

Quo vadis? Career of Brazilian ethologists earning a doctoral degree in 2010

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Fifty two doctors (22 ♂♂, 30 ♀♀) got a degree in Ethology in 2010, according to a previous study; 46 *curricula vitae* (21 ♂♂, 25 ♀♀), 88% of the initial group, provided career information at *Plataforma Lattes* database during a life-span of six years. Employability was high, at least 90% for both sexes. 48% of doctors work at the public sector, holding stable jobs; 40% are professors at public universities. Fellowships provide 10 positions (19%), and the private sector nine jobs (17%); mostly at private universities (15%). Men occupy the majority of positions at public universities (14 of 21, representing 67%), while most women are holding positions at the private sector or as public servants outside professorship (nine out of 13, corresponding to 69%). 70% of fellowship holders are women. 96% advised or are advising academic works. 89% of all are co-authors of at least one peer-reviewed article: a total of 366 reports (♂♂ = 166, ♀♀ = 170; 61 articles.year⁻¹; 1.5 article.year⁻¹.doctor⁻¹). 56% of doctors graduate at Institutions located in the Southeast region, where most graduation programs are. A clear regional transference of doctors is observed when employment is considered, in this case the participation of the Southeast region shrinks to 30%. This indicates a role played by the Southeast region as disseminator of animal behavior knowledge within Brazil. This opens the possibility of an equitable relationship among regions in Brazil concerning higher education in Ethology. It is foreseen a positive effect upon the knowledge of the particular fauna of Brazilian regions, diverse and numerous, and mostly unknown from the ethological point of view. In our sample women are in slightly greater number than men, and are involved in mentoring and publishing, as well as men. Most females holding doctorate in Ethology work in less stable jobs (at private institutions or holding temporary fellowships) and probably endure less favorable conditions regarding research and remuneration. Not surprisingly this is the scenario seen in 30 out of 35 countries of the *Organisation for Economic Co-operation and Development* community, including in countries like USA and Germany. So it is not enough just to support accessibility; special attention should be given to assure fair working conditions for all. Our data also show a favorable scenario for Ethology in Brazil, mostly associated with the public educational system that is tuition-free and dependent of governmental resources. Recent governmental cutbacks for Science and Technology may curb further expansion of Ethology in Brazil.

Keywords: Academic mentoring. Employability. Gender. Public university. Brazilian Regions.

Quo vadis? A carreira dos Etólogos no Brasil que obtiveram seu título de Doutor em 2010

Cinquenta e dois doutores(as) (22 ♂♂, 30 ♀♀) defenderam teses em Etologia em 2010, de acordo com um estudo prévio; 46 *curricula vitae* (21 ♂♂, 25 ♀♀), 88% do grupo inicial, forneceram informações a partir de consulta à base de dados da *Plataforma Lattes*, durante seis anos. A empregabilidade foi alta, de pelo menos 90% para ambos os sexos. 48% dos doutores(as) trabalham no setor público, e têm empregos estáveis; 40% são professores(as) em universidades públicas. Dez posições são ocupadas por bolsistas (19%), e o setor privado é responsável por nove empregos (17%); a maioria deles em universidades privadas (15%). Homens ocupam a maioria das posições nas universidades públicas (14 de 21,

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representando 67%), enquanto que a maioria das mulheres tem posição no setor privado ou são servidoras públicas não docentes (nove de 13, correspondendo a 69%). Setenta por cento dos pesquisadores bolsistas são mulheres. 96% supervisionaram ou estão supervisionando trabalhos acadêmicos. A maioria (89%) é coautor(a) de pelo menos um artigo *peer-reviewed*: um total de 366 publicações (♂♂= 166, ♀♀= 170; 61 artigos.ano⁻¹; 1,5 artigos.ano⁻¹.autor⁻¹). 56% dos doutores fizeram Pós Graduação em Instituições do sudeste brasileiro, onde a maioria dos programas de Pós Graduação está situada. Observa-se uma clara transferência regional de doutores quando se considera os empregos ocupados, nesse caso a participação do sudeste se reduz a 30%. Este dado indica que o sudeste pode ser considerado um disseminador de conhecimentos sobre comportamento animal dentro do Brasil. É possível se antever um futuro de relações de maior igualdade entre as regiões brasileiras em relação ao ensino superior de Etologia. Efeitos positivos são previstos com relação ao conhecimento de faunas muito particulares das regiões brasileiras, que são diversas e numerosas, além de majoritariamente pouco conhecidas do ponto de vista etológico. Na presente amostra as mulheres estão ligeiramente mais representadas em número do que os homens, e estão envolvidas em atividades de orientação e publicação, tanto quanto os homens. Entretanto, a maioria das doutoras trabalha em empregos menos estáveis (em instituições privadas ou como bolsistas temporárias), e provavelmente convivem com condições menos favoráveis tanto com relação à pesquisa e à remuneração. Não surpreendentemente este é o cenário visto em 30 dos 35 países da *Organisation for Economic Co-operation and Development*, inclusive em países como os Estados Unidos e a Alemanha. Não é suficiente, portanto, aumentar a acessibilidade; atenção especial deve ser dispensada de maneira a assegurar condições adequadas de trabalho para todos(as). Os dados também mostram um cenário favorável para a Etologia no Brasil, principalmente no sistema público de educação, que é isento de taxas e dependente de fundos governamentais. Cortes recentes no orçamento governamental da Ciência e Tecnologia podem interferir com a continuidade da expansão da Etologia no Brasil.

Palavras chaves: Orientação acadêmica. Empregabilidade. Gênero. Universidade Pública. Regiões brasileiras.

Introduction

Traditionally professional activities of Brazilians holding a doctor degree are concentrated in the academy (Velloso, 2004; Viotto, 2010, 2013). Lately the university scenario in Brazil has changed and here we present a brief review of the academic world as a probable destiny of doctors in Ethology.

Historical aspects of higher education in Brazil

Higher education in Brazil had a late start — the first Brazilian Schools (*Faculdades*) were established in the early XIX century, as secular and professionally oriented institutions of tertiary learning (Teixeira, 1989; Oliven, 2014). Even nowadays most Brazilians are eager to get a university degree,

but achieving quality at the tertiary level of learning is quite a demanding endeavor, despite successful efforts toward expansion of the higher educational system in the last decade (Dourados, 2002; Durham, 2003; Schwartzman, 2004; Oliven, 2014, MEC, 2014; MEC/UNESCO, 2015). Also, according to Alfinito, 2007 “*no Brasil, o nível educacional mantém relação direta com a renda, ou seja, pessoas com maior renda têm mais acesso à educação que os demais cidadãos brasileiros*”, i.e. in Brazil, income matters, when access to higher education is considered.

