

Research Article

Scientometrics of the genus *Macrobrachium* by using the regional PERIODICA database

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ABSTRACT. In order to provide information on the development status of the *Macrobrachium* genus study in Latin America, the results of the scientometric analysis of 161 documents published between 1976 and 2016 in journals of the region, managed from the PERIODICA database, are presented. The current status of the genus *Macrobrachium* is described in the above geographical area. Results are presented on the years of generation of articles, species studied, main themes treated, journals, most representative authors, countries and language. The most productive countries are Brazil and Mexico. The contents were written in Portuguese as the preponderant language, followed by Spanish. The main topics covered are culture, ecology, food-nutrition, physiology and reproduction, and the least discussed were biology, pathology, food technology, genetics, molecular biology and behavior. The most studied species are *M. rosenbergii*, *M. acanthurus*, *M. carcinus* and *M. amazonicum*. The most representative authors are V.L. Lobao, W.C. Valenti, J.V. Lombardi and C. Graziani.

Keywords: *Macrobrachium*, regional database, science, prawn, Latin America.

INTRODUCTION

In order to obtain a total scenario in the study on the knowledge generated on the genus *Macrobrachium*, a comprehensive vision is required that does not only focus on the large databases of Web of Science or Scopus, but take in account the production of scientific articles collected in journals of developing countries, poorly represented in the mentioned databases. Using regional databases overcomes the bias of the registration of scientific production related to geographical areas and language (Michán *et al.*, 2008). Russell (1998) mentioned, decades ago, that science of peripheral countries is published mostly through national or regional magazines, where only part of the mass of researchers published in international journals of high impact and usual visibility. This fact seems to be maintained until these days. The largest number of scientific journals in Latin America and the Caribbean

remain in a vicious circle: due to the fact that they are not cited, they are not in the citation indexes and because they are not in these, they are not cited. Therefore, much of Latin American research could be classified as "lost science" (Aguado-López *et al.*, 2003). The regional PERIODICA database, has the characteristics required to offer a new perspective, integrating journals that are not considered in other, transnational and with an obvious commercial profile. It was created in 1978 at the National Autonomous University of Mexico (UNAM) and to date has about 350,000 bibliographic records of original articles, technical reports, case studies, statistics and other documents published in nearly 1,500 journals in Latin America and the Caribbean, specialized in science and technology. It is considered the information system with the most complete universe of academic journals published in the region (Michán, 2008) and the number of articles registered is an order of magnitude greater

than the contents of the region in any other database with scientific literature such as SCI, Scopus, Pascal, CA, Biosis, CAB, Medline, Inspec and Compendex (Michán, 2009).

Based on the above, the objective of the present study is to show the scientific production on the genus *Macrobrachium*, derived from published manuscripts, which has been developed in a regional way and has been published in journals of the same character.

MATERIALS AND METHODS

The research consisted of a search of the descriptor *Macrobrachium* in the field 'title' of the scientific documents contained in the selected database. Recovery, migration, standardization, validation and analysis of the managed information were performed. For each record, 14 fields were retrieved, from which eight fields (author, institution, title, journal, language, country, year and keywords) were finally required to comply with the research design. The records were processed in Word® and loaded into Microsoft Office® Excel for organization and analysis. Records that lack relevant information were discarded. A content analysis of the titles and abstracts was made to determine the species studied within the genus *Macrobrachium*. Later the construction of matrices of data that were used for statistical analysis and corresponding figures in Excel Microsoft Office® were performed.

RESULTS

A total of 161 documents were obtained under the title *Macrobrachium*, 48% of them published in Portuguese, 37% in Spanish and 15% in English.

The production of manuscripts published and recorded in PERIODICA database from the 1970s to 2016, comparing this with the Scopus and Web of Science databases is shown (Fig. 1). The trend of PERIODICA records has remained almost stable but with a downward trend, while those of the other two bases shows a clear upward trend. The maximum peak of registrations in "Periodic" is in 1996 and coincides with peaks of greater registries in the other two bases in that same year.

The species that have been addressed in the publications on *Macrobrachium*, registered in PERIODICA are shown (Fig. 2). *Macrobrachium rosenbergii* shows the highest number of records with more than 50%, while the native species of America (23 registered) appear with smaller percentages. The five native species of the Americas with the highest numbers are *M. amazonicum* (13%), *M. carcinus* (11%), *M. acanthurus* (11%), *M. tenellum* (8%) and *M. borelli* (7.4%).

