



## A decade of Zoology Summer Course: impressions and impacts of the first university extension course on Zoology in Brazil

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**Abstract:** Although the diversity of animal groups distributed in Brazil provides countless research opportunities, the current scenario does not follow this demand. The reasons for the disconnections range from inequality in the availability of resources for teaching and research to the focus of researchers on specific groups of animals, while others remain neglected. Training new potential Brazilian researchers interested in Zoology is essential for a greater understanding of this diversity, as well as exposing those potential new researchers to new groups and different work possibilities. Thus, the Summer Course in Zoology (in Portuguese, CVZoo) promoted by the Graduate Program in Zoology at the University of São Paulo, over the last ten years, has been seeking to contribute to this training of new researchers in the field of Zoology, as well as in updating teachers through university extension activities. In order to assess the impacts caused by CVZoo on the academic and professional training of the participants, Google forms were sent to participants in the ten editions of the course, as well as compiled information available on the Lattes Platform. Qualitative and quantitative analyses showed the profile of graduates, their expectations, and perceptions about the course. Based on these data, we demonstrate the CVZoo's efficiency in popularizing Zoology throughout the country in contributing to the decentralization of knowledge as well as in meeting the urgent concerns of making access to knowledge more egalitarian and socially fair.

**Keywords:** Biodiversity; University extension; Student training; Graduation.

## Uma década de Curso de Verão em Zoologia: impressões e impactos do primeiro curso de extensão universitária sobre Zoologia no Brasil

**Resumo:** Embora a diversidade de grupos de animais existentes no Brasil ofereça inúmeras oportunidades de estudo, o cenário atual não acompanha essa demanda. Os motivos para essa desconexão vão desde a desigualdade na disponibilidade de recursos para ensino e pesquisa até o foco de pesquisadores em grupos específicos de animais, enquanto outros permanecem negligenciados. O treinamento de novos pesquisadores interessados em Zoologia é essencial para um maior entendimento da diversidade brasileira, assim como a exposição de tais pesquisadores a novos grupos e diferentes possibilidades de trabalho. O Curso de Verão em Zoologia (CVZoo) promovido pelo Programa de Pós-graduação em Zoologia da Universidade de São Paulo, ao longo de dez anos vem buscando contribuir para a formação de novos(as) pesquisadores(as) na área da Zoologia, bem como na atualização de docentes do Ensino Básico por meio de atividades de extensão universitária. Para avaliar os impactos causados pelo CVZoo na formação acadêmica e profissionalizante dos participantes, foram enviados formulários aos participantes das dez edições do curso, bem como compiladas informações disponíveis na Plataforma Lattes. Análises qualitativas e quantitativas evidenciaram o perfil das pessoas egressas, suas expectativas e percepções acerca do curso oferecido. Com base nesses dados, é apontada a eficiência do CVZoo na popularização da Zoologia por todo o país, contribuindo para a descentralização do conhecimento, bem como atendendo às preocupações prementes de tornar o acesso ao conhecimento mais igualitário e socialmente justo.

**Palavras-chave:** Biodiversidade; Extensão universitária; Formação discente; Pós-graduação.

## Introduction

### 1. Research and teaching in Zoology in Brazil

Brazil is a megadiverse country that concentrates in its territory a unique diversity of several animal groups (Mittermeier et al. 1997). Lewinsohn & Prado (2002) estimated that there are between 170 and 210 thousand known species in our country, a number that has been increasing significantly in the last twenty years. However, there is still a long way to go, since estimates suggest the existence of a number seven times greater than the currently described species (Lewinsohn & Prado 2005). In addition to the species that remain without proposed names, an extensive body of knowledge still awaits to be revealed.

Given the potential load of knowledge that this diversity represents, Zoology emerges as an area of knowledge with the purpose of cataloging and understanding both current and extinct animal diversity. The area can be subdivided into several subareas, one of which is Systematic Zoology, whose objectives are to understand the evolutionary history of species and propose hypotheses to name and classify them. However, although more than 500 Brazilian researchers call themselves “systematists” and “taxonomists”, they are unevenly distributed, mostly concentrated in the Southeast (about 50%) and South (20%) regions, with emphasis on the states of São Paulo, Rio de Janeiro, Paraná and Rio Grande do Sul (Marques & Lamas 2006). This is quite inconsistent with the diversity of biomes and specialized fauna found in each of the country’s regions, and the potential for discovering new species in each of them.

Similar geographic patterns are observed in scientific production in Zoology, with the Southeastern holding the highest part of productivity (70% of papers and 75% of citations) and in graduate programs in the area, in which the South and Southeast regions concentrate most of them (approximately 70% for masters and PhDs; data extracted from Marques & Lamas 2006). However, if we look at federal investment in university projects, we find that the South and Southeast regions once again hold most of the research funds, which include the provision of scholarships for students, and result in greater adherence and academic productivity (Marques & Lamas 2006).