In this scenario the number of bachelor degree holders has grown from four to eight percent in a decade (2000 to 2010) according to the *Instituto Brasileiro de Geografia e Estatística* (IBGE census). Despite continuous growth, especially in the last

twenty years, only 20% of youngsters aged 18 to 24 years are enrolled at the higher education system. 75% of 7.5 million students are in private institutions of learning, half of them at for-profit organizations (Barreyro, 2008; Knoble and Marcelo, 2017).

Brazil now has a large and decentralized system of higher education. Overall, the country has 2,368 higher education institutions, offering around 33,000 undergraduate courses, which are distributed in every single region of the country (census of Higher Education/*Ministério de Educação/Anísio Teixeira Instituto Nacional de Estudos de Educação e Pesquisa/INEP*, 2015).

Holders of doctoral degrees are even rarer despite the understanding of how valuable they are to create, advance and disseminate knowledge. In this context, the expansion of graduate learning in Brazil has been a successful story of state policies in the last forty years (Balbachevski, 2005; Picinin *et al.*, 2012; Alves e Ferreira, 2014), although there is still a lot to be accomplished.

Numbers express clearly the growth seen in the beginning of the XXI century. There were 38 graduate programs in 1960, and 2,588 by 2008, mostly at research-oriented public institutions, which are non-profit organizations that remain tuition-free.

According to Ribeiro (2005) the number of new doctors increased 932%, from 868 in 1986 to 8,084 in 2003. Viotto (2010) reports an expansion of 1,000% between 1987 and 2007. In 2016, residents in Brazil, that hold a doctoral degree are 187,354; the number of doctors per 100,000 inhabitants is 7.6 compared to 3.4 in Chile, 39.7 in Portugal, and 41.0 in USA (*Censo*, 2010; *Centro de Gestão e Estudos Estratégicos/CGEE*, 2016).

State policies are responsible for the expansion at the public sector and directly/indirectly of the private sector. Eighteen new federal universities were created between 2003 and 2014. In 2014, an expansion of facilities and of student enrollment,

representing an investment of R\$ 88 billion, also occurred in 2014 (Mendes, 2015).

More recently new programs have been implemented (MEC, 2015) aiming to facilitate access to the private system of Higher Education [e.g. “*Fundo de Financiamento ao Estudante do Ensino Superior*” (Fies), “*Sistema de Seleção Unificada*” (Sisu), “*Programa de Bolsa Permanência*” (PBP), “*Programa Nacional de Assistência Estudantil*” (Pnaes) and “*Programa Nacional de Acesso ao Ensino Técnico e Emprego*” (Pronatec)]. The outcome of these policies may be curbed by changes that have occurred at the government level when President Dilma Roussef was impeached in 2015 (Gibney, 2015).

The role of doctoral holders in the Brazilian societies

Doctorate holders are a crucial part of processes aiming to build prosperous scientific, economical and social networks (see OECD/UNESCO, Institute for Statistics/Eurostat Care CDH project). To know where doctors are and what are they doing is an important step to optimize financial support and resources in times of budget cutbacks as seen nowadays in Brazil (Velloso, 2004; Auriol *et al.*, 2013; Gibney, 2015). Here the focus is on those doctors who earned a degree in Ethology, a multidisciplinary area associated with animal welfare and concerned with the knowledge of wild organisms living in a natural environment, both aspects of fundamental interest to a country like Brazil, known for its huge biodiversity and vigorous livestock.

In the present work the career of doctorate holders in Ethology is analyzed also regarding employment sources and production in science, meaning mainly academic mentoring and paper authorship, during an interval of six years after 2010. Whenever possible, the gender (meaning here the sex of doctoral holders) issue is also addressed.

Material and Methods

Subjects and data collection

Fifty two individuals of both sexes (30 ♀♀ and 22 ♂♂) obtained their Doctoral Degree in 2010, choosing Ethology as the main theme, according to a previous study (see Table 1 at Spinelli de Oliveira and Magrini, 2015), and were selected as subjects of the present work. The following questions are addressed:

- Is information about current professional position available?
- If information is provided, where are they working and how many have a steady job?
- Are they working as professors at public or private universities in Brazil?
- If so how many Master Theses and/or Doctoral Dissertations have they advised?
- Are they mentoring monograph/senior thesis and projects undertaken by undergraduate students?
- Have they otherwise attained a post doctoral position or a fellowship at governmental or private institutions of higher education or research?

- How many peer-reviewed articles have they published?
- Where did they come from and where are they now? Finally, the topic of sex — does sex matter? — will be addressed as a component of each of the previous questions.

The group of doctors was selected from a previous studied (Spinelli de Oliveira and Magrini, 2015). In order to answer the above-mentioned questions, data from January of 2011 to December of 2016 were accessed at *Plataforma Lattes* database, *Conselho Nacional de Pesquisa* (CNPq) (<http://lattes.cnpq.br/>). When necessary information was confirmed at <https://www.escavador.com/>. A time frame of six years was chosen because in Brazil several funding agencies require candidates to have concluded their doctoral dissertations less than seven years prior to the application for research grant and postdoctoral fellowship (e.g. *Fundação de Apoio à Pesquisa do Estado de São Paulo*, FAPESP at <http://www.fapesp.br>, and CNPq at CNPq — *Portal CNPq*).

Table 1. Careers of doctorate holders in Ethology (n= 52) six years after getting their degree, according to sex, in Brazil.

