PUBLICATIONS OF SCIENTISTS IN DEVELOPING COUNTRIES: NATIONAL AND INTERNATIONAL PRODUCTION OF ARGENTINIAN ECOLOGISTS

Jorge E. RABINOVITCH
Investigador Principal
Consejo Nacional de Investigaciones Cientificas y Tecnicas
Casilla 1395, Correo Central
1000 - Buenos Aires, Argentina

ABSTRACT

The production of articles by Argentine ecologists is examined both in local journals as well as in SCI. A careful analysis of the citation patterns of local and international production shows that argentine ecological sciences are not visible. In particular, local production would have been totally unknown to foreign ecologists if there were no argentine authors writing in international journals.

RESUME

La production d'articles scientifiques des écologistes en Argentine est examinée à travers les revues locales et la production dans des revues internationales identifiées dans le SCI. Une analyse des citations des revues nationales et internationales montre que la production locale est pratiquement inconnue des auteurs étrangers et qu'elle n'aurait jamais été citée si des auteurs Argentins n'avaient pas publié dans des revues internationales.

INTRODUCTION

There are very few studies on the scientific production of Argentina. They usually range from extremely general (Quesada Allué, in press; Velasco, 1983a, 1983b) to extremely specific ones, as a study of scientific production in the area of limnology (Gabellone et. al., 1987). The present paper shows the results of a study of argentine scientists working in one particular field: ecology. The study had a fairly specific objective: to try to evaluate the importance of argentine authors that publish both in national and international journals as a channel for international detection of argentine colleagues that publish only in national journals.

METHODS

The articles that appeared in the last 25 years in 22 argentine periodical journals (see Annex 1), where biologists (and among them ecologists) publish normally, were analyzed individually. As these journals are not specialized in ecology, a careful definition of the criteria for what kind of article would be considered eclogical was in order.

Articles both academic as well as applied were included in the study. Examples of the types of subjects covered in basic ecology are:

- Interactions between one or several abiotic factors with individuals, populations, or communities
- Interactions between individuals, and between populations
- Geographical and/or tempo-spatial distribution of species
- Seasonal cycles, primary productivity, trophic webs
- Migrations and dispersal
- Population dynamics
- Structure and diversity of communities

Examples of the types of subjects covered in applied ecology are:

- Man's impacts on population, communities, and ecosystems
- Renewable natural resources management
- Pest control
- Preservation and conservation of habitats and species
- Public health and medical ecology (vectors of diseases)
- Legal and administrative aspects of some of the above

With these criteria at hand, the stacks of seven University libraries were checked for all numbers of these journals for the last 25 years (1963-1988). However, the first 15 years of most of these journals were very irregular, and many of the results here presented are given for the period 1978-1988. When a larger period was considered it is indicated.

The following information was registered: last name and initials for the first author and all coauthors of an article, institution of first author, province of that institution, name of journal, volume, number and year of publication of journal, title of the article, numbers of first and last page, and a subject and a methodological classification of the article (details of the classification can be provided by the author on request).

Additionally, the Science Citation Index (SCI) data base was consulted; however, due to budgetary constraints, only the 1988 information was available for consultation. Thus the comparisons between international and national rates of publication are limited by this restriction; nevertheless, still many useful relative indicators could be produced. The SCI data base was consulted by searching as cited authors the names and initials of the ecologists that were found to publish in the Argentine journals as first authors.

From the results of the SCI search the following information was registered: last name and initial of cited author, year of publication cited, name, volume and

number of journal cited, last names of authors that produced the citation, as well as the name, volume, number and pages of the article source of the citation.

By inspection of the names of people and journals, an additional information was recorded: nationality of the authors that produced the citation, kind of work that produced the citation (article, review, or note, as well as its language), and the relation-ship between the authors cited and the authors source of the citation ("citing" authors); for the latter the following four classes were used: 1) self-citation, 2) citation by argentine colleagues (either of the same institution or not), 3) citation by other Latin-American colleagues, and 4) citation by authors from outside the Latin American region. When the establishment of the relationship was dubious, that record was classified as undetermined, and eliminated from certain analyses.