The themes identified in the scientific publications on *Macrobrachium* recorded in PERIODICA are presented (Fig. 3). The most important topics in descending order as a percentage of total records are: culture (17%), ecology (14%), food/nutrition (13%), physiology (11%), reproduction (11%) and morphology (8%). These topics represent more than 80% of all records obtained.

The countries of origin of the journals, registered in PERIODICA, which have published scientific articles on the genus *Macrobrachium* are shown (Fig. 4). Only Brazil corresponds to more than 60% of the total with 101 published manuscripts (of 161). Mexico ranks second with 16% (26 scientific articles), followed by Venezuela with 9% (15) and Costa Rica with 6% (10), the rest of countries (Colombia, Cuba, Peru and Argentina) together they provide 6% of records (9).

The scientific-technical journals that have contributed scientific publications on the genus *Macrobrachium*, registered in PERIODICA in descending order are shown (Fig. 5), the journals and countries of origin of the journals with at least three historical records are shown: Boletim do Instituto de Pesca (Brazil), Brazilian Journal of Biology (Brazil), Acta Scientiarum (Brazil), Revista de Biología Tropical (Costa Rica), Boletim de Fisiologia Animal (Brazil), Acta Amazonica (Brazil), Anales del Instituto de Ciencias del Mar y Limnología (Mexico), Revista Brasileira de Zootecnia (Brazil), Boletín del Instituto Oceanográfico de Venezuela (Venezuela), Ciencia e Cultura (Brazil), Anais de Academia Brasileira de Ciencias (Brazil), Boletim Tecnico-Cientifico do CEPNOR (Brazil), Interciencia (Venezuela) y Oceanologia (Mexico). Brazilian journals represent 60% of the total of the 15 journals with more than three publications registered in PERIODICA.

Authors with at least three publications on *Macrobrachium* registered in PERIODICA are presented, in ascending order of number of publications (Fig. 6). Outstanding L. Lobao-Vera, W.C. Valenti and J.V. Lombardi (Brazil) and C. Graziani (Venezuela) as the most productive authors historically. There are forty additional authors with only two published manuscripts.

The number mentions of institutions of authors involved in publication on *Macrobrachium*, with at least three published manuscripts registered in PERIODICA are shown (Fig. 7). Brazilian institutions represents more than 50% of the total. Universidade Estadual Paulista and Instituto de Pesca are the most productive institutions in Latin America.

The mentions number of the country of institutions of involved authors in publications on *Macrobrachium* are shown (Fig. 8). Brazil represents the most mentioned country of author affiliations, outstanding too Mexico and Venezuela, far below.