Doctoral holder	Professor at Public University	Public servant	Professor at Private University	Private sector (*)	Fellowship holder	Career not informed	CV not available (**)	CV Not updated (***)	Total
Male	14 (67)	1 (33)	3 (38)	0	3 (30)	0	0	1 (25)	22
Female	7 (33)	3 (67)	5 (62)	1	7 (70)	2	2	3 (75)	30
Total %	21 (40)	4 (8)	8 (15)	1 (2)	10 (19)	2 (4)	2 (4)	4 (8)	52 (100)

Percentage values are shown in parenthesis. Data from January 2011 to December 2016 were accessed at *Plataforma Lattes* database, *Conselho Nacional de Pesquisa* (CNPq) <http://lattes.cnpq.br/>. Three doctors (two ♂♂ and one ♀) had their curricula vitae (CV) updated in 2015, all others had CV updated in 2016. (*) working at a private organizations outside universities; (**) CV not available at *Plataforma Lattes* and not analyzed; (***) CV not updated for more than two years considering 2016 as the upper limit. “Public servant” is an employee outside professorship at e.g. *Empresa Brasileira de Pesquisas Agrárias* (EMBRAPA), *Instituto de Pesquisas Nucleares* (IPEN/CNEN/USP); *Fundação Estadual de Pesquisa Agropecuária* (FEPAGRO). Fellowship [e.g. *Programa de Apoio Técnico às Atividades de Ensino, Pesquisa e Extensão* (PROATEC), Universidade Federal do Rio de Janeiro; Fellowship (*Atração de Jovens Talentos*, level A, *Ciências sem Fronteiras*) at *Instituto de Psicologia da Universidade Federal do Rio Grande do Sul* e *Hospital de Clínicas de Porto Alegre*]. Fellowship also includes postdoctoral positions.

Data presentation and analysis

Here we use the following terminology:

- a) Thesis is the final project for master degree and dissertations leads to a doctoral degree, according to <http://www.cam-pusexplorer.com/college-advice-tips/64C6D277/What-Is-the-Difference-Between-a-Thesis-and-a-Dissertation/>.
- b) Monographs and senior theses are considered here indistinguishably in the same category. Monograph “is a specialist work of writing on a single subject or an aspect of a subject, usually by a single author”. Senior thesis “is a large, independent research project that students take on in the senior year of high school or college to fulfill a graduation requirement. For some students, a senior thesis is a requirement for graduating with honors”, after G. Fleming, 2017. (<https://www.thoughtco.com/what-is-a-senior-thesis-1857482>) and (<https://www.insidehighered.com/news/2016/04/04/new-data-show-tightening-phd-job-market-across-disciplines>).
- c) Advisor “is the person who is formally recognized as the main responsible for supervising the student’s thesis research. A co-advisor is a person who also works with the doctoral candidate, but often in a secondary role”.
- d) Here we use “graduation” referring to programs that award Doctor and Master degrees. We acknowledge that this classification is not adequate to countries organized along the European pattern. In this case “graduation” refers to the first stage of higher education (level 5 in UNESCO’s International Standard Classification of Education, ISCED 1997); and “post-graduation” refers to the second stage, ISCED 6, which includes master and doctoral programs.

The category “university professor” also includes professorship at *Instituto Federal de Educação, Ciência e Tecnologia* (IF).

Results and Discussion

I. Data collected at Plataforma Lattes: is information about current professional position available?

Information was not available (two ♀♀) or was not updated (three ♀♀ and one ♂) at *Plataforma Lattes* for a group of six doctorate holders in Ethology, a number corresponding to 12% of the initial account (Table 1). This group was not further considered in the analyses as data source was non-updated.

II. Are doctorate holders in Ethology (2010) working? If so, where are they?

Empregability

96% of all doctors whose *curricula vitae* (CV) at *Plataforma Lattes* provided job information are holding public or private positions, in universities, research institutes, either as professor, civil servant, technician or postdoctoral researcher. The career of two doctors (♀♀) was not informed (Table 1). Those results are in accordance with the literature since employability of doctors in Brazil is considered high, a value estimated as 99% in 2010 (Viotto, 2013).

Role of the public sector

According to the present study the public sector plays an important role providing jobs for doctorate holders in Ethology (2010), being responsible for employing 48% of them (15 ♂♂ and 10 ♀♀). In this context public universities are the predominant provider, supporting 40% of all jobs (Table 1). Most positions at public universities are occupied by men (14 jobs out of 21, representing 67%), while most women

are holding positions at the private sector or as public servants (a total of nine out of 13, corresponding to 69%). Also 70% of fellowship researchers are women (Table 1). Below we address two questions: what these data mean? What are the probable causes of the pattern found?

Characteristic of public universities distributions and number

In Brazil the majority of public universities is tuition-free and federally funded by state governments (*)¹, including the prestigious universities of São Paulo State, e.g. *Universidade de São Paulo (USP)*, *Universidade de Campinas (UNICAMP)* and *Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP)*. Federal and State universities are found in all 27 Federative units. In general, they provide full-time, permanent jobs and are ruled by regulations applicable to all employees in the State payroll, including public servants. For example, 90% of UNICAMP professors conform to a full-time, stable job schedule (UNICAMP, 2012).

Our data indicate that at least 48% of doctorate holders in Ethology of 2010 enjoy a stable job, since they are university professors at public institutions of education or public servants at research centers (e.g. *Empresa Brasileira de Pesquisa Agropecuária, Instituto de Pesquisas Energéticas e Nucleares*, and *Fundação Estadual de Pesquisa Agropecuária*) (Table 1). Those institutions secure full time and continuous employment (for details see Schwartzman, 2010).

Results obtained in the present work were somehow expected. According to Viotto (2010 and 2013), higher learning institutions are the main provider of jobs in Brazil for doctoral holders; 115,087 doctors were working in the education sector in 2012. Also it is known that 50% of jobs for

doctorate holders in Brazil are provided by federal organizations, including universities and research public centers (CGEE, 2016). The group of ethologists of the present study fits the pattern found in other areas of knowledge in that the public university plays a fundamental role as job provider.

Private universities

Private higher education in Brazil started operating a little later than the public system, only after the promulgation of the Constitution of 1891 (Teixeira, 1969). In this respect the Brazilian scenario is different from ones seen in other countries in the American continent, where Christian universities were founded at the beginning of colonization, Catholic in Latin America and Calvinist in USA (Durham, 2003; Oliveira, 2013; Oliven, 2014). More students were in low-quality private schools than in high-quality public institutions by 1985. In most cases, entrance requirements at private universities are considered more lenient than at public institutions of higher learning (Schwartzman, 1988; McCowan, 2004).

At the end of the XX century a new legislation named *Lei de Diretrizes e Bases da Educação Nacional 9394/1996* opened opportunities for further expansion of the private educational system, allowing the establishment of profit-orientated institutions, a fact what was not possible before. Since then undergraduate courses have been offered on a mass scale by the private sector. In 2009, there were 2,069 private higher education institutions compared to 1,004 private institutions in 2000 (see INEP, 2000 and 2009).