Finally each citation was classified by ecological subject (plant ecology, animal ecology, aquatic ecology, taxonomy, and a "various" ecology that included more specialized disciplines such as chemical ecology, epidemiology, climatology, paleoecology, and evolutionary ecology).

For determining the relationship between citing and cited authors (apart from the obvious self-citation case) the institution and/or the country of origin of the citing authors had to be established. I resorted to international directories of ecological societies (ESA, 1988; Misra, 1983; BES, 1986; SPE, 1980), if not found or in case of uncertainty the citing article was checked physically. Local and national directories (Prosag, 1986; CERZOS, 1986, 1987; Villar, 1988) were used for the institutional origin of Argentine ecologists; however, the main source for the Argentine ecologists' identification was SPIDER's directory (SPIDER, 1989), with a data bank with over 1,000 people, with personal, institutional and research subject information.

The information was entered as tables in a PARADOX data base for PCs. An AT equipment was used, with extended memory that could be used as a virtual disk, accelerating all the searching procedures, particularly cross-searches between tables.

The presentation of results is divided in three parts: the national rates of publications, the international rate of publication as given by the SCI for 1988, and the relationships between national and international production.

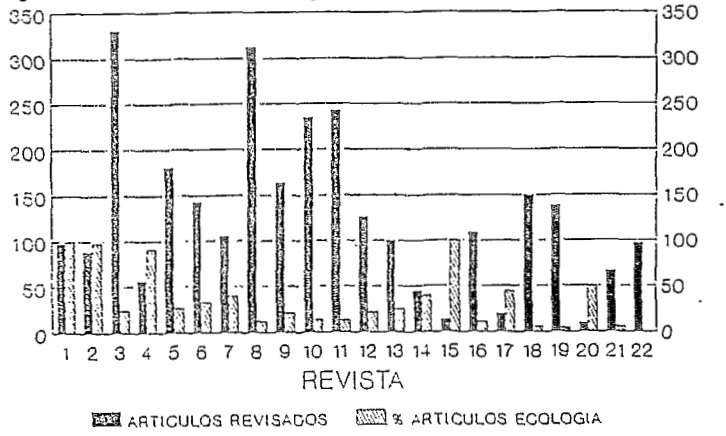
RESULTS

1. Scientific production of Argentine ecologists in Argentine journals

The search in the 22 Argentine journals resulted in a broad and irregular distribution of ecological articles per journal (Fig. 1): from zero to 100% ecological articles. There were a total of 722 articles of an strict ecological nature, that were produced by 404 first authors. All the information was stored in what

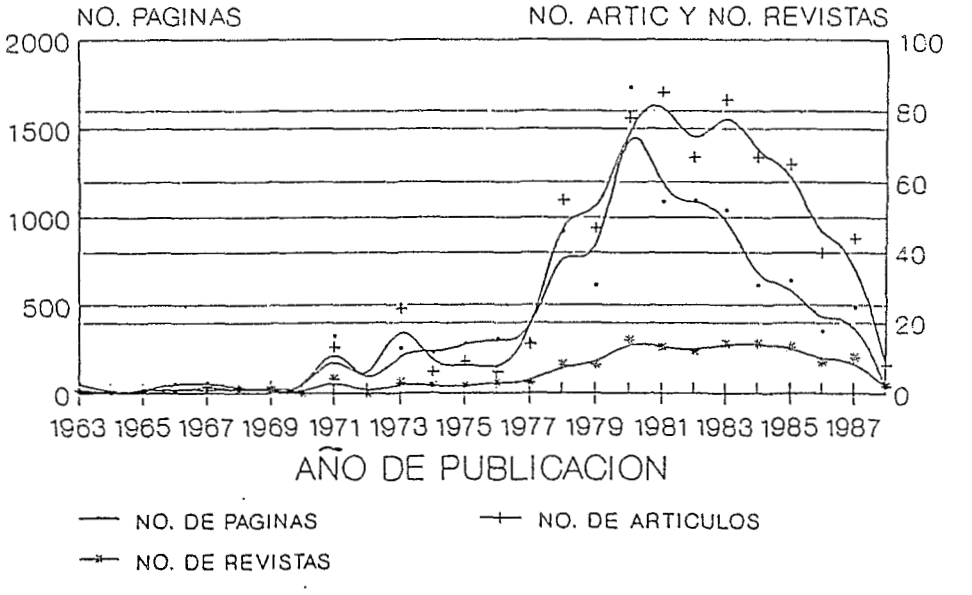
will be called below the Argentine Ecological Data Base (AEDB). The annual production shows a strong growing tendency up to about 1980 (depending upon if the indicator used is the number of pages or the number of articles), and then a sustained decline (Fig. 2).

