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ASSESSMENT OF RESEARCH GROUPS ON NATURAL PROTECTED AREAS AND THEIR PUBLIC USE IN BRAZIL

Keywords:

Parks
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ABSTRACT: The objective of this study was to assess the contribution of the Brazilian scientific community to knowledge generation concerning Brazilian protected areas and to identify research groups focused on the public use of such areas. A systematic search was performed in the database of the Research Groups Directory of the National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico), an organization under the Brazilian Ministry of Science, Technology and Innovation (Ministério da Ciência, Tecnologia e Inovação). The search yielded 177 research groups on protected areas, formed by 3872 members, including researchers, undergraduate students, graduate students, and technicians from different areas of scientific knowledge distributed across the country. However, the research groups were concentrated in the southeast and south of Brazil. They were mainly linked to federal educational institutions, and they had a strong academic background and considerable scientific production. However, few groups study the public use of protected areas; thus, there is space for new research in this area. Based on the results, government incentives for the formation of research groups in the less represented regions to study the public use of protected areas and for the adoption of strategies to disseminate knowledge produced beyond academia are recommended.

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LEVANTAMENTO DOS GRUPOS DE PESQUISA EM ÁREAS NATURAIS PROTEGIDAS E USO PÚBLICO NO BRASIL

Palavras chave:

Parques
Conservação da natureza
Biodiversidade
Pesquisa científica

RESUMO: O objetivo neste estudo foi avaliar a contribuição da comunidade científica do Brasil para a geração de conhecimento sobre suas áreas protegidas, bem como identificar a existência de grupos de pesquisa que têm por foco o uso público dessas áreas. Para isso, realizou-se uma busca sistemática na base de dados do Diretório de Grupos de Pesquisa do Conselho Nacional de Desenvolvimento Científico e Tecnológico, vinculado ao Ministério da Ciência, Tecnologia e Inovação do Brasil. Encontraram-se 177 grupos de pesquisa em áreas protegidas, formados por 3872 integrantes, entre pesquisadores, estudantes de graduação e pós-graduação, além de técnicos; de diferentes áreas do conhecimento científico, distribuídos em todo o país, porém com concentração nas regiões sudeste e sul do Brasil, vinculadas principalmente às instituições federais de ensino, com sólida formação acadêmica e de considerável produção científica. No entanto, poucos são os grupos que pesquisam o uso público das áreas protegidas, havendo um grande espaço para atuação de novos pesquisadores. A partir dos resultados, recomenda-se o incentivo governamental à formação de grupos de pesquisa nas regiões menos representadas, ao estudo do uso público das áreas protegidas e também a adoção de estratégias para a divulgação dos conhecimentos produzidos para além da academia.

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INTRODUCTION

Biodiversity conservation or, more broadly, social biodiversity conservation depends on the protection of natural spaces commonly called protected areas. The widely accepted concept of the International Union for Conservation of Nature, which defines a protected area as a space with clearly defined geographic boundaries that is recognized, dedicated, and managed to achieve the long-term conservation of nature with associated ecosystem services and cultural values through legal or other effective means (SCHERL et al., 2006), is adopted here.

In Brazil, there are more than 150 million hectares (1.5 million km²) of protected areas, representing over 17% of the continental territory, a value slightly higher than the global value of 13% but falling short of the needs and responsibilities as a mega-diverse and economically emerging country (WADT et al., 2008; GURGEL et al., 2009; MEDEIROS & YOUNG, 2011; FUNDO VALE, 2012).

These areas, in addition to the protection goal, have public use as a strategy to raise the awareness of visitors with regards to the importance of the conservation of natural areas. Public use is developed in the protected area through visitation and usufruct with touristic, recreational, educational, scientific, artistic, or spiritual purposes, mediated by infrastructure, equipment, and services, in compliance with the management objectives of the area (BRAZIL, 2005). The management of protected areas not only relies on the basic knowledge and training of the management team but also depends in large part on studies that assess situations case by case and, especially, studies that find innovative solutions for the protected areas system as a whole. As stated by the Chico Mendes Institute for Biodiversity Conservation (Instituto Chico Mendes de Conservação da Biodiversidade - ICMBio), the government agency responsible for Brazilian protected areas, the challenge lies in proposing and conducting research that assists decision making or evaluates the measures that have already been implemented, often questioning paradigms (ICMBio, 2014).