Faced with this unequal scenario of Zoology development in Brazil, the creation and execution of actions that equalize knowledge, teaching and scientific productivity across the country are urgently needed. Among the actions proposed by Marques & Lamas (2006), there are suggestions aimed at training new professionals in different regions of the country, increasing scientific production and disseminating knowledge to different audiences. The offering of specialization courses in meetings and scientific events are also mentioned (Marques & Lamas 2006), but extension projects with the participation of the university community were not considered as one of the possible agents for the expansion and decentralization of Zoology in Brazil.

The Summer Course in Zoology (in Portuguese, CVZoo), created and organized by students of the Graduate Program in Zoology at the University of São Paulo, stands out as an important milestone for university extension in Zoology in Brazil. Below is a brief history of the course.

### 2. History of CVZoo

The Summer Course in Zoology began in January 2013, organized by students from the Graduate Program in Zoology (PPGZOO) at the University of São Paulo and supervised by Prof. Dr. Alessandra Bizerra.

Initially, the course had the following objectives: 1) to disseminate the research lines in Zoology developed by students of the graduate program and 2) to provide teaching practice experiences and thus fill a gap in the professional training of such students (Soares et al. 2020).

The course lasts for two weeks, the first one dedicated to classes on general topics in Zoology, such as Systematics, Philosophy of Science, Animal Behavior and Biogeography, and the second one containing activities with more specific subjects. Despite the fact that the first week of the course has changed little over time (with the exception of the remote editions that occurred in 2021 and 2022), the second week has changed considerably. In the first four editions, participants were divided into three groups, considering their research groups – Vertebrates, Panarthropoda and Non-Panarthropoda - and the activities were carried out jointly. Since the fifth edition, such a division into three groups no longer occurred and students began to assemble their own grid, choosing from several options of workshops and short courses on taxonomic groups (e.g., Annelida, Arthropoda and Chondrichthyes) and research and teaching methods.

As of the third edition, the selection process for participation in the course began to consider the proportion of enrollments coming from the five regions of Brazil (Midwest, Northeast, North, Southeast and South), thus seeking to expand knowledge to more people. From the fifth edition onwards, teachers became part of the course’s target audience, participating in workshops in the second week and developing a research project or didactic sequence. Thus, updating knowledge in Zoology for teachers was included as one of the objectives of the course. More detailed information about the participant selection process can be found in the work of Soares et al. (2020).

Since the first edition of the course, members of the organizing committee have sought various ways to raise funds and thus partially or fully defray the cost of accommodation at the Sports Practices Center of the University of São Paulo (in Portuguese, CEPE-USP) and meals at the university restaurant. In this way, the principal aim is to contribute to reducing expenses and facilitating access for students from more distant regions and in less favorable socioeconomic conditions.

As an evaluation criterion, course participants are invited to develop over the two weeks a research project in the format of a master’s degree, on a topic within Zoology under the supervision of members of the course organizing committee. On the last day of the course, the projects are presented and evaluated by an examining board, composed of members of the organizing committee not involved in the development of the projects. The participation and frequency of the participants are also considered as an evaluation criterion and make up the final grade.

In ten editions, 460 students from different regions of Brazil and other Latin American countries (e.g., Peru, Colombia) were selected to participate in the course (Table 1), among more than 4,500 enrollments. Over time, adjustments in the number of vacancies were necessary to meet the growing demand for registrations. The offer of vacancies doubled between the first and tenth editions, going from 30 vacancies in 2013 to 60 in 2022, with numbers of people registered above 400 in all editions from the fourth.

Given the already exposed need to provide access to Zoology teaching and equalize the generation of knowledge throughout the country, and considering the ten years of application of an extension course with concerns beyond content, this study had the following objectives: 1) raise and evaluate the profile of the certified participants

**Table 1.** Number of enrollments and participants selected by course edition.

Edition	N enrollments	N students	N teachers
I	200	30	0
II	364	35	0
III	206	35	0
IV	732	40	10*
V	599	40	10
VI	493	40	15
VII	499	40	15
VIII	400	40	15
IX	624	55	0
X	602	48	7
Total	4.719	403	62

who helped build CVZoo over ten years, 2) investigate their motivations, expectations and evaluations, 3) evaluate the impacts of the course on the academic and professional training of the certified participants.

## Material and Methods

To profile the course concluding participants, data on the academic background of them (degrees obtained, universities, region and animal phylum studied) were obtained through the Curriculum Lattes Platform. Only participants who passed the course and received certification were considered.

Two questionnaires were developed, one for participants selected as undergraduate students and the other for participants selected as teachers. Both contained multiple-choice and essay questions and were divided into three parts (Appendix 1). Only the first part had the same content in both questionnaires, being focused on the profile and self-identification of the graduates of the course (e.g., nationality, race, sexual orientation and gender identity) as well as on the research area and current institution. These data allowed us to obtain additional information regarding the profiles of participants. In the second part of the questionnaire addressed to the students, the questions dealt with motivations and expectations related to CVZoo and impressions about workshops and the process of developing a research project. In the second part of the teachers' questionnaire, motivations and expectations were also questioned, as well as the relationship between the topics covered and the school environment. In the third part, students were asked about the influence of CVZoo on academic life (research and extension) while teachers answered questions about teaching and prospects for pursuing an academic career. In order to understand how the target audience has been informed about CVZoo activities and editions, the third part of the questionnaire also included, for both categories, a question about the method by which the participant became aware of the course, involving all means of dissemination incorporated throughout editions (social networks, website, email list and through undergraduate colleagues).

