



RELATÓRIOS CIENTÍFICOS E TÉCNICOS

SÉRIE DIGITAL

**A BIBLIOMETRIC STUDY OF PORTUGUESE PLANKTON
LITERATURE: A PRELIMINARY ANALYSIS**

Antonina dos Santos e Susana Garrido

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A BIBLIOMETRIC STUDY OF PORTUGUESE PLANKTON LITERATURE: A PRELIMINARY ANALYSIS

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RESUMO

Título: Estudos de plâncton em Portugal: uma análise preliminar. O presente trabalho tem por objectivo identificar as tendências gerais da literatura publicada sobre plâncton das águas portuguesas nos últimos dois séculos. O primeiro estudo de plâncton referente a Portugal foi publicado em 1880 por Paul Langerhans e tratava dos Chaetognatha e Apendicularia das águas costeiras da Ilha da Madeira. Desde esta altura mais de 400 artigos foram publicados sobre plâncton de águas portuguesas. Nesta análise preliminar incluem-se todos os estudos feitos no meio marinho, estuarino, rios, lagoas e reservatórios até ao ano 2000. A maioria dos trabalhos publicados são relativos ao plâncton marinho e apenas 25% ao de água doce. Mais de 80% dos trabalhos são sobre fito e zooplâncton, sendo os restantes sobre ictioplâncton. Os dados revelam um constante aumento dos trabalhos sobre plâncton desde o início do século XX, com excepção das décadas de 60 e 70. Verifica-se que durante as primeiras décadas do séc. XX dominam os estudos de morfologia e distribuição do plâncton enquanto que, actualmente, se centram, essencialmente, em aspectos da ecologia e ensaios laboratoriais. Da análise dos resultados conclui-se que estes dois temas continuarão a ser os predominantes em estudos de plâncton no futuro. O objectivo final é o de disponibilizar, através da Internet, a base de dados construída durante este estudo, de maneira a ser útil em futuros trabalhos de plâncton.

Palavras Chave: Plâncton, Portugal, Bibliometria.

ABSTRACT

This paper is an attempt to identify the general trend on plankton published literature in Portuguese waters over the past two centuries. Paul Langerhans is the author of the earliest papers referring to plankton studies in Portuguese waters in 1880, namely on the Chaetognatha and Apendicularia of Madeira Island. Since then, more than 400 papers were published. The present analysis includes marine, estuarine, rivers, lagoons, and reservoir waters. Almost half of these papers are on marine and 25% on freshwaters. Phyto and zooplankton account for more than 80% of the total number of papers analysed, the remaining referring to marine and brackish ichthyoplankton studies. The data revealed a constant increase in plankton studies over the last century, except for the 1960 and 1970 decades. While in the first decades, scientific papers were centred on morphology and distribution, at present, the research is mainly based on ecological and laboratory studies. According to the results of this study, it seems certain that ecology and laboratory studies will continue to increase. Our database will become available on the Internet, so that it can be useful to future research.

Keywords: Plankton, Portugal, Bibliometric.

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INTRODUCTION

Several bibliometric analyses on aquatic sciences have been made in the last years, revealing the main tendencies in different countries and on diverse subjects. There are bibliometric analyses in the aquatic sciences, on a specific country (e.g. on Indian oceanographic research, Tapaswi and Maheswarappa, 1999), on a specific studied group (e.g. on larval crab, Rice, 1993), on marine technologies (e.g. on ocean currents and protein crystallography, Martin et al., 1985; on biotechnology, Sears and Stover, 1991) and also on works relating scientific literature with political events (de Bruin et al., 1991). This paper has no such pretension. In fact, the objective of this work is to compile an extensive bibliographic database that can be useful to planktologists (nationals and foreigners) studding Portuguese waters and to identify some of the general trends in the published literature on plankton in this area over the past two centuries. As far as we are aware, this review is the first attempt to analyse the plankton literature in Portuguese waters.

The objective of the database is to bring light to the existence of some old papers of the first half of the XX century that might be miss regarded in present investigations due to a more difficult access.

MATERIALS AND METHODS

The analysis is based on the bibliography concerning the plankton from Portuguese waters published in scientific journals and books whose papers have been submitted to a review committee. Therefore, works such as reports, abstracts and academic thesis have been excluded. This review attempts to be as exhaustive as possible, for the period between the first reference found, published in 1880 and the end of 2000. We believe to have compiled the majority of papers within this period.

The search of bibliographic references has been mainly done through the ASFA (Aquatic Sciences and Fisheries Abstracts) database, as well as bibliographic sources of the most ancient Portuguese libraries and all the journals edited in Portugal. All Portuguese publications prior to 1960 were examined one by one.

Each paper was classified within the following categories: subject area (taxonomy and morphology, ecology, laboratory studies, toxicology, parasitism, occurrences, methods and technologies), studied group of plankton (phyto and bacterioplankton, zooplankton and ichthyoplankton), type of ecosystem (marine, brackish and freshwater), journal origin (national or international) and the first

author's affiliation at the time of publication.

