agricola* (Table 1). As has been shown in other fields, what has come to be known as "Bradford's law of scattering" also applies to mosquito-research literature. This law refers to a phenomenon represented by Bradford in 1934 that there is a "nucleus of periodicals particularly devoted to the subject" for any given topic (Bradford 1934).

An examination of the list of core journal titles (those which contained more than 1% of the citations in *Agricola*, Table 1), showed that the highest number of citations appeared in the *Journal of the American Mosquito Control Association*, and the second highest was in the *Journal of Medical Entomology*. These 2 journals would intuitively be placed at the top of a core list. Interestingly, 2 California-centered research publications were third and fourth on this list, and they contained more citations than several national and international journals (Table 1). However, there are journals such as *Bulletin of the Society of Vector Ecology, Chinese Journal of Parasitology and Parasitic Diseases, Excerpta Medica International Congress Series, Indian Journal of Malariology* and *Indian Journal of Medical Research* that would be expected

[1] Department of Entomological Sciences, University of California, Berkeley, CA 94720.
[2] BioSciences Library, University of California, Berkeley, CA 94720.

Table 1. Journals comprising >1% of citations in *Agricola* (1985–89) examined.

Journal	No. of citations (% total citations)
Journal of the American Mosquito Control Association (including Mosquito News)	553 (18.4)
Journal of Medical Entomology	209 (7.0)
Proceedings and Papers of the Annual Conference of the California Mosquito and Vector Control Association	166 (5.5)
Mosquito Control Research, Annual Report (University of California)	125 (4.2)
Mosquito Systematics	101 (3.4)
Journal of Invertebrate Pathology	94 (3.1)
American Journal of Tropical Medicine and Hygiene	82 (2.7)
Eisei Dobutsu (Japanese Journal of Sanitary Zoology)	65 (2.2)
Journal of the Florida Anti-Mosquito Association	62 (2.1)
Proceedings: Annual Meeting—New Jersey Mosquito Control Association	54 (1.8)
Journal of Parasitology	44 (1.5)
Transactions of the Royal Society of Tropical Medicine and Hygiene	44 (1.5)
Bulletin of Entomological Research	40 (1.3)
Journal of Insect Physiology	34 (1.1)
Cahiers O.R.S.T.O.M. Série Entomologie Médicale et Parasitologie	32 (1.1)

to be included (and in fact are represented in the 1985–89 citations in the bibliography of Barr 1989), but according to the *Agricola* data base these journals had no citations. This is because in *Agricola* (and other databases as well) there is a limited amount of indexing codes assigned within descriptor fields, and only about one-half of the file contains abstracts; therefore, the words searched must be in the title in many cases, or in the descriptor field. There is a controlled vocabulary of terms in the descriptor field but it is not consistent or as thorough as in some other files. However, indexers do augment the title at times with extra keywords, but again this is inconsistent.

The core-journal list of mosquito research based on the *Agricola* data base has no serials in common with the core-journal list of 5 aquatic insect groups examined by Resh (1988). Thus, although mosquitoes are usually treated as aquatic insects in courses or textbooks dealing with aquatic entomology, in terms of where research is published they are clearly separate fields.

To determine which specific indexes and abstracting services contain extensive numbers of mosquito-related citations, a search was run on the CROS file, which is a file that lists the number of times a term appears in all of the databases in the extensive BRS system (BRS Information Technologies). The BRS is an online retrieval system that includes approximately 100 databases, most of which index bibliographic citations from the early 1970s onward. This search examined how often the above-listed keywords appear across all disciplines, including the humanities, social sciences and business, as well as the life sciences. In addition, some full-text databases (databases that include the entire text of articles or book chapters as compared with just a bibliographic citation in other databases) were included, as were indexes of popular and other types of literature, e.g., *Magazine Index*, *Academic American Encyclopedia* and *Predicasts* (which is a business database).

An analysis of the number of citations over a longer time period than 1985 to 1989 and across a variety of databases on the CROS file, shows that the number of citations varies greatly. For example, of 126 databases examined on the CROS file using the word "mosquito," 39 had no citations at all but 13 databases had over 100 citations (a list of these results are available from us on request). Many citations are found in some of the medically oriented indexes. For example, with "mosquito": *Toxline*, the toxicology file of the National Library of Medicine, had 797 citations from 1965 to October 1989; *Medline*, the National Library of Medicine file, had 1,760 references in the 6-year period 1983–89, and the backfiles (1966–82) had a relatively high number (2,185) as well; *Embase*, the Excerpta Medica file, had 2,286 citations from 1974 to 1989.

As expected, indexes of life sciences literature had high numbers of citations. For example, *Zoological Record*, which is often viewed as primarily covering the taxonomic literature, had 3,296 citations for "culicidae" (but only 2,591 for "mosquito") over the 11-year period 1978–October 1989. Other key databases found in terms of numbers of citations in response to "mosquito" were: *Biosis Previews*, which had 5,658 references from 1978 to Oct. 1989; *CAB Abstracts*, which had 10,005 references from 1972 to August 1989 (perhaps because this file includes the *Review of Applied Entomology* as

well as some of the veterinary literature); and *Cambridge Scientific Abstracts*, which had 1,887 citations from 1981 to August 1989. The importance of the topic is also evident when analyzing the popular literature. *Magazine Index*, for example, which provides coverage of newspapers and popular magazines, yielded 224 references since 1959.

The core list of journals in Table 1 is a starting point for better literature coverage by both researchers and research managers. Computer searching, although useful, is expensive because the user pays for the cost of each citation as well as online time. The advent of databases on CD-Roms is a useful change, but it must be remembered that the purchase of such systems will shift the burden of the cost from the researchers to the libraries that provide them; this may subsequently affect the capability of libraries to subscribe to all of the necessary journals. In addition, with the rise in prices of journal subscriptions, it is likely that even major research libraries will no longer be providing as many of the journals as they have in the past. In the future, libraries and researchers may have to consider tradeoffs among journal subscriptions, purchase of CD-Roms, and the costs of conducting searches on databases online. This, of course, underscores the need to establish what journals comprise a core-journal list for a specific research field.

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