The questions were arranged in Google Forms and sent to students and teachers who concluded in CVZoo on two different occasions. The first research round took place from February 20th to April 19th, 2018 (contemplating certified participants from the first six editions) and the second, from March 4th to June 4th, 2022 (contemplating certified participants from all course editions). For certified participants who

answered the forms on both occasions, only the second answer was considered, as it was the most recent, thus excluding the possibility of double entries for the same participant in the quantitative analyses; in the qualitative analyses, both responses were considered. The total (n) of responses for each question on the form was treated independently, so that questions left unanswered by any respondent did not interfere with the calculations for other questions. The publication of the data provided here was authorized by the respondents.

The data obtained through the Curriculum Lattes Platform were compiled in a spreadsheet and standardized (Appendix 2). We categorized the information about the studied phyla following the names of the phyla, when dealing with specialized studies (for example Annelida, Arthropoda and Chordata), and when dealing with less specific studies or involving more than one phylum, we used other three categories: Fauna (for studies with more than one phylum, or communities such as meiofauna or zooplankton); Protists (for studies with unicellular eukaryotes such as foraminifera); and Others (for studies on other topics, not related to metazoans). Similarly, due to the diversity of graduate programs and the number of graduates in each program, we chose to categorize this information by related areas, thus obtaining the following categories of graduate programs: Animal Biology, Biodiversity and Conservation, Biology, Ecology, Teaching, Entomology, Oceanography, Systematics, Zoology and Others (including areas less related to Zoology, such as Botany, Bioinformatics and Genomics, Biochemistry, Ethnobiology, Geology, Museology, among others).

Frequencies of each category and their changing patterns over the ten CVZoo editions were analyzed and described. To compare whether there was a difference in each category (race, gender identity and sexual orientation) over the years, we applied a chi-square test, considering a significance level of 0.05. The answers to the discursive questions were analyzed using content analysis procedures as parameters (Bardin 1977).

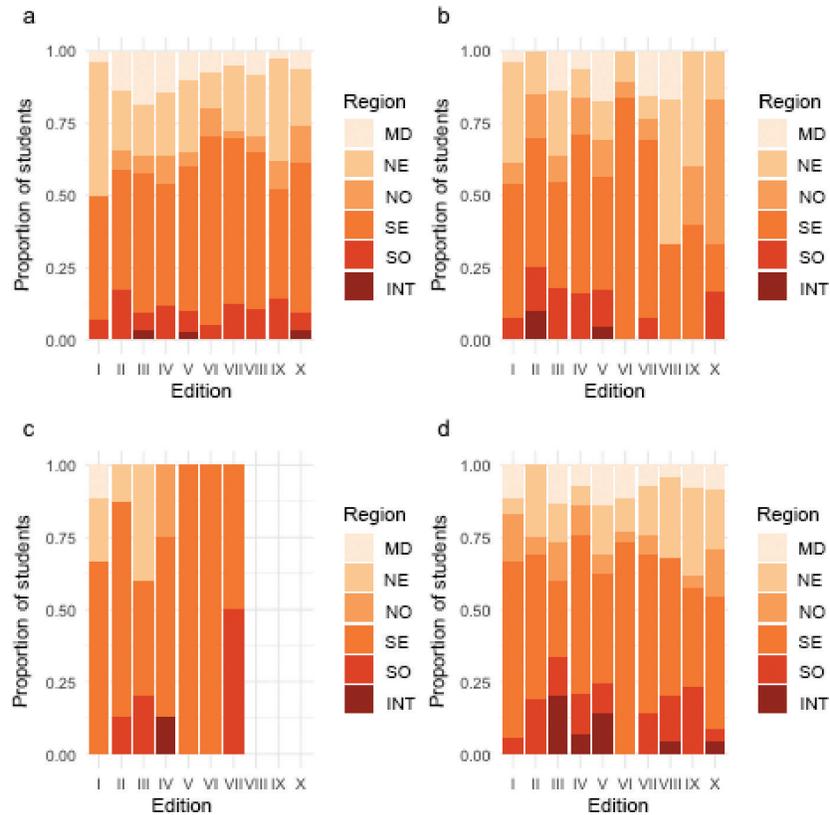
## Results

We were able to locate Curriculum Lattes data from 371 concluding participants of the course and of these 193 responded to the Google forms.

### 1. Profile of participants

According to data collected from the Lattes Platform, most CVZoo participants came from the Southeast and Northeast regions of the country. While nearly 50% graduated from universities in the Southeast and more than 20% from universities in the Northeast, less than 10% came from each of the other regions of Brazil (Figure 1a).