Each paper to be classified was first assigned to the theme, which we judged to represent the main purpose of the study. However, in some cases this was difficult and we had to choose two themes to represent the same paper. In practice, phyto and bacterioplankton were put together because the studies involving only bacterioplankton are scarce, being generally studied together with phytoplankton. In the category “brackish water” we included the studies in coastal lagoons.

RESULTS

This study covered the analysis of 450 publications. The first papers concerning the study of plankton in Madeira Waters date back 1880 (Langerhans, 1880a; 1880b) and one was about Chaetognats descriptions and the other on Appendicularian. Since then, a constant increase in the total number of papers was observed, except for the period 1960-80, when the same number was maintained in the sixties and even diminished in the seventies (Fig. 1).

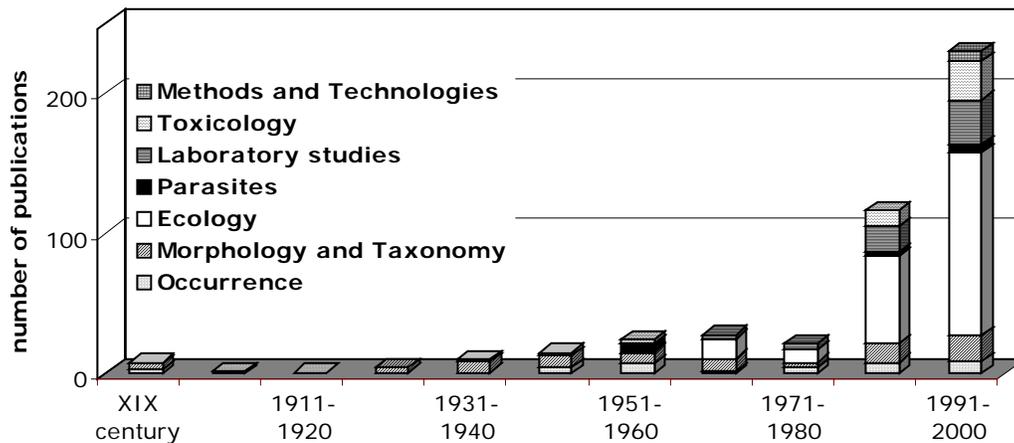


Figure 1- Total number of plankton on Portuguese waters papers published during each 10-year period between 1880 and 2000 according to the broad area of their main subject.

The 1991-2000 period is the first decade where there are publications on every subject of our classification, representing 50% of the total papers in the database (Fig. 1). A more detailed analysis of this decade shows three peaks in the number of publications, which match the years when Portuguese plankton symposiums and congresses occurred (Fig. 2).

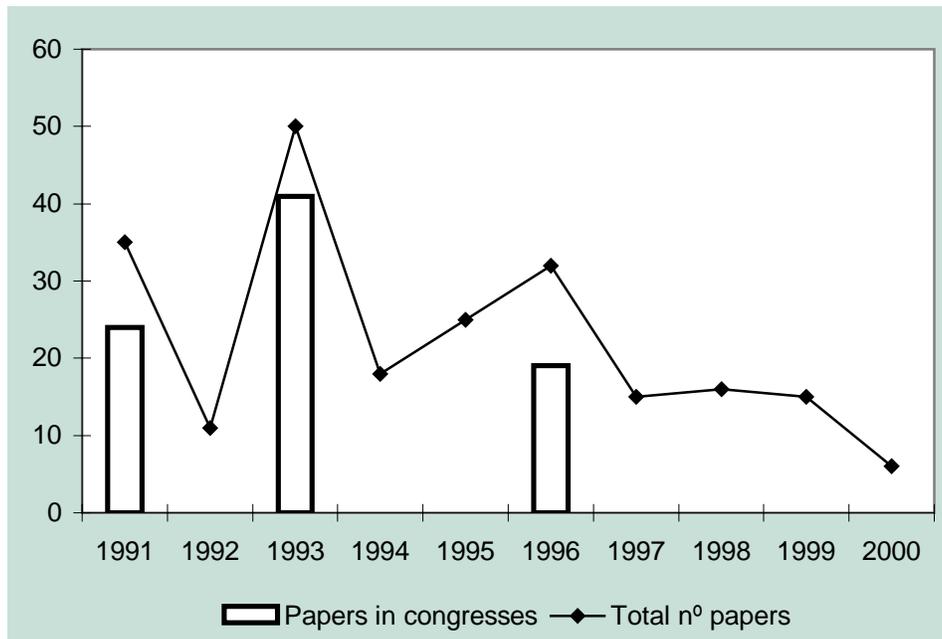


Figure 2- Yearly production of plankton on Portuguese waters papers between 1991 and 2000.