Figure 1. Results from the search of ecological scientific articles in 22 argentine periodical journals from 1963 through 1988.



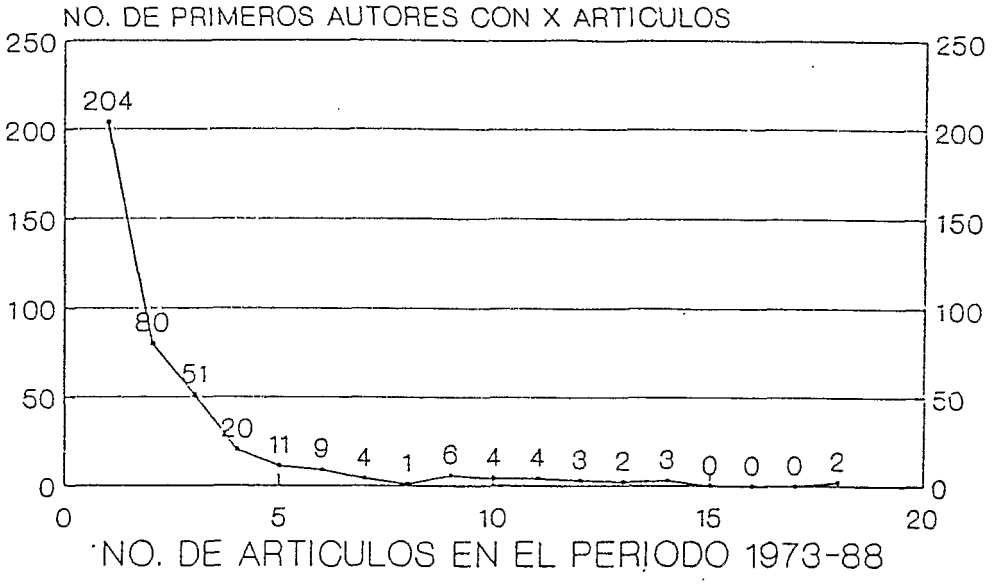
The numbers of the horizontal axis correspond to the name of the journals as they appear numbered in Annex.

Figure 2. Annual variation in the publication rate of ecological scientific articles in 22 argentine periodical journals from 1963 trough 1988.



The *per capita* production rate shows the classical decaying exponential form for larger number of articles per author (Fig. 3).

Figure 3. Per capita productivity of Argentine ecologists between 1973 and 1988, as indicated by the number of articles published by first author.



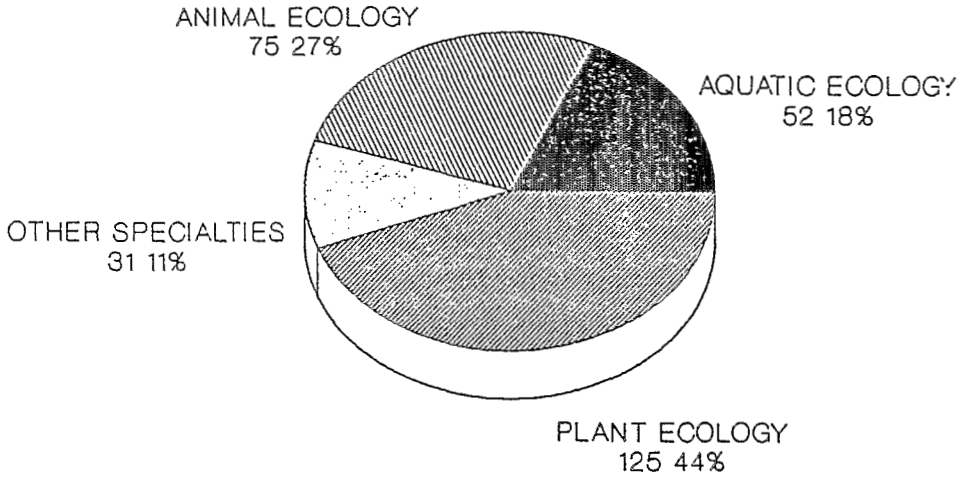
2. Citation of Argentine ecologists in the SCI 1988 Data base