A similar pattern is observed when we analyze the regions where graduates have completed master's degrees because the Southeastern and Northeastern together account for more than 65% of graduates who attended a master's degree (Figure 1b). However, this pattern changes significantly for the Doctorate course, given that most students (>65%) who continued their studies at the Doctorate level attend or have attended universities in Southeast Brazil (Figure 1c). In the master's degree, some universities concentrate a higher percentage of students. In doctorates, this concentration is even more drastic, with only three universities (UFRJ, UNICAMP and USP) concentrating more than 40% of graduates who are studying or have finished PhD. Altogether,

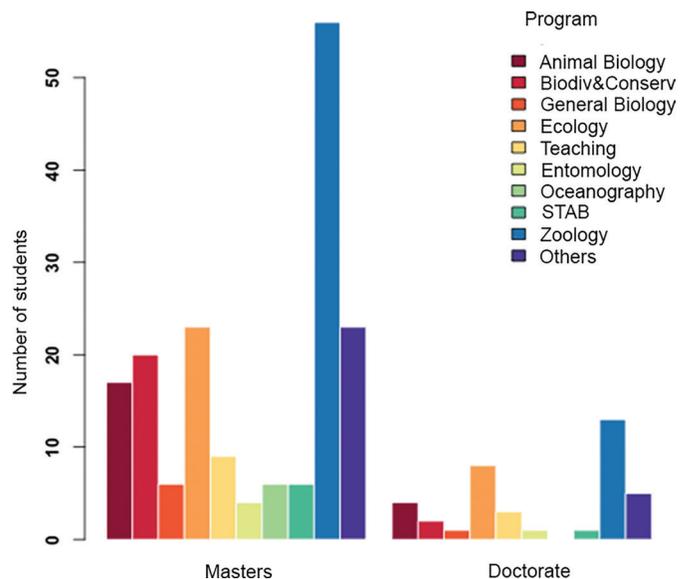


**Figure 1.** Origin of participants of the 10 editions of the Summer Course in Zoology during the undergraduation period (a), masters (b), doctorate (c), and the current address (d). INT, International; MD, Midwest; N, North; NE, Northeast; SE, Southeast; S, South.

more than 45% ( $n = 170$ ) of CVZoo concluding participants continued their studies at least at the Master's level, 10% ( $n = 38$ ) continued at the Doctorate level and two participants at the post-Doctorate level.

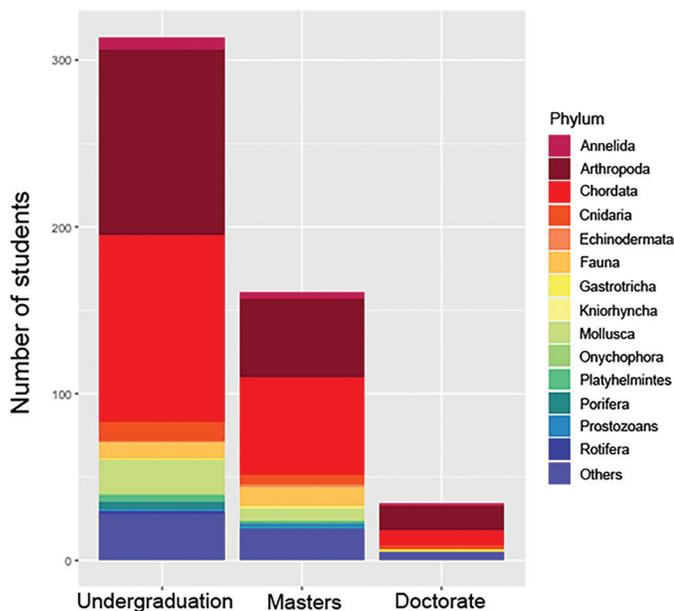
Over 30% of CVZoo concluding participants have attended in programs focused on areas related to Zoology (Figure 2) at both levels (master's and doctorate), most of them at the University of São Paulo (USP). Other USP programs also received graduates from CVZoo, such as the graduate programs in Systematics, Animal Taxonomy and Biodiversity (STAB), Ecology, Entomology, Biological Oceanography and Science Teaching. Such results demonstrate that the course has played a decisive role in attracting new students to postgraduate courses at USP. Another interesting fact about the destination of graduates from the course is the diversity of insertion areas. In addition to the postgraduate programs totally focused on the study of animals, such as the Animal Biology, Entomology and Zoology programs, we also observed many graduates, with "zoological" lines of research, but inserted in other programs, such as Ecology and Biodiversity and Conservation. The programs farthest from zoology, such as Genetics and Evolution, Biosystems, Tropical Diseases or Biotechnology, for example, were all compiled in the category "Others". When analyzing the focal phylum, in all CVZoo editions and throughout the various training levels, more than 60% of participants were interested in Chordata or Arthropoda, while only a tiny percentage of graduates dealt with the study of other animal phyla (Figure 3).

According to the answers obtained through the forms on students' race ( $n = 153$ ), the majority declared themselves as white (62.1%),



**Figure 2.** List of focal phyla at different levels of training of course egresses.

followed by brown (24.8%), black (11.1%) and other races (2%). These proportions differ substantially from the Brazilian population, of which 54% of the Brazilian population declares itself to be black, including a broad spectrum of skin colors (IBGE 2019). We also note that proportions vary over the editions (Figure 4a). Among teachers ( $n = 11$ ), most self-declared as brown (63.6%) (Figure 4b).