Presently, Brazil has the largest number of profit-oriented institutions of the tertiary level of education in the world. Both in USA and in China, differently of Brazil, government policies regulate the maximum percentage of

¹ Municipal governments tend to be responsible for small institutes, tuition-free or not

profit-oriented educational enterprises or the level in which they may operate. In China, for example, pro-profit organizations focus primarily on non-degree vocational education (Knoble and Marcelo, 2017). Presently private institutions of tertiary learning in Brazil belong to two groups: nonprofit (*filantrópicas*) Schools/universities and profit-oriented ones, and those charge wide-ranging fees. Since the private system of education exists in large number and everywhere in Brazil (Barreyro, 2008) it would be reasonable to suppose that they would provide a large number of jobs for doctor, including doctorate holder in Ethology. Why this has not been observed up to now?

Public versus private universities

Full employment and stable jobs are rare at private institutions. The majority of universities in the private sector are profit-oriented (Knoble and Machado, 2017) and research and teaching are expensive activities. Also public universities are responsible for a significant portion of the research scenario of Brazil as providers of most graduation programs. Broad scientific research options and diverse graduate programs are offered mainly at public universities (e.g. UNICAMP, 2008).

As stated before in the present study, most jobs for Doctorate holders in Ethology (55%, 29 out of 46) are at universities, 21 (40%) are at public universities (Table 1). Public universities/research centers probably are chosen due to the favorable conditions these institutions provide regarding job stability, high quality teaching, and broad research opportunities.

Investments in Education

The total federal budget for Education in Brazil grew from R\$ 24,5 billion (2004) to R\$ 92 billion (2014) values corrected by inflation and representing 1.7% of the Brazilian Gross Domestic Product (GDP),

an increase of 2.3 times in 10 years. Eighteen new federal universities were created between 2003 and 2014. In 2014, an expansion of facilities and of student enrollment also occurred, totalizing an investment of R\$ 88 billion (Mendes, 2015).

Lately programs were established aiming to democratize and expand even further the higher education system in Brazil. The government support to the private sector also has increased since the last decade of the XX century (Dourados, 2002). Some of the programs are: *Fies*, *Sisu*, *PBP*, *Pnaes*, “*Acessibilidade na Educação Superior*” (*Programa Incluir*), “*Programa Nacional de Assistência Estudantil para as Instituições de Ensino Superior Públicas Estaduais*” (*Pnaest*), “*Programa Milton Santos de Acesso ao Ensino Superior*” (*Promisae*) and “*Lei de Cotas*” (MEC, 2015).

The private sector also had a further buster especially through initiatives as “*Programa Universidade para Todos*” (*PROUNI*), created in 2004 (*Lei n° 11.096/2005*) providing fellowships for students at private universities. In 2014, PROUNI supported 300 mil fellowships.

How those programs will modify empregability at the public and private educational system must yet be seen. Changes in government policies may interfere with the scenario just described (Gibney, 2015) and the future of doctorate recipients in Ethology may become less bright than what was found by the present work.

Does sex matter?

The present study shows 100% employment of male doctors and 92% of female doctors (23 of 25) in Ethology, after six years of earning their degree (Table 1). In the context of empregability both values are high, but they may indicate a tendency of harder opportunities for women at the academic world as already pointed out by other studies

(Shen, 2013; Moschkovic and Almeida, 2015; Valentova *et al.*, 2017). Women corresponded to 55% of all professors at the tertiary level of learning in Brazil in 2009 (INEP, 2010). 51.5% of doctorate holders were women in 2008 (CGEE, 2010). Previous studies have found parity between gender when the number of master and doctorate degrees in Ethology is concerned (Magrini and Spinelli de Oliveira, 2015; Spinelli de Oliveira and Magrini, 2015). Although in our sample women holding doctoral degrees are in greater number than men, women seem to be working in less stable jobs (i.e. at private institutions or holding temporary fellowships) and probably endure less favorable conditions regarding research and remuneration. Not surprisingly, sex dynamics reveal that the share of part time contracts is higher among women having doctoral graduation in 35 but 5 economies of *Organisation for Economic Co-operation and Development* (OECD) members: Malta, Turkey, Portugal, Chinese Taipei and Romania. This unbalanced scenario is particularly marked in Germany, Israel, Belgium, the Uni-

ted States, and the Netherlands (Auriol *et al.*, 2013). The topic is so important that in 2013 *Nature* issued a special number about women in Science (see <http://www.nature.com/news/specials/women/index.html>).

The sex scenario in Brazil has changed, and now is more balanced than it was not long ago (see Leta, 2003; Leta, 2014), nevertheless it is necessary that state policies for sex parity continue to be discussed with the participation of women, and structural changes continue to be implemented (Barsted and Pitanguy, 2011; Allum and Okahana, 2015; Valentova *et al.*, 2017).

III. Supervision of dissertations, theses, monographs and undergraduate fellowships by doctorate recipients of Ethology

Advising at tertiary level of education (dissertations, theses, monographs and undergraduate fellowships) is unevenly distributed when doctors in Ethology (2010) are regarded as mentors, either when data is presented as mixed-sex group (Figure 1), or when data are

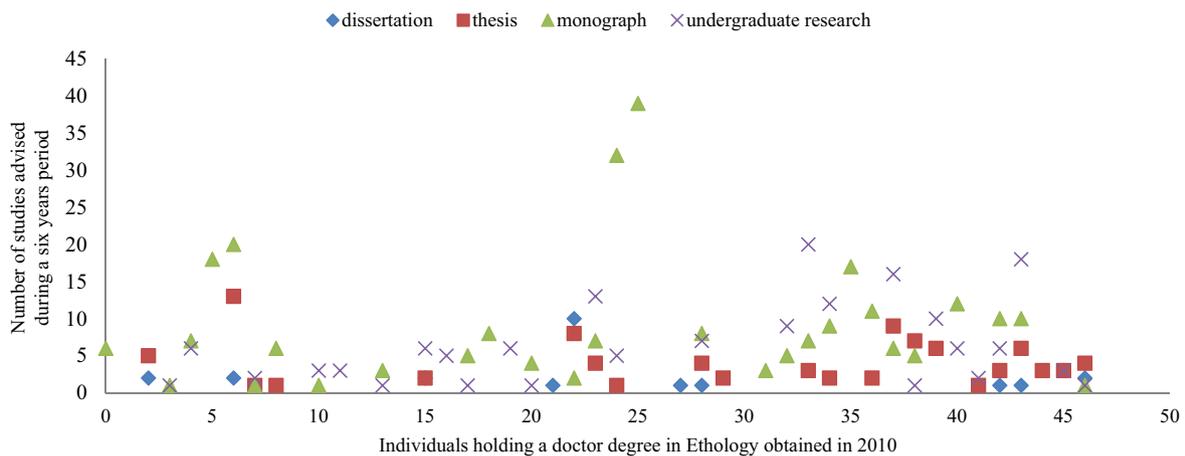


Figure 1. Number of studies (doctoral dissertations, master theses, monographs and undergraduate research) at y-axis, advised per each doctor shown as numbers at x-axis (n = 46, 21 ♂♂ and 25 ♀♀), during six years after graduation in Ethology (2010).