From the 404 first authors of the AEDB that were entered in the 1988 SCI data base, a total of 318 citations were obtained; of these 35 (11%) were articles in plant or animal taxonomy, and were eliminated from the analysis; the remaining 283 citations were dominated by plant ecology works (44%), followed by animal ecology papers (27%), and aquatic ecology (18%); the other specialties amounted for only 11% of the total citations (Fig. 4). These 283 citations of ecological articles were published by 88 different (first) authors, that is, with an average rate of 3 . 22 articles per author.

The annual distribution of the 283 ecological citations found in the 1988 SCI data base shows a peak in 1985 (Fig. S), which coincides with the accepted fact that the mode in the number of citations used in most references lists is usually not older than 2-3 years (Schubert et. al., 1988).

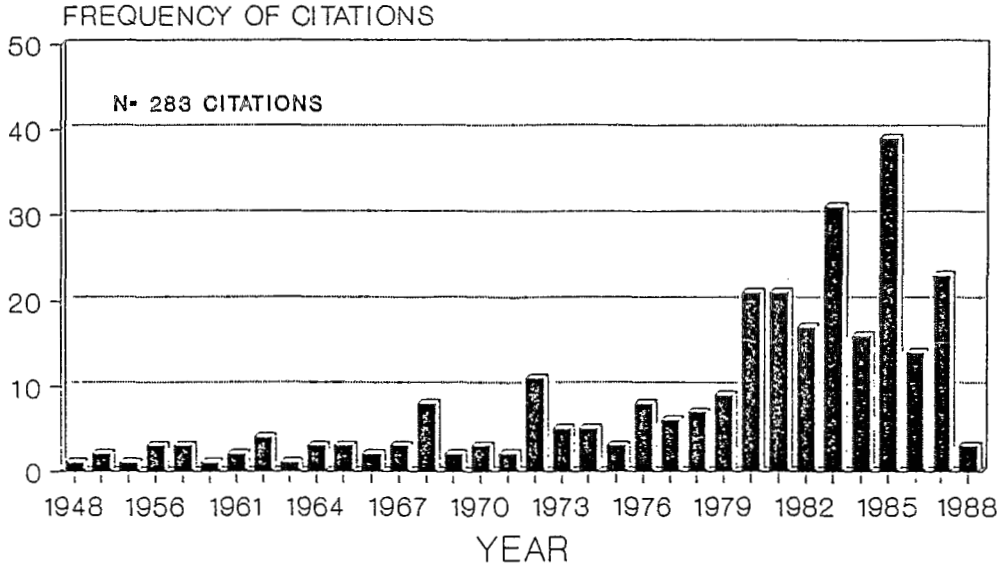
Table 1 (cf annex) shows some of the quantitative results of the frequency of citations grouped by origin of the cited paper, average number of citations per citing article, by nationality of the citing authors, by type of citing article, language of the citing paper, and the cited/citing authors' relationship.

Figure 4. Percent of ecological fields present in the argentine ecology citations in the 1988 SCI data base.



N = 283 (taxonomy excluded.

Figure 5. Annual citation of publications by argentine ecologists from the 1988 SCI data base.