**Figure 3.** Classes of graduate programs in which CVZoo graduates entered. “Biodiv & Conserv” includes programs focused on Biodiversity and Conservation; “STAB” corresponds to the graduate program in Systematics, Animal Taxonomy and Biodiversity, at the Zoology Museum of USP.

Regarding the gender identity of students (n = 150), the proportion of cisgender men (49.3%) and women (50.7%) varied little over the ten years of CVZoo (Figure 4c) but the representation of transgender students is still low (n = 3). Among teachers (n = 11) women were more numerous (72.7%) than men (27.3%) (Figure 4d). On the other hand, a great diversity is observed regarding the sexual orientation of those certified participants (n = 153). Heterosexual students make up the majority of those participants (55.5%), followed by bisexuals (22.2%), homosexuals (20.3%) and asexuals (1.3%); only one student did not want to inform his sexual orientation (Figure 4e). Likewise, diversity differs significantly between teachers (n = 12), with 75% declaring

themselves to be heterosexual, 16.7% bisexual and 8.3% homosexual (Figure 4f). None of the respondents declared having any disability.

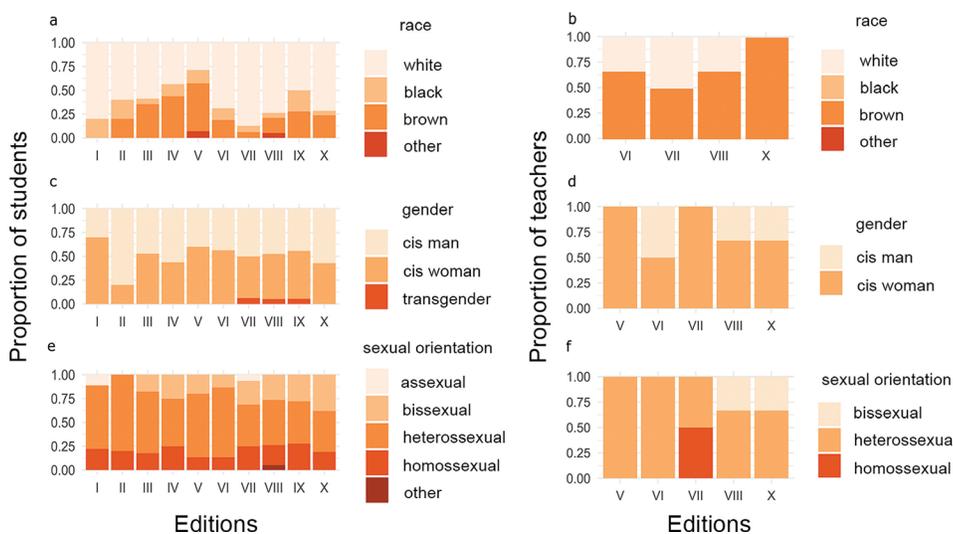
2. Publicizing the CVZoo

The most effective ways of publicizing the course have included announcements on social media (49.5%) and referrals to friends and fellow graduates (47.4%). Disclosure through social media has changed over the years. Following the progress and adherence to different forms of virtual communication, especially by the targeted audience, social networks such as Facebook and the course website itself have been more effective in the past (Soares et al. 2018), while Instagram has been the network responsible for greater adherence of subscribers in the last three editions (2020, 2021 and 2022). This highlights the importance of considering the advent of new social communication tools and understanding what content is consumed by users (Soares et al. 2018), as they can increase the reach of the course in future editions. Additionally, many enrollees came to know about CVZoo through the indication of former participants, which provides indications of the satisfaction of these graduates regarding the quality of the course offered throughout all editions, since the indications have remained stable over these ten years.

3. General impressions about the course

The course was well rated by the participants (students: n = 192; teachers: n = 19) since 73.5% of the students and 63.2% of the teachers stated that their initial expectations were exceeded, 23.4% of the students and 36.8% of the teachers felt that the initial expectations were met, while for 3.1% of the students the initial expectations were only partially met.

The positive points most mentioned by the respondents were the contact with people from different regions of Brazil (25.3%), the content offered and the quality of the course programming (23.9%), the motivation to enter graduate programs and pursue an academic career (22.5%), and the approximation with students and professors of the graduate programs in Zoology and in Systematics, Animal Taxonomy, and Biodiversity and the lines of research developed at USP (21.1%).



**Figure 4.** Profile of students (left panel) and teachers (right panel) enrolled over the 10 editions of the Summer Course in Zoology, regarding race (a, b), gender identity (c, d) and sexual orientation (e, f).

These points are in accordance with the extension guidelines established for these activities (FORPROEX 2012).