Data from January 2011 to December 2016 were accessed at *Plataforma Lattes* database, *Conselho Nacional de Pesquisa* (CNPq) <http://lattes.cnpq.br/>. Three doctors (two ♂♂ and one ♀) had their *curricula vitae* (CV) updated in 2015, all the others had CV updated in 2016. Numbers include ongoing and already completed works, advised or co-advised. One value representing 124 monographs supervised by a female doctor is not shown for the sake of illustration. There was no information of two male doctors working as professors (at one private and one public university). Dissertation=doctoral level, thesis=master level, monograph or senior thesis at undergraduate level. See definitions and other information at Material & Methods.

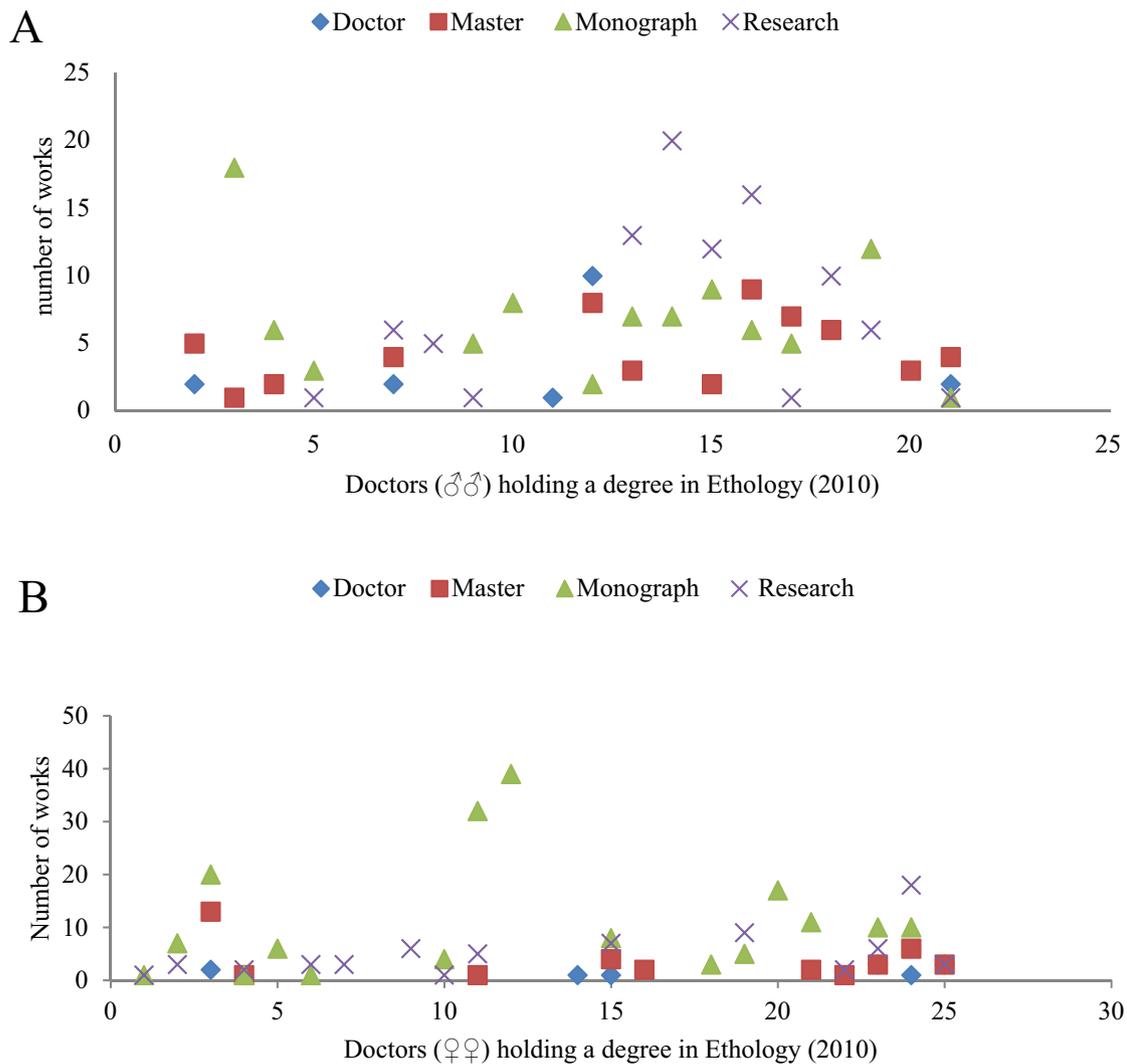


Figure 2. Number of works (doctoral dissertations, master theses, monographs and undergraduate research) at y-axis, advised by doctoral holders in Ethology (2010) at x-axis (In A, n = 21 males; In B, n = 25 female), during six years after graduation.

Data were accessed at *Plataforma Lattes* database (for more information see Material & Method). Doctor 13, not shown for sake of illustration, is responsible for advising 124 monographs. Four doctors (two ♂ and two ♀) did not advise any work during the six years studied.

separated according to sex (Figure 2). In either case the number of studies advised varies a lot from individual to individual, independently of sex. Figure 1 shows, for example, that doctor 41 advised two works, but doctors 42 and 43 advised or are advising four works (one thesis, one dissertation, one monograph and one undergraduate research). In Figure 2 we can see that female doctors have advised

or/are advising a greater number of works than male doctors, mostly monographs.