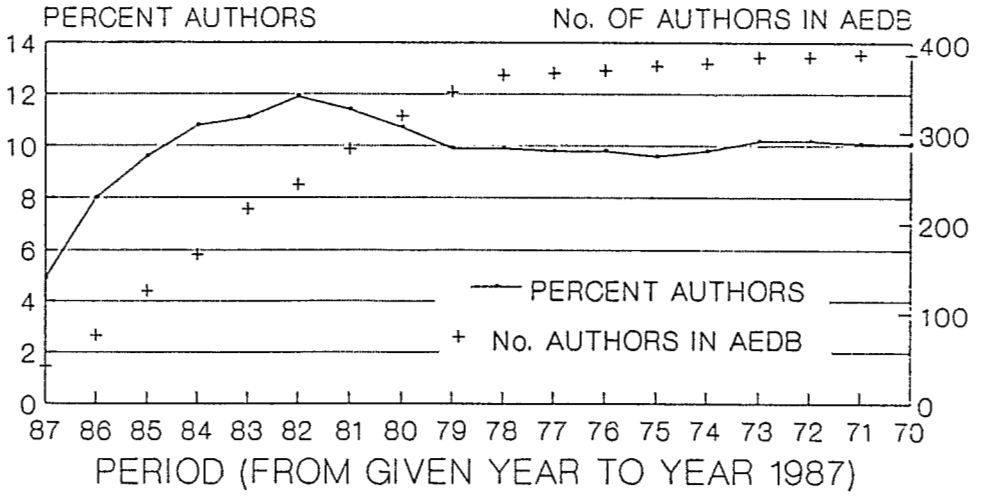


It was of interest to evaluate some cross-tabulations, such as the intersection between origin of the cited paper and relationship between cited/citing authors; the results (Table 2 cf. annex) show that in terms of the number of citations the relationship with colleagues is very close to the one with apparently independent citing authors; self-citations account for a lower number, but is not trivial at all.

3. Relationship between the Argentina Ecology data base and the 1988 SCI

Comparing the number of different authors retrieved from the SCI search (N=88) with the list of first authors of the AEDB, the number of common authors varies depending upon the number of years used in the AEDB; however, the percent of authors of the SCI data base that is found in the AEDB stabilizes at about 10%, after reaching a flat peak of near 12% shown for the period 19821987 (Fig. 6).

Figure 6. Percent of the argentine authors in the 1988 SCI data base that published in the Argentine Ecology Data Base (AEDB) in cumulative periods between 1970 and 1987.



Note: maximum N for SCI = 283; maximum N for AEDB = 404.

When the number of citations of the SCI data base is restricted to argentine journals and compared with the AEDB, I obtained that only 50 first authors of the AEDB (that is, 50/404= 12.4%), represented by 126 articles (that is, 126/722= 17.5%), had been cited in the SCI; however, when a one to one comparison is

made between the articles of the AEDB and the ones cited in the SCI, only 16 (that is, 16/722= 2 . 2%) specific articles of the AEDB appeared in the SCI; the other 110 citations were not in the AEDB because: a) it was a "grey publication" and not an argentinean periodical journal, and/or b) it was not an ecological publication (frequently an ecological article cites many taxonomic publications). In terms of authors, only 3.7% (15 out of 404) were cited in the SCI .

When the comparison was made taking into account the relationship between "cited/citing" authors I obtained that, from the 16 publications of the AEDB cited in the SCI, one citation was a self-citation, one was made by a Latin-American colleague, three were made by apparently independent authors, and eleven (68 . 8%) by Argentinean colleagues (generally of the same institution).

DISCUSSION AND CONCLUSIONS

Blickenstaff and Moravcsik (1982) claim that only 31.2% of scientific and technical articles published in the World are detected using the international data bases and the best libraries of the developed countries. Quesada-Allué (in press) found that approximately 50-60% of argentine publications in scientific journals are detected in the international circuits.

Our study shows that about 30-40% (when restricted to the years 1983-1985) of all publications by argentinean ecologists are detected in the SCI; lor those same years, in terms of the number of authors, the proportion detected drops down to less than 12%.