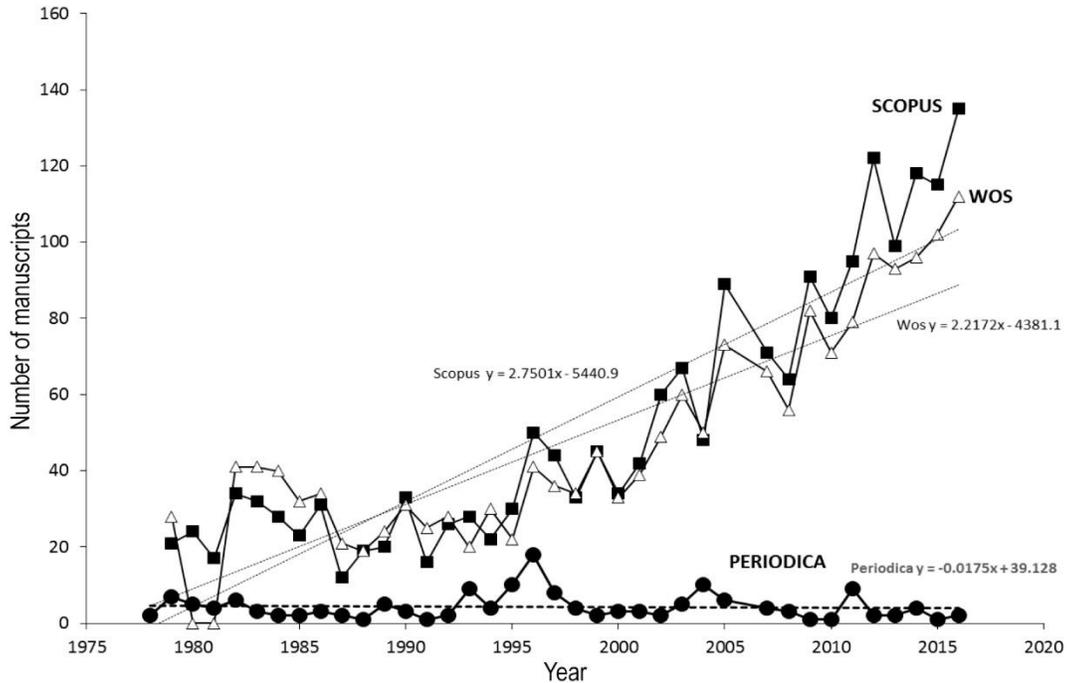


Figure 1. Production of manuscripts on *Macrobrachium* recorded in PERIODICA database from the 1970s to 2016, comparing this with the Scopus and Web of Science databases. Marks: square = Scopus, triangle = Web of Science, circle = PERIODICA database. Dotted lines = Trends.

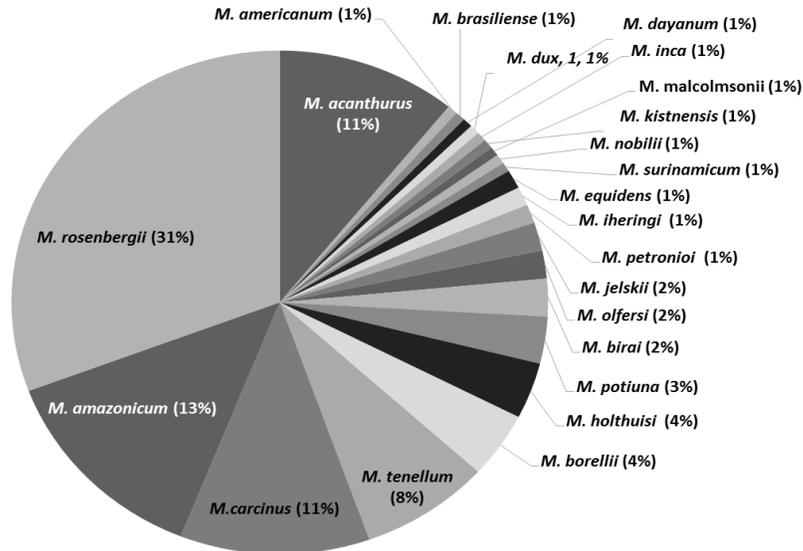


Figure 2. Species in the publications on *Macrobrachium*, registered in PERIODICA database.

DISCUSSION

It is contradictory that, as the world production of *Macrobrachium* has increased, the presence of publications on the genus in PERIODICA database shows a decline. This does not mean that in Latin America there has been a decline in research on *Macrobrachium*, but rather that researchers-authors

have probably chosen as repositories of their publications to high-impact journals outside the region. This is a dilemma that has several causes: the lack of stability in several publications in the region, the limitation that constitutes the language to achieve visibility and the subsequent impact generated by the citations received (Van Raan, 2001). They also influence the demands of the authors' own institutions,

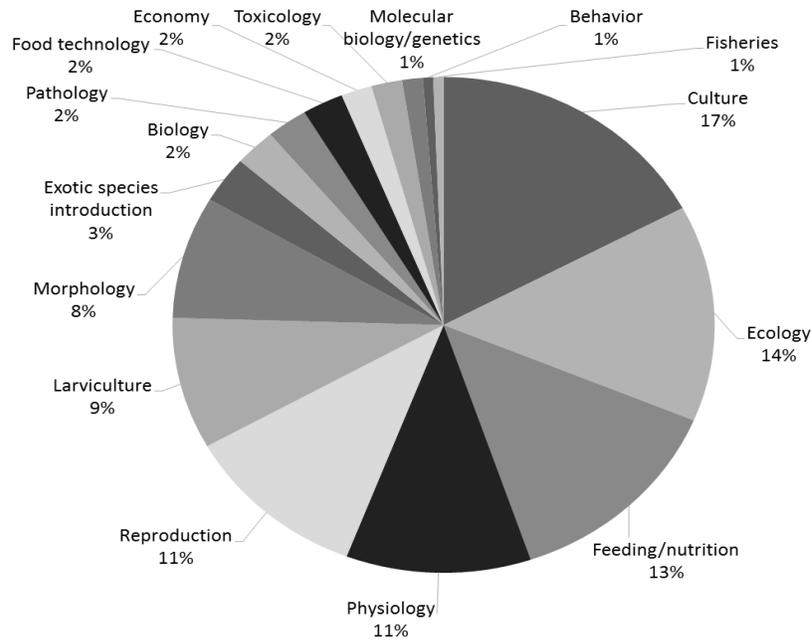


Figure 3. Themes in the scientific publications on *Macrobrachium* recorded in PERIODICA database.