Regarding the dissemination of research carried out at the university, visits to the IB-USP laboratories and MZUSP collections were cited by 12.8% of the respondents, and their importance is represented in the speech of a participant who claims to have known approaches within the area, which she intends to use in the future when she enters a graduate program. The activity of preparing a research project (5.6%) was pointed out by some respondents as a very positive and challenging point of the course. Even so, it contributed to the development of critical thinking about the work of colleagues and articles already published, in addition to the development of scientific thinking of participants involved in the process. One of the participants commented that she was “fearful” because of the project, “I thought I wouldn’t be able to develop it, but I found out that it is an essential part of the entire course process.” This denotes how part of teaching still remains dissociated from research and how the gradual insertion of undergraduates in Scientific Initiation (CI) activities can facilitate their understanding of the production of knowledge through the scientific practices (Massi & Queiroz 2010).

Some respondents praised the classes and teaching strategies employed (15.5%) and the dedication of the organizing committee (11.2%). The cost of accommodation and food was cited by 4.2% of the participants, and one of them reported that “the possibility of staying in accommodation and food in the university restaurant were decisive points, because at that time he lived in a state very far from Sao Paulo”. This shows that efforts to popularize university extension need to be linked to offering equal conditions for access by all. However, 8.4% of respondents highlighted the need for improvements in CEPE-USP housing facilities.

For some, the environment provided by the course was quite enriching (10%) due to the exchange of experiences and their influence on their academic training. According to one of the respondents, the course would have been a great “watershed”. The marked influence of the course is present in the response of another participant, in the following passage: “whenever I teach a short course, I remember how I experienced CVZoo, the enchantment that students have with us, they were the same as I experienced when I was a CVZoo student”.

Among the negative aspects of the course, many responses included the appeal for a longer duration of the course (12.6%), suggesting at least one additional week. The remote offering of the last two editions (IX and X), due to the COVID-19 pandemic, was mentioned as a negative point by the participants (5.6%) due to the desire that the activities could have taken place in person. Even so, one of the respondents’ comments: “the online format had a positive side because I was able to participate even though I lived far away, but the negative side was the difficulty in concentrating and the tiredness I felt from sitting all day in front of the computer”.

#### 4. Permanence in the academic environment and impacts on research

Among students, 91.1% stated that CVZoo influenced their permanence or progress in the academic environment (n = 191), and 73.7% confirmed that the knowledge acquired during the two weeks of the course was applied in some way in their research projects developed later (n = 133). Among the acquired knowledge most cited by respondents are procedures and techniques (e.g., statistical analysis,

electron microscopy, ecological niche models) and theoretical content such as those related to molecular biology, geometric morphometry, taxonomy, systematics, and scientific writing. For one respondent, the course was important for “creating the habit of studying Philosophy and understanding my research in the Epistemological sense and developing Integrative Taxonomy”.

About half of the students (48.4%) highlighted that the project development experience helped in the elaboration of future projects, and 32.3% of the students applied the proposal or part of it later, in activities of CI or even in the selection for graduate studies (i.e., master’s and doctorate). One student stated that during the project’s elaboration he was introduced to a methodology that he did not yet know, scanning electron microscopy (SEM), and that he later used it in his own master’s research project. About 52% of the students claimed that they had not executed the project due to lack of opportunity, change of area or because they had not taken this specific project forward.

For 24 students, the positive results went beyond the practical application, with 17 highlighting the networking developed with members of the course committee and professors at USP and the possibility of getting to know the scientific routine more deeply. Two students mentioned that their advisors at CVZoo were part of their TCC evaluation panel and two others mentioned that their advisors at CVZoo are currently helping with their research projects in graduate school. One of the respondents stated that the course directly influenced the choice of his master’s degree and the continuity of his academic career.

Nine students stated that the presentation to an evaluation panel, made up of CVZoo organizers, was an important preparatory experience for similar situations in the future. Terms such as “challenging”, “dynamic”, “instigating”, “enriching”, and “profitable” were used to describe the project development experience, demonstrating the good reception of the activity by the participants. Only 5 students claimed that they had not developed a project or did not remember carrying it out. Seven negative responses were observed regarding the development of the research project during the course and among these, two students claimed not to have had a specialist advisor in their animal group or research field.

Among the contents offered in the form of workshops and with the possibility of choice by the participants, those that stood out the most were: Systematics, Taxonomy, workshops of specific taxonomic groups, techniques (Software, MicroCT, Molecular Biology), and scientific writing/methodology. The reasons given by the respondents were learning useful tools, up-to-date information on poorly studied taxonomic groups, discovering new topics of interest, and teaching practices by the lecturers.

#### 5. Impacts on teaching practice and university extension

For teachers, 72.2% stated that they had incorporated the knowledge obtained in the course into their teaching practice (n = 12), and 41.7% had implemented the didactic sequences presented at the end of the course (n = 5), which are equivalent to the project developed by undergraduate students. Three teachers preferred to take advantage of the CVZoo opportunity to develop research projects instead of teaching sequences.

Some teachers highlighted the importance of acquiring and updating knowledge in Zoology during the course to improve their classes. One teacher pointed out: “I already did practical classes using collected animals, seeing them with such diverse specimens inspired me to elaborate the classes with greater care. The postgraduate course

in management and conservation of wild fauna that I had taken the previous year gained even more meaning.” One teacher also commented that she discussed aspects of the research routine, such as collection and animal preservation techniques, with her students. It should be noted that specimens preserved in alcohol were used during practical classes, allowing not only contact with different groups of animals but also a reflection on their use in school spaces.