It was the Porto University together with various foreigners' institutions that began plankton studies in Portugal. In Lisbon, the Estação de Biologia Marinha, created in 1919, which gave place to the Portuguese Institute for Marine and Fisheries Research (IPIMAR) in 1975, the work on plankton started with a list of Copepoda from Portuguese coast (Candeias, 1926); with increasing number of papers published by this Institute ever since, except for the 40's, 70's and a small inflection in the 1990's. The other Portuguese universities began their works on plankton in the last two decades, except for Coimbra University, which starts in the 1930's.

In the first half of the XX century there are important and pioneer contributions to the plankton studies in Portugal, e.g., the ones by E. Sousa e Silva on phytoplankton and red tides and J. M.

Braga with studies on plankton of subterranean waters.

The papers on plankton in Portuguese waters were published mostly in national journals except for the last decade. Papers on zooplankton account for 47% of the works, followed by the phyto and bacterioplankton group with 39% and then ichthyoplankton with 14% however, studies of the latter group only started in Portugal in 1979 (Ré, 1979a; 1979b) (Fig. 3). Most of the works were done on marine waters off Portugal mainland, only 5% in Azores waters and 3% in Madeira archipelago. This is also true for freshwater studies, where only 5% of the studies were developed in Azores lagoons.

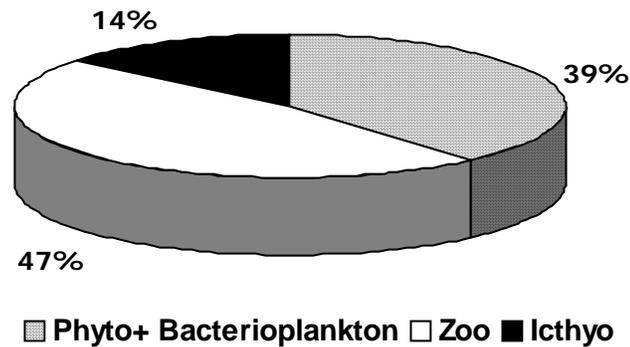


Figure 3- Percentage of the papers by studied group of plankton.

The results concerning different ecosystems show that the majority of plankton studies were done in marine waters (44%), followed by brackish (31%) and finally freshwaters (25%) (Fig. 4). If we consider the papers published in fresh and brackish waters in the Portuguese mainland we found that Tagus and Sado rivers, Aveiro and Formosa coastal lagoons, Mira estuary and river Douro are the most studied areas.

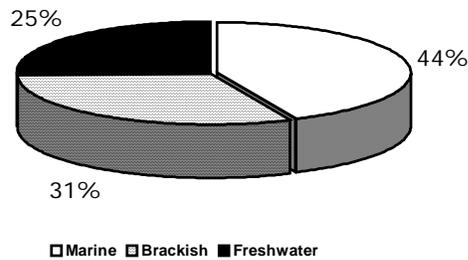


Figure 4- Percentage of the papers on plankton by type of ecosystem.

DISCUSSION AND CONCLUSIONS

This bibliometric analysis probably adds no new general information to those familiar with plankton studies in Portugal; on the other hand, it might be surprising in the sense that most of the works done in the first half of the XX century have been nowadays neglected when studying the plankton in Portuguese waters. Nevertheless, this analysis allows to reinforce some ideas that can be useful to future studies: 1) the constant growth in the number of works of plankton in Portuguese waters, more moderate for the 60' and 70' decades, for which scientific marine research was mostly done in Portuguese ex-colonies and the retirement of some productive investigators, as well as some instability due to political changes in 1974 regime may be an explanation for this fact; 2) the relevance of plankton congresses and symposiums that enhance the number of publications, especially in the 1990's; 3) the evolution in the subjects studied shows that description of new occurrences, morphology and taxonomy were the main focus of the first publications while in the last decades the laboratory studies and mostly ecology studies dominate, and it seems certain that these studies will continue to increase; and 4) the majority of studies being in marine waters, followed by brackish and then by freshwaters. We stress upon the fact that papers dealing with methods and technologies are scarce.

The impressive increase of the number of plankton papers published during the last two decades reflects also the adherence of Portugal to the European Union, which brought more investment to

the scientific investigation. However, they do not explain the change in emphasis from “occurrence” towards “toxicology” and others disciplines. These changes were certainly influenced by the new concerns with ecosystems and environment related studies.

This analysis forecast for the future of plankton papers that the work on Portuguese waters will concentrate in ecological, behavioural and toxicology studies, with occurrence and distribution papers only as a by-product of ecological studies.

Finally, it is imperious to reinforce that our main intention was not to evaluate how and why things evolved as they did but, instead to look at the main tendencies of the past and compile them to serve in some way, the present investigation on plankton in Portuguese waters. For that, the database created during this work will be available on the Internet (<http://www.ipimar.pt>), and is our intention to constantly update it with the support of all the scientific community.

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