However, little is known regarding the profile of studies and Brazilian researchers investigating protected areas. Overall, the politics of environmental agencies to ward scientific activity is deficient, and the low number of research programs reveals a weakness in the partnership between researchers and environmental agencies (FERREIRA & FIGUEIREDO, 2011).

One method for identifying which research groups in Brazil study protected areas is using the Research Groups Directory of the National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq), an organization under the Brazilian Ministry of Science, Technology and Innovation.

The Research Groups Directory is an inventory of active scientific and technological research groups in the country and plays an important role in preserving the memory of scientific-technological activity in Brazil. This directory is an interaction and information exchange tool, and its data bases provide directly available information on research groups, including their location and scientific production over the years. The census nature of this directory facilitates increasing knowledge through the numerous possibilities of survey-type studies. Thus, the Research Groups Directory is an efficient instrument for planning and managing science and technology activities (BRAZIL, 2015c).

The objective of this study was to evaluate the contribution of the scientific community of Brazil to knowledge generation on (or from) its protected areas and to identify research groups focused on studying the public use of these areas.

MATERIALS AND METHODS

The survey of groups researching protected areas active in Brazil was conducted in May 2015, using the open access database of the Research Groups Directory of the CNPq belonging to the Brazilian government. A search was conducted for groups associated with the term “*areas protegidas* [protected areas]”. From this point, the technique known as snowball sampling (BIERNACKI & WALDORF, 1981) was used. This technique is a non-probabilistic sampling method typically used in the social sciences to analyze the connections between members with a common interest.

Thus, the term “*areas protegidas*” allowed for identifying groups associated with other topics, i.e., other search terms on the topic being surveyed or keywords that, in turn, successively provided the basis for new group searches until reaching the “saturation point”, at which the interconnected content started to be repeated and no new information was added. Certification of the research groups by institutional directors was the inclusion criterion for analysis. The certification of groups is the responsibility of the leaders of the research activities of the institution to which the leader of the group is linked (BRAZIL, 2015c).

The correspondences between the following variables of the research groups identified were raised and analyzed: the broad area of study to which the group belongs (e.g., the biological sciences or the humanities), geographical location, year of establishment, home institution, number and academic training of the members, and scientific production (articles published in indexed journals, books published or edited, book chapters, full papers, and abstracts published in conference proceedings), starting with the year of the establishment of the research group. Then, from the total sample collected, the research groups with research lines on the public use of protected areas were identified and characterized.

RESULTS

Snowball sampling using the term “areas protegidas” reached saturation after finding the following interconnected expressions: “*areas naturais protegidas* [natural protected areas]”, “*areas silvestres* [wilderness areas]”, “*conservação de areas silvestres* [conservation of wilderness areas]”, “*conservação da natureza* [nature conservancy]”, and “*unidades de conservação* [conservation units]”. A total of 215 research groups were initially found, and after excluding repetitions, 177 groups remained. Of the 177 groups, 29% are in the life sciences area of knowledge, 25% in the humanities, 16% in agricultural sciences, 15% in the hard sciences and earth sciences, 11% in applied social sciences, and 5% in engineering (Figure 1).

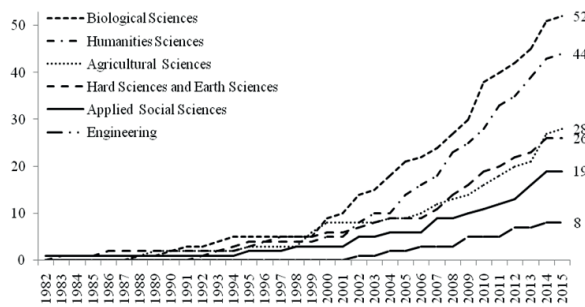


FIGURE 1 Number of research groups on Protected Areas in Brazil, officially recognized through May 2015, ranked by fields of knowledge and growth over time.

The research groups were distributed across 25 (out of 27) Brazilian states and covered all 5 regions of the country (Figure 2). The 177 research groups had 909 research lines and were part of 55 federal institutions, 22 public State institutions, and 10 private institutions. Since the establishment of the first group in 1982, the number of research groups has grown approximately geometrically (Figure 3).



FIGURE 2 Number of research groups on Protected Areas in Brazil, officially recognized through May 2015, distributed by geographic region.