According to one of the respondents, classes on Biogeography and evolutionary processes were a watershed in her pedagogical practice, giving her greater confidence and autonomy to teach classes on these subjects. Another teacher highlighted that the way in which the contents were addressed in the course encouraged her to explore more teaching possibilities, such as working with drawings, collecting materials in the environment, visiting institutions, using and building objects (e.g., magnifying glasses, microscopes), use of media (e.g., podcast) and games. One teacher commented that she passed on the knowledge acquired during the course to colleagues in the Science area who did not participate in CVZoo, thus expanding the scope of the course and the knowledge that is worked on.

Regarding the engagement towards extension actions, 77.6% (n = 149) of respondents stated that CVZoo would have motivated their participation in other courses and subsequent extension activities. The awakening to university extension can be exemplified by the phrase of one of the respondents about the main motivation for continuing to carry out extension actions: “to perhaps generate the same impact that the course had on me”. Among those who answered ‘no’ to the question (23.4%, n = 44), one of them commented that he already participated in extension activities before the course. Another respondent commented that “if there are more extension activities that show the population, especially young people, the importance of different types of knowledge, from there it is possible to create a new culture, in which the community supports and benefits from the work carried out in the universities”. This in fact prevents teaching and research from becoming alienating practices when removed from society, or when exempt from reflections on the knowledge produced within academic walls, but which must be transmitted and discussed with communities (Santos et al. 2016).

The extension activities most cited by the respondents as those of interest and/or already carried out by them were: environmental education actions such as building vegetable gardens, carrying out trails and exchanging knowledge with traditional communities and in schools (23.7%), scientific dissemination by research groups, conservation projects and science museums (20%), and organization and monitoring of events (17%). In addition to CVZoo, respondents reported having participated in other university extension courses (20%) and also mentioned workshops and isolated lectures at their universities or nearby institutions (11.1%). One of the respondents reports that after participating in CVZoo, he began “looking for more extension courses from universities around the world, almost as if he had discovered a new way of interacting with people from other areas”.

## Discussion

### 1. CVZoo and the Brazilian scenario

Extension practices are strategic spaces for the implementation of interdisciplinary activities that promote greater contact between the subjects involved, with knowledge of reality being fundamental for the

application of efficient methods that allow social transformation. Among the existing actions for the popularization and development of Zoology in Brazil, we present here the experience of the Summer Course in Zoology at USP, which over the course of 10 years has contributed to the training of students and teachers from different regions of the country.

The high proportion of course participants from Southeast and Northeast regions observed here is expected if we consider that these regions concentrate the largest portion of the population (42.1% and 27.8% respectively) (Artes & Unbehaun 2021) and the course has been held in the state of São Paulo. Almost half of concluding participants have continued their studies at Masters or Doctorate levels, a high proportion when compared to the national scenario, which can be justified by the bias of the selection process of course participants, which prioritizes candidates with greater interest in the academic career.

The great interest in Systematics and Taxonomy demonstrated by the participants is quite positive given the urgent need to awaken and train new professionals engaged in the description of biodiversity, including that of lesser-known groups (Marques & Lamas 2006). In addition, due to CVZoo’s national coverage, we have increased the incentive to enter this sub-area of Zoology for students from all regions. Thinking of USP as a national reference in both research and teaching (EGIDA 2022), we feel that it is our responsibility to offer, in an extension format, the knowledge of techniques and tools that can be applied by young researchers from other universities spread around the country.

More than a third of Brazilian systematists are dedicated to the taxonomy of fish, mollusks, crustaceans and insects (Diptera, Hymenoptera and Coleoptera). Despite such groups being quite numerous in terms of species, other taxa of extremely rich invertebrates within Arthropoda, or even taxa beyond, such as Nematoda, lack specialists who can dedicate themselves to making their diversity known (Marques & Lamas 2006). CVZoo has actively participated in the popularization of zoological groups that are not numerically diverse (e.g., lophophorates and interstitial pseudocoelomates), and in encouraging research into these relatively understudied groups by including in its thematic grid workshops aimed at presenting the diversity and evolution of groups that are worked on by committee members (e.g., workshops about mammals, flatworms and annelids). In this way, we draw attention to these groups and indirectly fill possible gaps in the academic training of participants from universities without specialists in certain groups. Even groups that are not directly worked on by committee members are often addressed in classes on broad topics (e.g., Metazoa). The University of São Paulo has a privileged didactic collection of zoological material, including specimens of rare groups of non-panarthropod invertebrates that would hardly be seen in another university environment, which is why the promotion of activities involving these animals increases the notion of biological diversity by the course participants.