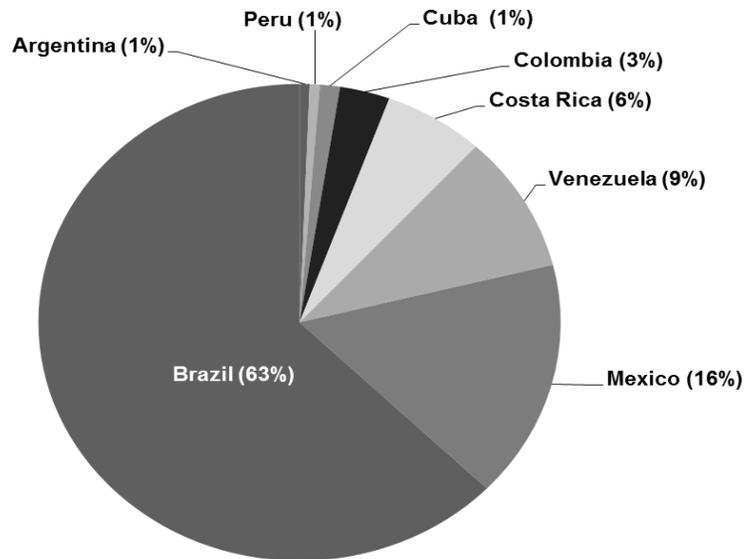


Figure 4. Countries of origin of the journals, registered in PERIODICA database, which have published scientific articles on the genus *Macrobrachium*.

which evaluate them according to the quartile where the magazine chosen for publication is located, demanding to publish in mainstream magazines.

Regarding the species studied, it is interesting to note that although *M. rosenbergii* is the most published species (31% of the total), the study of American species yields the largest number of publications (69% of the total). Chong-Carrillo *et al.* (2015) present the results of scientific research on *Macrobrachium* worldwide (using the most important commercial and

transnational databases), and show that *M. rosenbergii* has generated more than 60% of all publications, while native species less than 40%, and of the latter only 12 species are American. In the present study conducted on the basis of PERIODICA, 22 native American species are mentioned. This shows that there is intense research with native species that is not registered by the world databases, but by the regional ones, as is the case of PERIODICA, therefore any attempt to know the real status of research on this genus should include its use