However, considering only argentinean journals, the picture is very different; when the proportion citations of the argentinean publications of the ecological data base (AEDB) was compared one by one with the citations of argentinean ecologists that appeared only in argentine journals in the 1988 SCI, only a 2.2% was found. When the source of the citations was analyzed almost 70% of that 2.2% figure originated in argentinean colleagues.

If we evaluate the representation of the three citations made by apparently independent authors the figure drops down to 0.4% (3/722). Thus, it is concluded that the detection of argentinean publications in the international circuit is very low, and that if it would not be for a relatively small number of argentinean colleagues that publish in international journals, their detection in the international arena would have been nil. If this is also true in other fields of argentinean science or in other developing countries cannot be at this time asserted.

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ANNEX

Table 1. Frequency analysis of 283 citations of argentine ecologists cited in the 1988 Science Citation Index, grouped by different parameters (percent in parenthesis)

Origin of the journal in which the article was cited	No. of citations with that origin		No. of cit. of a given author that was found in one citing article	No. of cases with that Nb. of citations	
International	152	(53.7)	1	160	(56.5)
Argentinean	99	(35.0)	2	58	(20.5)
Local manuscript	25	(8.8)	3	34	(12.0)
Lat. Amer. Journal	7	(2.5)	4	12	(4.2)
			5	5	(1.8)
			6	7	(2.5)
			7	7	(2.5)

Country where the citing article was produced	No. of cit. with that origin		Type of citing publication	No. of citations	
Argentina	145	(51.2)	Article	246	(86.9)
Other	109	(38.5)	Note	27	(9.5)
Latin American	18	(6.4)	Review	11	(3.9)
Undetermined	11	(3.9)			

Language of the cited article	No. of citations		Relationship between cited and citing authors	No. of Citations	
English	256	(90.5)	Argentine colleague	112	(39.6)
Spanish	14	(5.0)	No apparent relation	106	(37.5)
German	11	(3.9)	Self-citation	42	(14.8)
French	2	(0.6)	Latin-American colleague	18	(6.4)
			Undetermined	5	(1.7)

Table 2. Number of cited authors and number of citations (in parenthesis) cross-tabulated by origin of the cited article and cited/citing authors' relationship.

	RELATIONSHIP									
ORIGIN	self-citation		Argentine colleague		Latin American colleague		Apparently independant		TOTALS	
Local manuscript	4	(6)	13	(15)	1	(1)	3	(3)	21	(25)
Argentine journal	3	(8)	39	(59)	6	(6)	15	(23)	63	(96)
L-American journal	O	(0)	2	(4)	2	(2)	1	(1)	5	(7)
SCI journal	12	(28)	15	(34)	3	(9)	32	(79)	62	(150)
TOTALS	19	(42)	69	(112)	12	(18)	51	(106)	151	(278)

(Five cases of undetermined relationship were left out of the analysis).

Names of the argentine periodical journals revisited

1. ECOSUR
2. ECOLOGIA
3. PHYSIS
4. DESERTA
5. REVISTA DE LA FACULTAD DE AGRONOMIA, UNIV. BUENOS AIRES
6. REVISTA DE INVESTIGACIONES AGROPECUARIAS
7. LIMNOBIOS
8. NEOTROPICA
9. EL HORNERO
10. REVISTA DE LA SOCIEDAD ENTOMOLOGICA ARGENTINA
11. HISTORIA NATURAL
12. AMBIENTE Y RECURSOS NATURALES
13. ACTA ZOOLOGICA LILLOANA
14. REVISTA DEL MUESEO DE LA PLATA (SERIE ZOOLOGIA Y BOTANICA)
15. REVISTA DEL MUSEO DE CIENCIAS NATURALES "BERNARDINO RIVADAVIA" (SERIE ECOLOGIA)
16. CIENCIA DEL SUELO
17. ANALES DE PARQUES NACIONALES
18. DARWINIANA
19. MEDIO AMBIENTE Y URBANIZACION
20. IADIZA (CUADERNOS TECNICOS)
21. LILLOA
22. REVISTA ARGENTINA DE PRODUCCION ANIMAL