A total of 667 academic works (28 dissertations, 90 theses, 388 monographs, and 161 undergraduate works) are advised or were co-advised by doctors who earned their degree in Ethology (2010), corresponding to 2.5 dissertation year¹.doctor¹ (Table 2; Figure 1 and Figure 2). Women (25 out of 25 ♀♀) are responsible for 415 works (61%

Table 2. Works advised by Brazilian ethologists earning a doctor degree in 2010 (n= 46) at graduate (doctoral and master degree), undergraduate (monographs/senior theses) levels and mentoring of undergraduate research according to sex (♂♂= 21; ♀♀= 25). Data are expressed by number of each category, total number, number. year⁻¹ (n/y), and number.year⁻¹.doctor⁻¹ (n/y/d).

Gender	n	Doctoral level				Master level				Monograph	Undergraduate			Total Number	n/y	n/y/d				
		advisor	co-advisor			advisor	co-advisor				Research									
		C	O	C	O	D _d	C	O	C	O	T _m	C	O	M _o	C	O	U _r			
♂	19	0	3	5	9	17	17	16	15	6	54	85	4	89	75	17	92	252	42	2.2
♀	25	0	1	5	5	11	10	5	17	4	36	206	93	299	50	19	69	415	69	2.8
Total	44	0	4	10	14	28	27	21	32	10	90	291	97	388	125	36	161	667	111	2.5

Data from January 2011 to December 2016 were accessed at *Plataforma Lattes* database, *Conselho Nacional de Pesquisa* (CNPq) <http://lattes.cnpq.br/>. Three doctors (two ♂♂ and one ♀) had their *curricula vitae* (CV) updated in 2015; all others had CVs updated in 2016; career was not informed for two female doctors. Two male doctors did not advise any student. Abbreviations: male (♂), female (♀), work completed (C), ongoing work (O), doctoral dissertations (D_d), master theses (T_m), monograph/ senior theses (M_o), undergraduate research (U_r). More information at Material & Method.

of total), and men (19 out of 21 ♂♂) have supervised 252 assays (39% of total).

The supervision of dissertations and theses as sole adviser is incipient among doctors in Ethology, now occupying professorships. No one has finished supervising a single doctoral dissertation as advisors up to the end of 2016 (Table 2); two doctors (one ♂= three dissertations and one ♀= one dissertation) are currently participating in ongoing supervision, both at public universities (Table 2). Ten doctors (five ♂♂ and five ♀♀) are co-advisers of dissertations already completed, and 14 doctors (nine ♂♂ and five ♀♀) are presently advising doctoral theses (Table 2).

Most graduate work is advised by male doctors (71 out of 118 or 60%); female doctors are accountable of 47 graduate works, corresponding to 40% of dissertations and theses. Most undergraduate research is supervised by men: total of 92 in six years (57%); 15.3 year⁻¹, corresponding to 0.8 year⁻¹.doctor⁻¹. Most monographs are advised by women: total of 299 (77%) in six years; 49.8 year⁻¹, corresponding to 1.9 year⁻¹.doctor⁻¹ (Table 2 and Figure 2). Probably these differences reflect the working conditions that are different for men and women doing research in public or in private institutions.

Supervising at public and private universities — Does sex matter (2)?

When mentoring is considered, male and female doctors in Ethology (2010) present an uneven production (Table 2): males supervise a smaller total number of students (n= 252 out of 667; 38%) than females (n= 415 out of 667; or 62%), but the first group does so predominantly at the graduate level (71 of 118), while females are responsible by supervising mainly monographs. Also male doctors are responsible for supervising most of the research done at undergraduate level. Considering that male doctors work at public universities in larger number than women doctors (Table 1) these differences could be understood in terms of better research conditions found for men than for women at their jobs.

Analyzing subtle differences is important to the understanding of sex unbalance toward men, still seen in the academic world in Brazil and otherwise (Cho *et al.*, 2014; Moschkovich and Almeida, 2015; Valentova *et al.*, 2017). Accurate interpretations are fundamental in establishing strategies aiming to restrain sex inequality.

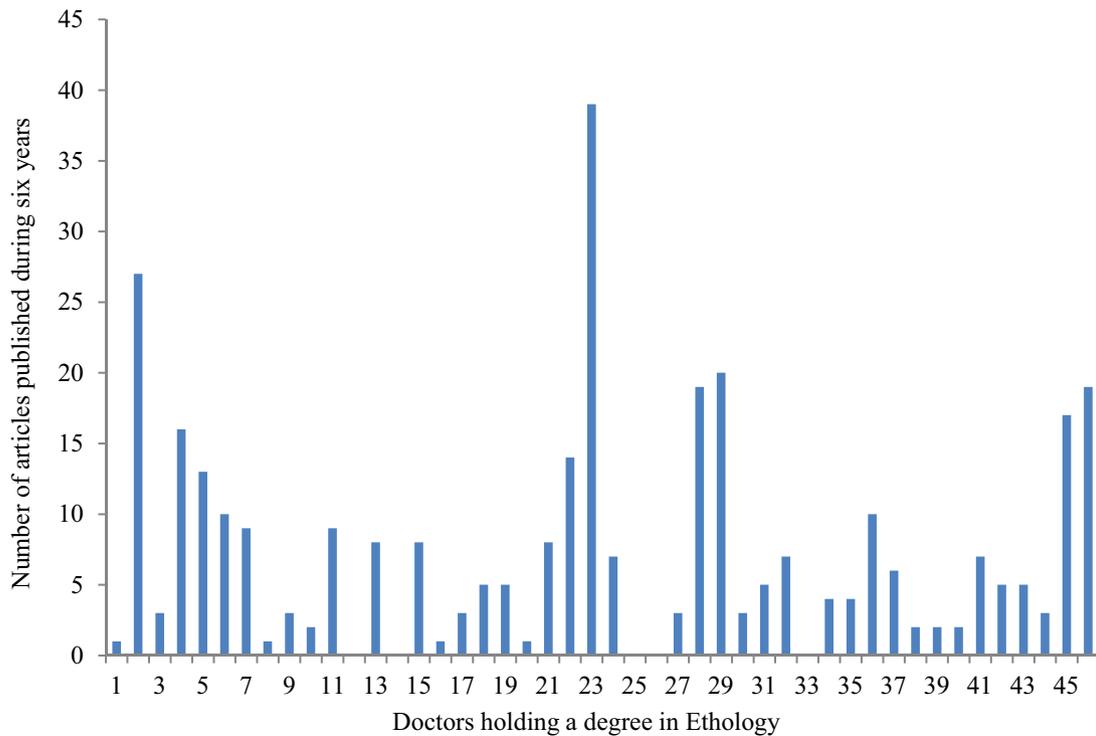


Figure 3. Number of peer-reviewed articles (y-axis) published during six years (2011 to 2016) by doctoral recipients in Ethology (n = 46; 21 males, and 25 female; x-axis), degree granted at 2010.