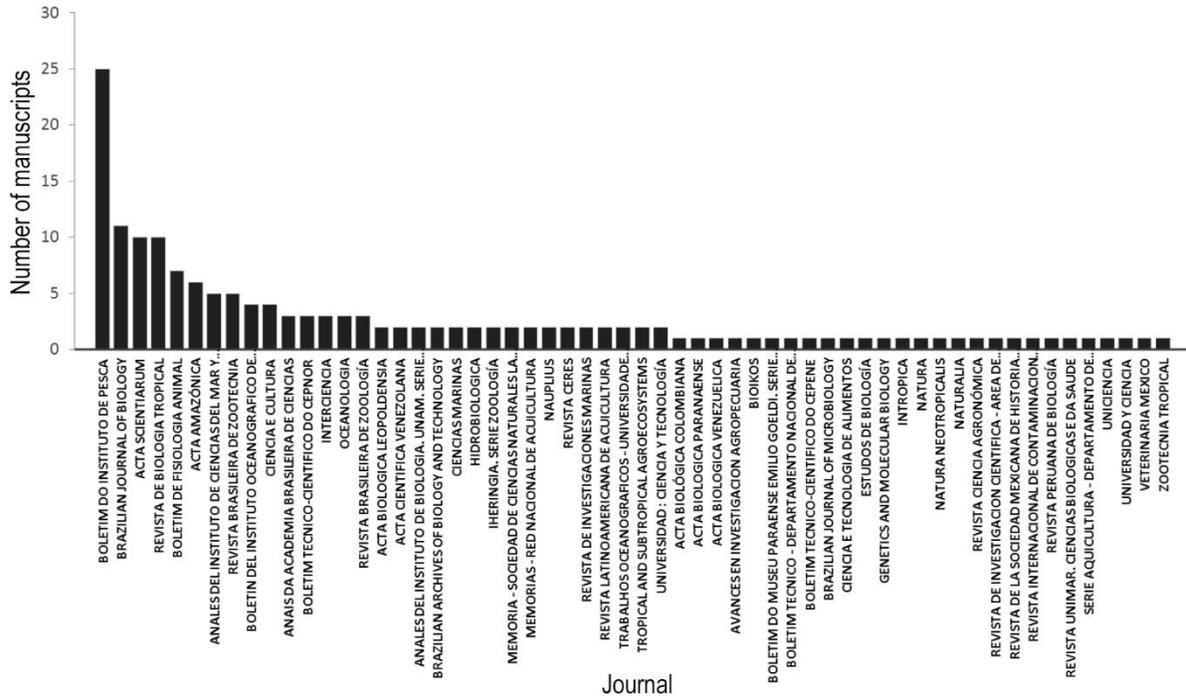


Figure 5. Scientific-technical journals that have contributed scientific publications on the genus *Macrobrachium*, registered in PERIODICA database.

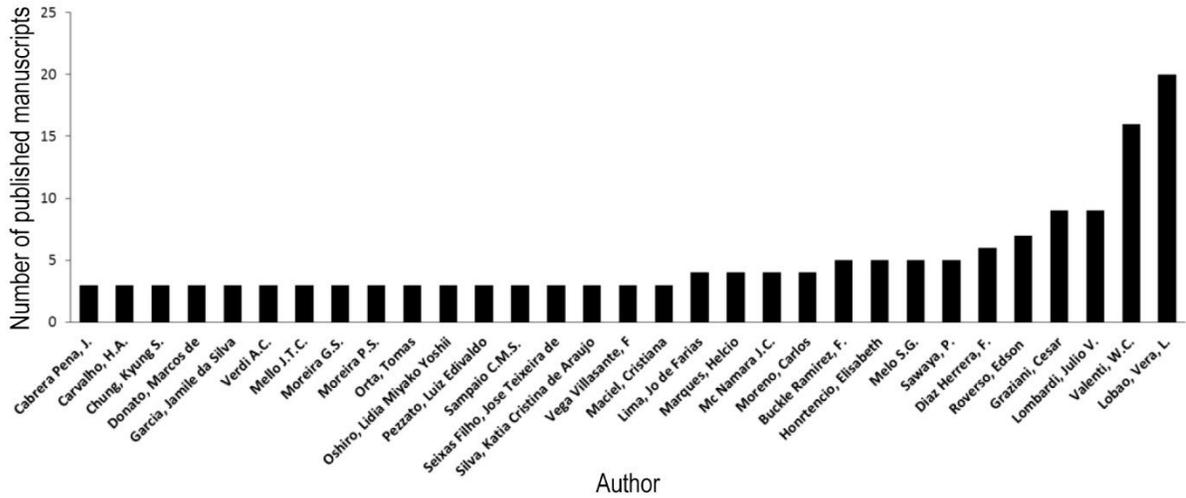


Figure 6. Authors with at least three publications on *Macrobrachium* registered in PERIODICA database.

to avoid the bias mentioned by Michán *et al.* (2008) in relation to the geographical areas and the language.

It is observed that the research fronts in the region are concentrated in culture, ecology, food/nutrition, physiology and reproduction, reporting these 66% of the articles recorded. These, in part, coincide with those of global interest reported by Chong-Carrillo *et al.* (2015), since both the culture and the feeding/nutrition are the most important, however the ecology is not

presented as relevant, but it does so in the present study, as evidenced by the records on publications with native American species. This shows that in the case of the research registered in PERIODICA, issues related to culture and nutrition are also preponderant because they are essential to develop technologies suitable for potential but currently non-commercial species. The same case of reproduction that is essential to ensure larval production and close the biological cycles of nati-