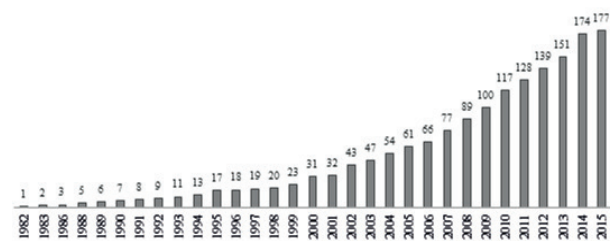


FIGURE 3 Annual progression of the number of research groups on Protected Areas in Brazil, officially recognized through May 2015.

The 177 groups researching protected areas are coordinated by 287 leaders (and many are coordinated by 2 leaders). A total of 73 of the 287 leaders have post-doctoral experience, 190 have doctoral degrees, 23 have Master’s degrees, and the other leaders have a specialization or graduate degree. A larger number of degrees are found in southeastern Brazil, followed, in descending order, by the southern, northeastern, northern, and central western regions (Figure 4). In addition to the leaders, the groups are composed of researchers, undergraduate and graduate students, and the technical support staff (Table 1).

The southeast has the largest number of members, with 42.5% (n=1647) of the total members of the groups, followed by the south (18.8%; n=729) and the north (18%; n=695). The graduate and undergraduate students comprise 52.6% of the members of all groups (n=2037), followed by professor-researchers (45.6%, n=1765) and technicians (1.8%; n=70).

Articles published in journals correspond to 27% (n=4164) of the scientific production of the groups (Table 2), of which 38% (n=1568) corresponds

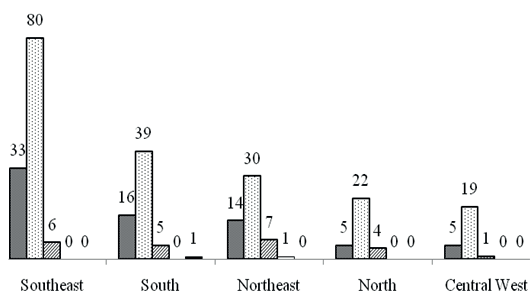


FIGURE 4 Number and academic titles of the leaders of the research groups on Protected Areas in Brazil, officially recognized through May 2015, by region.

TABLE 1 Officially recognized research groups on Protected Areas in Brazil through May 2015, by region.

Region	Researchers	Students	Technicians	Total
Southeast	746	885	16	1647
South	332	367	30	729
Northeast	296	391	8	695
North	210	218	5	433
Central West	181	176	11	368
Total	1765	2037	70	3872

to the southeastern region, 24% to the northeastern region, and 21% to the southern region. A total of 15 of the 177 research groups focus on the public use of protected areas, with 7 being located in the southeastern region (states of São Paulo and Rio de Janeiro), 4 in the northeastern region, 2 in the southern region, and 2 in the central western region.

Additionally, 13 of the 909 research lines focused on the public use of protected areas, including the following: sustainable tourism; the management of conservation units; ecotourism; adventure races in conservation units; recreational carrying capacity in natural environments; the effects of public use on vegetation; public use in conservation units; ecotourism and the management of wilderness areas; public use and the monitoring of visitation impacts; tourism in natural areas and environmental interpretation; planning and territorial management of tourism; the determinants of tourism demand in natural areas; tourism; and sustainability. A total of 342 professionals are involved in these research lines, including 156 researchers and 186 students and technicians.

DISCUSSION

The distribution of the Brazilian research groups researching protected areas across different areas of scientific knowledge indicates the multidisciplinary

TABLE 2 Scientific production of the officially recognized research groups on Protected Areas in Brazil, through May 2015, distributed across the Southeast (SE), Northeast (NE), South (S), North (N) and Central West (CW) regions.

Type of production	SE (n=72)	NE (n=30)	S (n=38)	N (n=20)	CW (n=17)	Total (n=177)
Articles published						
in indexed journals	1568	989	868	449	290	4164
Book chapters	636	497	314	267	124	1748
Full papers	1671	506	418	261	360	3216
Abstracts published in conference proceedings	1819	1301	1880	578	560	6138
Books	141	45	49	35	19	289
Total	5835	3248	3529	1590	289	15555

nature of the subject, as is well known. However, given that other areas such as the humanities are represented, it is important to emphasize that the studies are not concentrated only in the biological and agricultural sciences, as traditionally expected.