### 2. University extension as a path for social transformation

More than half of CVZoo concluding participants have declared themselves as white, which does not reflect the existing racial scenario in the country, in which self-declared brown and black people make up 56.2% of the Brazilian population (IBGE 2019). Considering the Southeast and Northeast regions alone as the most representative of the students enrolled in the course, we have brown and black people constituting 48.9% of the population in the Southeast, and 74.4% in the

Northeast (IBGE 2019). However, when we visualize the national scenario of higher education, we see proportions corresponding to those obtained here, including promising estimates of the decrease in the difference between white and black students over the years. In 1993, black people constituted only 18.2% of the student class, while in 2011 they already represented 37.2% of the total number of students (Picanço 2016). Such an increase can be understood as a reflection of the enactment of the Law of Quotas for Higher Education n° 12.711/2012, in which several universities began to adopt racial quotas and quotas for public school students, thus expanding access for brown, black, and low-income people. However, even though inequality is gradually being reduced, the disadvantages of blacks and browns persist in terms of educational opportunities experienced, a scenario that begins in high school and continues until higher education (Barreto 2015). This highlights the need for affirmative policies that make the access of different ethnic groups to education more equal, including outreach activities.

Women represent the majority of enrollments in higher education (57%), both nationally and in all regions of the country (Barreto 2014). This is a recent situation that began to emerge in the 2000s, but which still cannot be understood as representing equal opportunities for men and women in professional insertion (Barreto 2014). If different graduate courses are analyzed, women make up the majority of those with “lesser prestige” and related to “caring” functions, such as in education and health, while men constitute the majority in exact sciences and technology courses (Artes & Unbehaum 2021), which is exemplified by the higher proportion of female teachers enrolled in CVZoo.

The low representation of transgender participants reflects the national scenario of invisibility and exclusion of transgender people from citizenship, with only 0.02% of the trans population reaching higher education in Brazil, as pointed out by Benevides & Nogueira (2019). Unfortunately, it was not possible to make any comparison with the national scenario in regards to the sexual orientation of people living in Brazil, since data are scarce and were not included in the latest IBGE censuses.

In the interactions promoted between students from different backgrounds and between them and graduate programs, the dialogical interaction between subjects and content was guided by the inseparability between teaching-research-extension. As for the motivation to continue an academic career and enter in a graduate program, CVZoo allows interdisciplinarity between different areas of knowledge, considering the diversity and heterogeneity of existing undergraduate courses in the country and culminating in the expectation of impact on student training, with consequent impact on social transformation (FORPROEX 2012).

Offering the course in a remote format made it possible not only for students and teachers from different Brazilian regions to access it, but also for people whose financial condition would not allow for face-to-face participation. Therefore, in order to expand the scope of the course, it is essential to rethink its format in future editions, considering the possibility of carrying out face-to-face and remote activities together, since simply paying for accommodation and food for participants is not enough to ensure access for everyone.

The data presented here denote the scope of the extension carried out, characterized as an intervention in social reality through the complementation of the academic training of teachers, sometimes quite relegated as secondary importance (Assis & Bonifácio 2011).

As discussed by Alarcão (2011), reflection on teaching practice allows students and teachers to exercise their creativity and not only act by reproducing ideas and practices in the same way they were presented. The use of varied didactic strategies by CVZoo lecturers has contributed to reach individuals with different teaching-learning characteristics, in addition to providing the construction of knowledge and production of meanings by its participants.

### 3. Final considerations and future perspectives for CVZoo

Since its inception, the course has prioritized the transdisciplinary approach of zoological groups, the participation of diverse people and the use of varied teaching approaches, based on these precepts that, at each edition, the opportunity to adapt to the academic scenario is recognized and so the social context of the target audience. Thus, affirmative actions, such as the implementation of a quota system for socially vulnerable people (ethnic groups and people with disabilities) are already being implemented in the process of selecting candidates for the eleventh edition. The idea is that the course becomes an increasingly tangible opportunity for people from socially marginalized groups, who are constantly denied access to academic spaces, thus contributing to the reduction of the disparity observed in the representativeness of certain groups in the scenario of Brazilian Zoology.

Another important aspect resides in the need for constant updating of the forms of interaction and dissemination of the course to and with the general public since social networks are always in motion. The effects of the COVID-19 pandemic are known to have reduced the academic productivity of scientists, but the understanding of the impacts on the training and profile of undergraduate students who changed their routine to distance learning is still unknown.

The diversity of workshops offered throughout the course, addressing taxonomic groups or macroecological and macroevolutionary aspects, still needs to be expanded, as well as the interdisciplinary nature of CVZoo activities should be considered a goal, but without losing focus on Zoology and the protagonism of animals. In this way, we aim to make the course grow and renew itself, becoming an integral activity of the academic culture of the student body of USP's graduate programs and continuing to contribute to the production of human resources in Zoology in the generations to come.

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Iverson Brandão: Contribution to data collection; Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

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Eduardo Gomyde: Contribution to data collection; Contribution to data analysis and interpretation; Contribution to manuscript preparation; Contribution to critical revision, adding intellectual content.

Marília Pessoa-Silva: Contribution to data collection; Contribution to data analysis and interpretation.

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## Conflicts of Interest

The authors declare that they have no conflict of interest related to the publication of this manuscript.

## Ethics

This study does not involve human beings and/or clinical trials and because of this the approval by an Institutional Committee was not required.

## Data availability

Supporting data are available at <<https://doi.org/10.48331/scielodata.E2K2TQ>>.

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