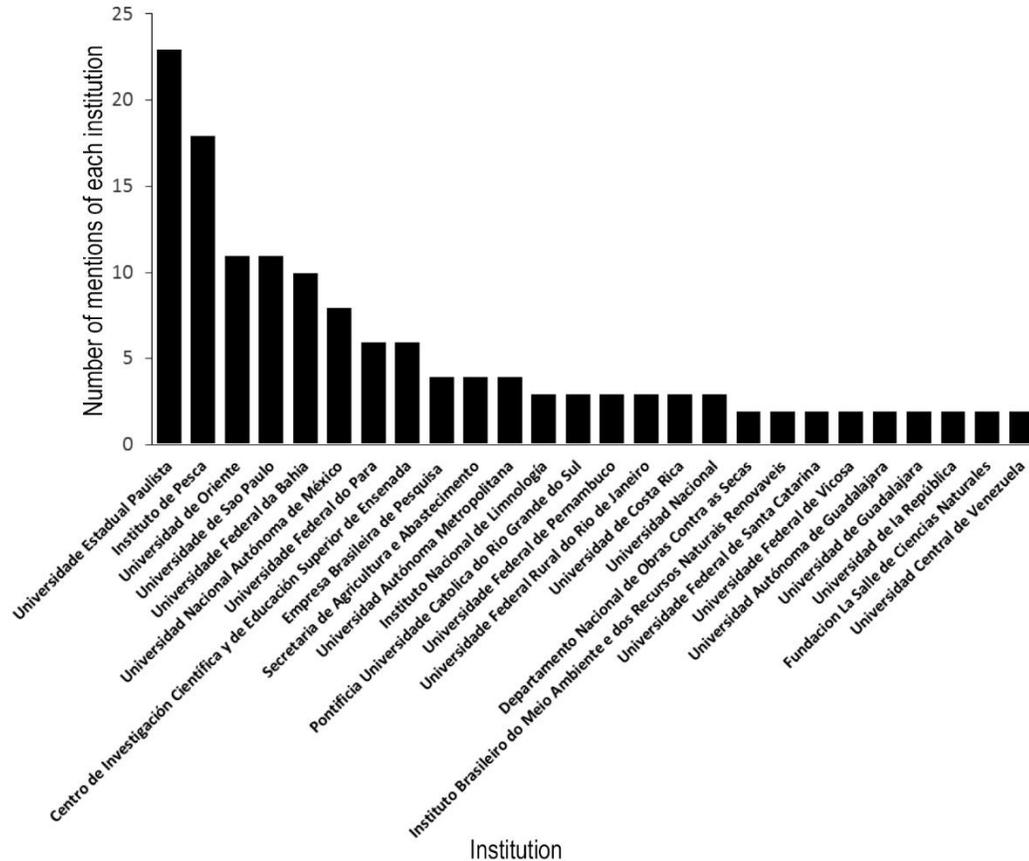


Figure 7. Number mentions of institutions of authors involved in publications on *Macrobrachium*, with at least three mentions registered in PERIODICA database.

ve species, but for *M. rosenbergii* is already a well described and replicable technology. It is noteworthy that the ecology of native species has been extensively addressed, probably because of the interest of various research groups in expanding knowledge about the large number of American species, many of which are still poorly studied.

The scientific journals that served as support for the publication of the genus *Macrobrachium* in the PERIODICA database are predominantly Brazilian, followed by the Mexican ones, and then by the Venezuelan ones (63, 16 and 9% respectively). It should be noted that a large number of regional journals do not achieve the solidity due to entering the mainstream, due to several factors: lack of periodicity and normalization, sometimes neglecting the relevance of their research, presenting high index of endogamy, not using the English language, the set of authors, the lack of editorial mattress, and finally the lack of institutional budget to support the academic publications (Laufer, 2007, III). In addition, other negative factors have been detected: sometimes presenting a local perspective of science, little professionalization of

editorial bodies, arbitrary selection of referees (Laufer, 2007, I, II). In this sense, Vázquez-Moctezuma (2016) stresses the importance of those involved in editorial processes (editors, proofreaders and authors), since they ultimately guarantee the reliability of the results, have the responsibility of detecting unethical behavior in publications such as fraud and plagiarism, conforming as the main development actors for human knowledge. All these elements, conditioned by extrinsic and intrinsic factors, by imposition and self-generated, surround the development of the scientific publications of the region, therefore, it is essential to complement the data obtained from international databases, with those from local or regional scientific journals (Moravcsik, 1989), so as not to have a skewed view of the scientific domain studied.