Data were accessed at *Plataforma Lattes* database (for more information see Material & Method). Five doctors (two ♂♂ and three ♀♀) did not publish a single peer-reviewed article during the time-span of six years.

IV. Publishing peer-reviewed paper

All but five doctors (two ♂♂, three ♀♀) published peer-reviewed articles as co-author along the time-span analyzed in the present study, representing 89% of degree-holders in Ethology in 2010 (Figure 3 and Figure 4). A total number of 366 articles were published (♂♂= 166, ♀♀= 170) corresponding to 61 article.year⁻¹ or 1.5 article.year⁻¹.doctor⁻¹. The pattern of publishing (Figure 3 and Figure 4) is uneven either for mixed-sex grouping or groups separated by sex: the range for men is 0 to 39 articles, while for women the range is 0 to 20 papers during the time-span of six years; the median value for both groups is 5 articles.

There is a strong pressure at public universities to get professors involved in publishing (see Unicamp, 2008) as emphasized by Moschkovich and Almeida (2015).

Otherwise, only a handful of private universities follow this rule. The number of articles published per doctor in Ethology found in the present work falls into what is expected in the international context. A study by Ioannidis *et al.* (2014) looked at papers published between 1996 and 2011 by 15 million scientists around the world, in many areas of knowledge, accessing the Elsevier's Scopus database, and found that fewer than 1% of all scientists publish one paper every year in a steady manner.

Considering the qualitative scenario it is encouraging that doctors holding degree in Ethology are contributing not only to teaching, but also to research done in Brazil. Co-authorship indicates the maintenance of links with laboratories already established within the exclusive cycle of researchers in Brazil, a positive aspect that should be highlighted.

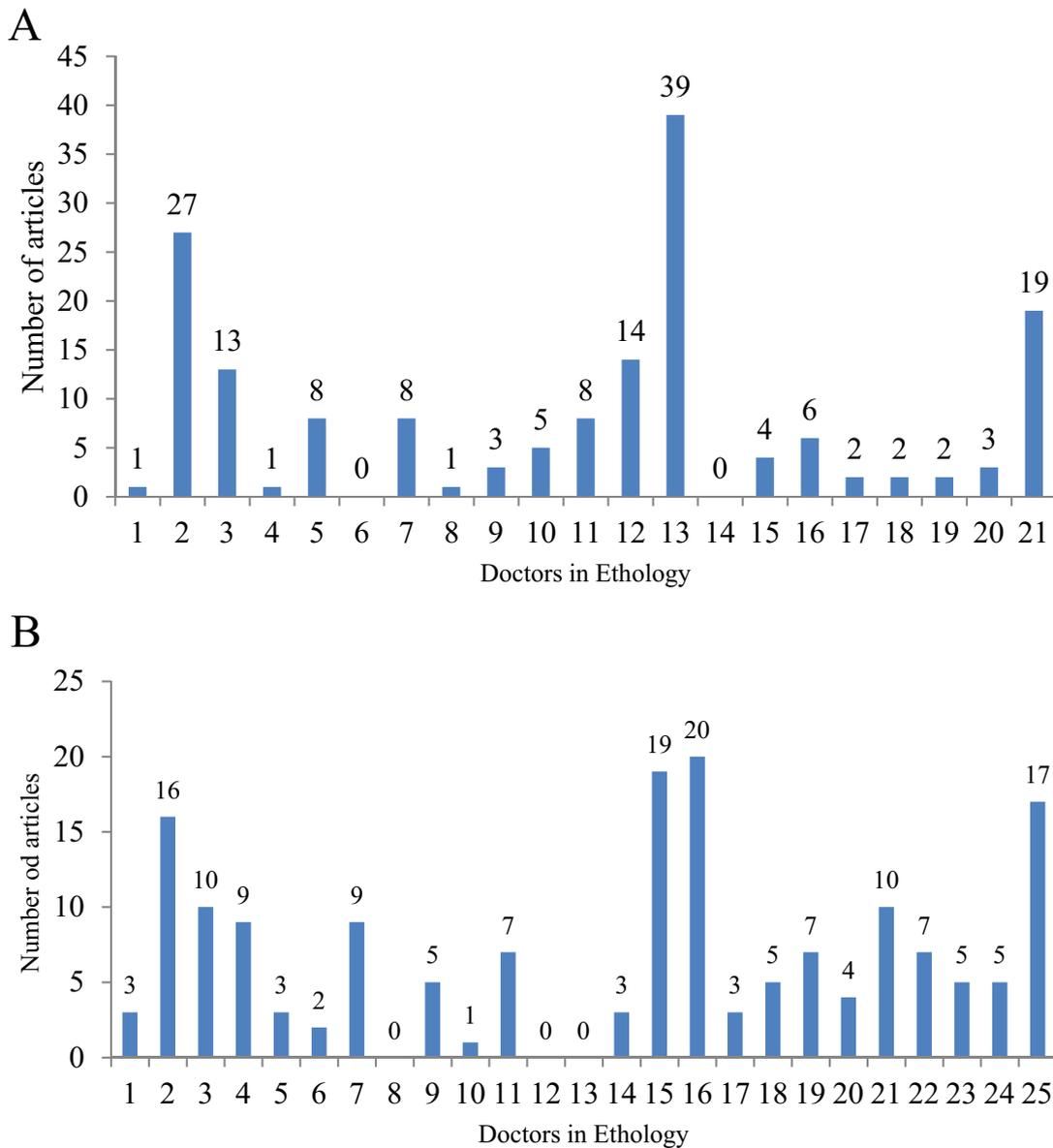


Figure 4. Number of peer-reviewed articles (y-axis) published during six years (2011 to 2016) by doctoral recipients in ethology (In A, n = 21 males; In B, n = 25 females), degree granted at 2010 (x-axis).

Data were accessed at *Plataforma Lattes* database (for more information see Material & Method). Five doctors (two ♂♂ and three ♀♀) did not publish any work during the time-span of six years analyzed.