This multidisciplinary approach has advanced in overall science (MARANHÃO, 2010), and it has become increasingly clear that biodiversity conservation strategies require social and environmental considerations that do not simplify the role of humans as antagonistic to and separate from nature (MARANGON & AGUDELO, 2004). This fact may be observed when analyzing community-based tourism, an activity that is gaining prominence in conservation units in Amazonas state.

As one of its main objectives, the State System of Conservation Units (Sistema Estadual de Unidades de Conservação) of Amazonas fosters improving conditions and promoting sustainable tourism, and the performance of studies is a guideline, requiring professionals from different areas (AMAZONAS, 2007).

The distribution of research groups throughout the Brazilian space raises concerns. On the one hand, the concentration of research groups in the southeast and south of Brazil reflects the concentration of anthropogenic pressure on ecosystems due to factors linked to the higher population densities in these regions. Even considering that some groups conduct important research outside their home region, the data are important indicators for planning public policies to encourage and support protected area researchers who work outside the southeast region.

On the other hand, the central western and northern regions are areas that exert strong pressure on nature due to the rapidly expanding agricultural

borders. These agricultural borders affect the Cerrado and Atlantic Forest Domains, requiring an efficient State presence. In the northeast, there is concern regarding the Atlantic Forest and the Caatinga, 7.6% of which is located within conservation units that are not well protected (BRAZIL, 2015a).

Tropical seasonal forests, for example, have been neglected in most conservation projects in South America (BARZETTI, 1993). In this case, conservation is largely due to the arid climate and the consequent difficulty of economically exploring the space, although it is already deeply affected (MOFFAT, 2002). The most representative areas must be preserved before they disappear along with their genetic resources and biodiversity potential (LEAL; TABARELLI; SILVA, 2003).

The fast growth in the number of research groups in the last 2 decades indicates that research on protected areas remains an open niche for many researchers. The importance of the federal universities, which are more closely related to the topic of protected areas, is stressed if the chosen strategy is to insert the topic into a greater number of educational and research institutions.

The concentration of a greater number of academic degrees in research groups from southeastern and southern Brazil is a reflection of the higher concentration of the research groups themselves in these areas, given that the ratios of the different degrees are similar among the regions. All regions have leaders with at least a master's degree, which may be at least partially explained by the recent incentives and progress of graduate programs in Brazil (BRAZIL, 2015c).

Thus, the data show that the training of researchers is not a problem in itself, but the number of researchers is. Indeed, the large participation of undergraduate and graduate students, comprising slightly over half the teams, supports the idea that there is a considerable amount of training of human resources to work on the protected areas topic. Similarly, the large number of scientific productions reinforces the importance of these research groups.

However, it is important to highlight the distance in Brazil between academic contributions and the general public, including the professionals responsible for the management of protected areas. In a broader sense, a project that makes the products of the research groups more accessible and visible beyond academia, taking advantage of the multidisciplinary nature of the groups to create an interdisciplinary approach, is needed. The result would be manifested in better biodiversity education and greater awareness of the importance of

protected areas, reaching not only the individuals closest to the protected areas but also the current and future decision makers.

The small number of groups working in research lines associated with issues involving the public use of protected areas reinforces the need to promote knowledge on natural protected areas and is in itself of great concern because public use is the direct means of valuing and justifying natural areas. Public use directly indicates appreciation and justification for such natural areas. According to a Brazilian government report (BRAZIL, 2015b), 10.4% of the 366 national and state parks (categorized as essentially touristic protected areas) are officially closed for visitation, 6.8% are open only with special permission, 4.9% are open without the assistance of a management plan, and 55.5% have no information on visitation activity.

In addition, the custom of using protected areas for integration with nature is still incipient. Therefore, there is a great opportunity for forming new research groups to deepen knowledge and formulate strategies to attract visitors and to propose uses that are more properly associated with the functions of protected areas. Such groups should be encouraged by the government, which is responsible for almost all of the natural protected areas in Brazil.

CONCLUSION

The Brazilian protected areas are the object of study of a growing number of research groups originating from different areas of scientific knowledge distributed across the country but concentrated in the southeast and south of Brazil. Furthermore, these groups consist of solid academic teams with considerable academic production that generate human resources and are mainly linked to federal educational institutions. However, few groups are studying the public use of protected areas; thus, there is a great opportunity for research in this area.

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