The main language of publication in PERIODICA database was Portuguese, followed by Spanish and English (48, 37 and 15%, respectively). This is related to that reported by Michán *et al.* (2008), in an analysis of systematics in Latin America, where the most used

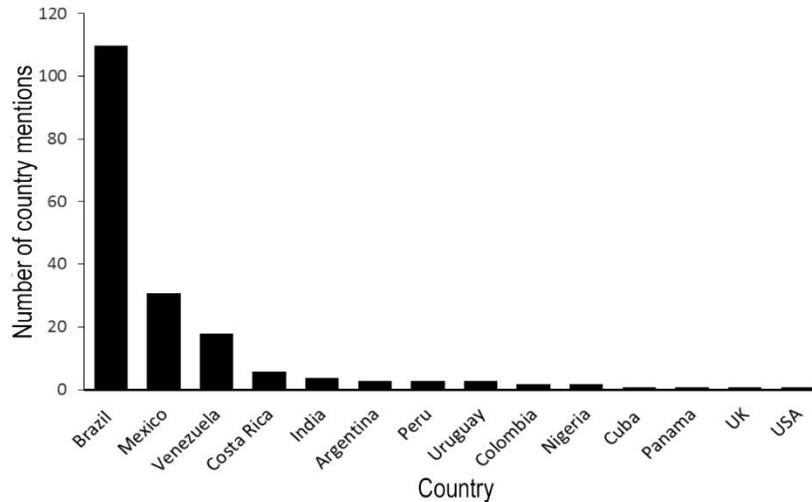


Figure 8. Mentions of the countries involved in publications on *Macrobrachium*, registered in PERIODICA database.

language was Spanish, followed by English and Portuguese, because the publications indexed in PERIODICA publish in the local language (Michán *et al.*, 2008). In our case, Portuguese is the preponderant language, because Brazil is the leader of research on the genus *Macrobrachium* in the area. The scenario of the language of science is published, it has been promptly treated by Laufer (2007, I) who lists the language as "an insurmountable barrier that will always establish an important dichotomy in the ability to reach a worldwide dissemination of science". There is a stated contradiction between publishing science in the language of researchers, and succumbing to the risk of not being visible, or choosing to publish in English, in order to be consulted and cited and included in the powerful databases. It is important to consider, as a reflection of this crossroads, that many of the Latin American journals have assumed English as the language of publication (Russell, 2007). The results obtained in this research contrast with that reported by Chong-Carrillo *et al.* (2015), where English is the language prevailing in publications on the genus *Macrobrachium*, conditioned by the type of databases chosen for the cited studies.

Among the institutions involved in research on the *Macrobrachium* genus, collected in PERIODICA, we find that the Universidade Estadual Paulista is the institution that has the most research results, followed by the Instituto de Pesca. W.C. Valenti belongs to the Paulista State University, one of the most productive and highest-ranking authors of the entire set of the most prominent scientists in this research domain (Chong-Carrillo *et al.*, 2017, *unpubl. data*). The institutions with a relevant participation in the generation of knowledge about the *Macrobrachium* genus in the

regional database, PERIODICA, also have a notable presence in the databases of global impact: Scopus and Web of Science, which makes them centers of reference in research related to this genus, axes of scientific knowledge in the region as well as in the world.

In relation to the countries where *Macrobrachium* research was carried out, 110 affiliations of Brazilian authors appear in the database, followed by 31 Mexican, 18 Venezuelan and 6 Costa Rican, followed by affiliations of authors of other countries in the region, however, it is important to note that 4 affiliations correspond to India, 2 to Nigeria, 2 to USA and 1 to UK. This corresponds to the ranking of the production of scientific documents at the level of the countries of Latin America and the Caribbean, published by Scimago, where Brazil and Mexico are the leaders for Latin America, and occupy positions 15 and 29, worldwide (Scimago Journal & Country Rank, 2017). It may be considered that behavior in the case of *Macrobrachium* genus research is not a specific event, but is subject to external conditions such as the scientific policies of governments, the level of state economic support to universities and educational institutions, the investment for R & D, economically active population and number of researchers per capita.

The analysis of the information collected in the PERIODICA database, on the genus *Macrobrachium*, was useful as an alternative to face the phenomenon called "lost science"; an issue caused by the meager existence of journals from developing countries in the large databases, making it possible to cover this informational gap by making a sweep of published science about the studied genus, also from a regional perspective.

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