V. Where did they come from? Where are they now?

As expected most doctors of Ethology of 2010 (56%) got their degree in public universities localized in the Southeast region of Brazil (Figure 5), where most graduation programs are (dos Santos and de Azevedo, 2009).

Data in the present paper highlight what has been shown previously considering doctorate holders (Spinelli de Oliveira and Magrini, 2015) and master degrees earning in Ethology (Magrini and Spinelli de Oliveira, 2015) in a survey of five years, from 2010 to 2014, which included the group presently studied. Institutions in the Southeast contributed with 62%

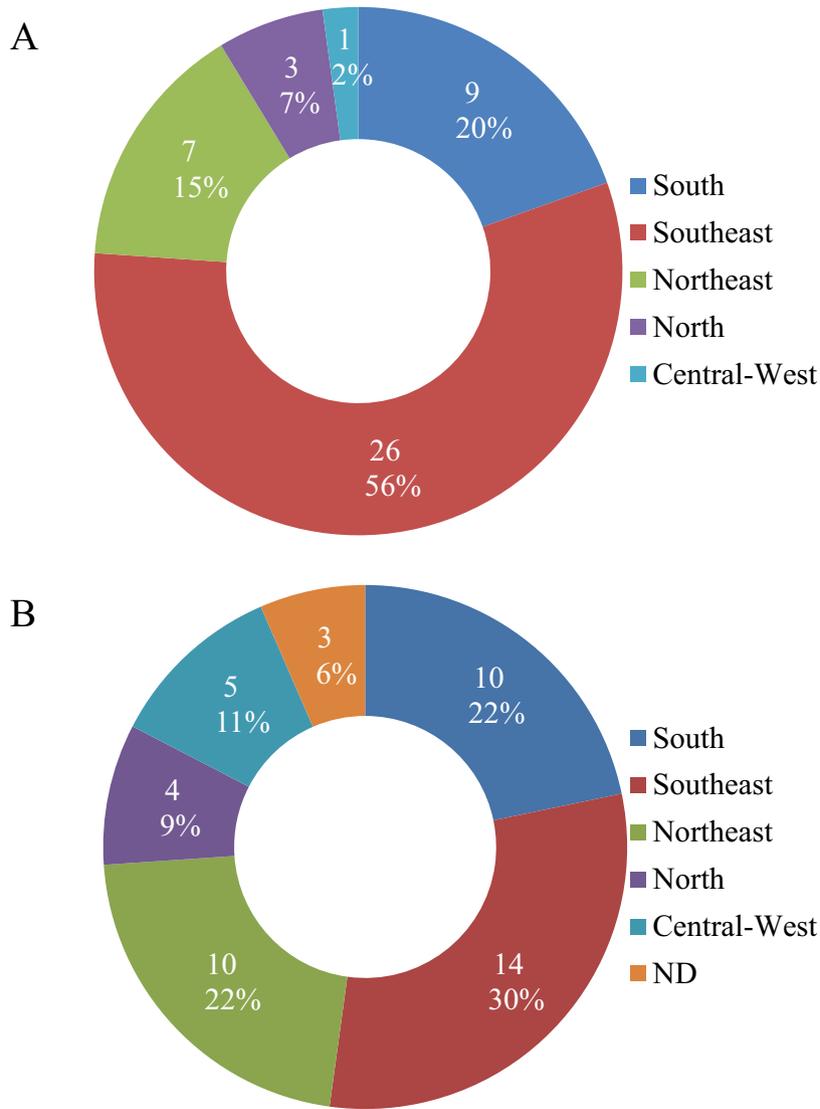


Figure 5. Regions of Brazil where doctorate holders in Ethology (n = 46) obtained their degree in 2010 (A) and where they are working in 2016 (B).

The majority of doctors (56%) earned their degree of Ethology at institutions localized in the Southeast region. After six years they occupy jobs in all regions of Brazil: the Central-West and the Northeast show the largest increase in number of doctor who earned title in 2010, while the presence of doctors at the Southeast region decreased 26%. Data was collected at *Plataforma Lattes* (CNPq) <http://lattes.cnpq.br/>. Three doctors (two males and one female) had their *curricula vitae* (CV) updated in 2015, all the others had CVs updated in 2016.

of all doctoral degrees (Spinelli de Oliveira and Magrini, 2015) and 52% of master degrees earned in Ethology in Brazil (Magrini and Spinelli de Oliveira, 2015). Also according to CNPq database of Research Groups in Brazil Lattes (2014) — “*Diretório dos Grupos de Pesquisa no Brasil Lattes*”/CNPq — a large number of Brazilian researchers (44% of to-

tal) are in the Southeast region (<http://lattes.cnpq.br/web/dgp/censo-atual/>).

In the present study a clear regional transference of doctors is observed: participation of the Southeast region shrinks from 56% to 30%; the North and the South shows a slight increase (from 7 to 9%, and from 20 to 22%, respectively), and the Northeast region incre-

ases from 15 to 22%. The largest difference is seen regarding the contribution of the Central-West region: from 2% to 11% (Figure 5).

This result opens the possibility of an equitable relationship among regions in Brazil concerning the tertiary level of educations, at least regarding Ethology. If we take in consideration that unique biomes in Brazil are situated at the Central-West and Northeast regions (e.g. Cerrado, Pantanal, Amazon Forest and Caatinga domains) we would expect a positive effect upon the knowledge of the particular fauna of those regions, diverse and numerous, but still mostly unknown from the animal behavior point of view.

While most of our data reflect patterns already known for other areas — e.g. the high level of empregability of doctors or the important role of the public sector as the main employer for doctorate holders — two aspects deserve more attention. One has been already pointed out by Leta (2003, 2014) and Moschkovich and Almeida (2015): the inequality of gender in Brazil needs to be examined going beyond just quantitative aspects. This is especially evident when high positions at the academic world in Brazil are concerned, as pointed out recently by Valentova *et al.* (2017). The other point is the fact detected in the present paper showing the role played by Institutions of the Southeast region of Brazil as disseminator of animal behavior knowledge to other regions of Brazil.

According to Picini *et al.* (2012) only 24% of professors are doctoral holders if one considers all Institutions of Higher Learning in Brazil, either public or private. At public federal universities the number increases to 50% and USP, UNICAMP and UNESP are exceptional for having more than 90% of professors holding doctoral degrees. The fact is that there is room for growth when positions are considered, and the present study confirms this assumption for those who choose Ethology as an academic carrier in Brazil.

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