

Diverse NETWORKS

A program mobilizes hundreds of institutions to expand the knowledge of Brazilian biodiversity

Bruno de Pierro

PUBLISHED IN JULY 2013

A national network of researchers dedicated to expanding the knowledge of Brazilian biodiversity has begun to take shape, as demonstrated by the first evaluation meeting of the National Biodiversity Research System (Sisbiota). The initiative is coordinated by the National Council for Scientific and Technological Development (CNPq) and brings together bodies from three ministries and 14 state research foundations known as FAPs. The meeting was held from June 3 - 6 in Brasília, with 356 institutions and 1,127 researchers in attendance from all over the country. “There are projects that are being carried out in all the Brazilian biomes using networking and decentralized research,” explains Roberto Berlinck, professor at São Carlos Institute of Chemistry at the University of São Paulo (USP). Berlinck is a member of the team that coordinates the BIOTA-FAPESP program, established in São Paulo in 1999 and used as a benchmark for the

national Sisbiota. Berlinck coordinated the team of eight professors who evaluated 39 Sisbiota projects, consisting of 38 research networks and one knowledge synthesis project.

FAPESP co-financed 14 projects in the program led by researchers from institutions in the state of São Paulo. Vanderlan Bolzani, professor at the Chemistry Institute of Araraquara, Universidade Estadual Paulista (Unesp), coordinates one of the projects; she is also a member of the BIOTA-FAPESP coordination team. The study, which should be completed by January 2014, focuses on the exploration of bioactive molecules and the study of the variability of plants and microorganisms in the Cerrado and Caatinga. Like other Sisbiota projects, Bolzani’s project required the establishment of a network. The network consists of 26 researchers, 15 laboratories and eight institutions, such as the federal universities of Ceará, Piauí and Minas Gerais.

“The more we collaborate with other states, the better our work is. In Brazil,

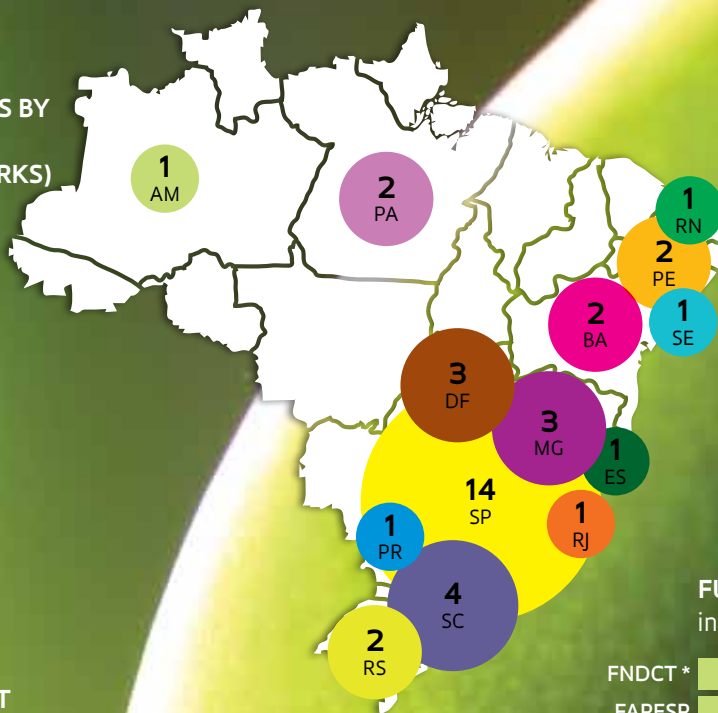
there is a substantial amount of quality research,” says Bolzani. Among her group’s results, the professor highlights the collection of historical information, searching for plant extracts with cytotoxic (tumor-fighting) activity, the characterization of active ingredients and the use of genomic information to control medicinal plants. The professor explains that 28 samples were found that are related to plant species unknown to science that are sold in public markets. “People use these samples without knowing the risk they face when they consume them.”

The network, coordinated by Professor Maria de Lourdes Teixeira de Moraes Polizeli of the Ribeirão Preto School of Philosophy, Science and Language and Literature at USP, is an example of how the work of cataloging new species can generate developments with market applications. For example, the research, which is still in progress with 123 researchers across the country, searches for enzyme-producing filamentous fungi

Sisbiota by the numbers

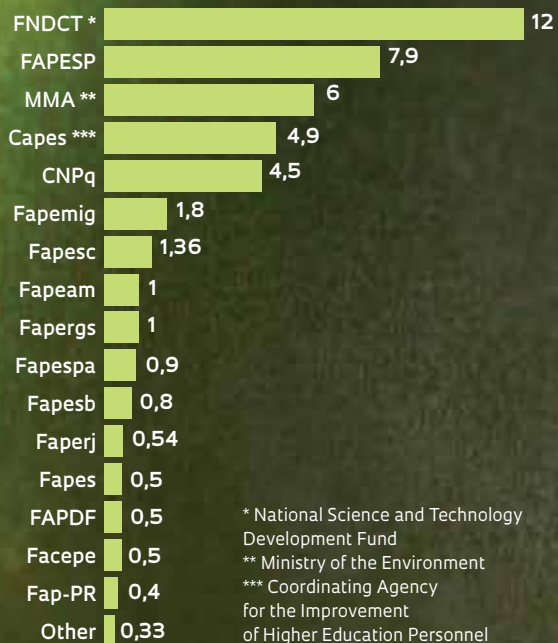
Distribution of program funding by country

PROJECTS BY STATE (NETWORKS)



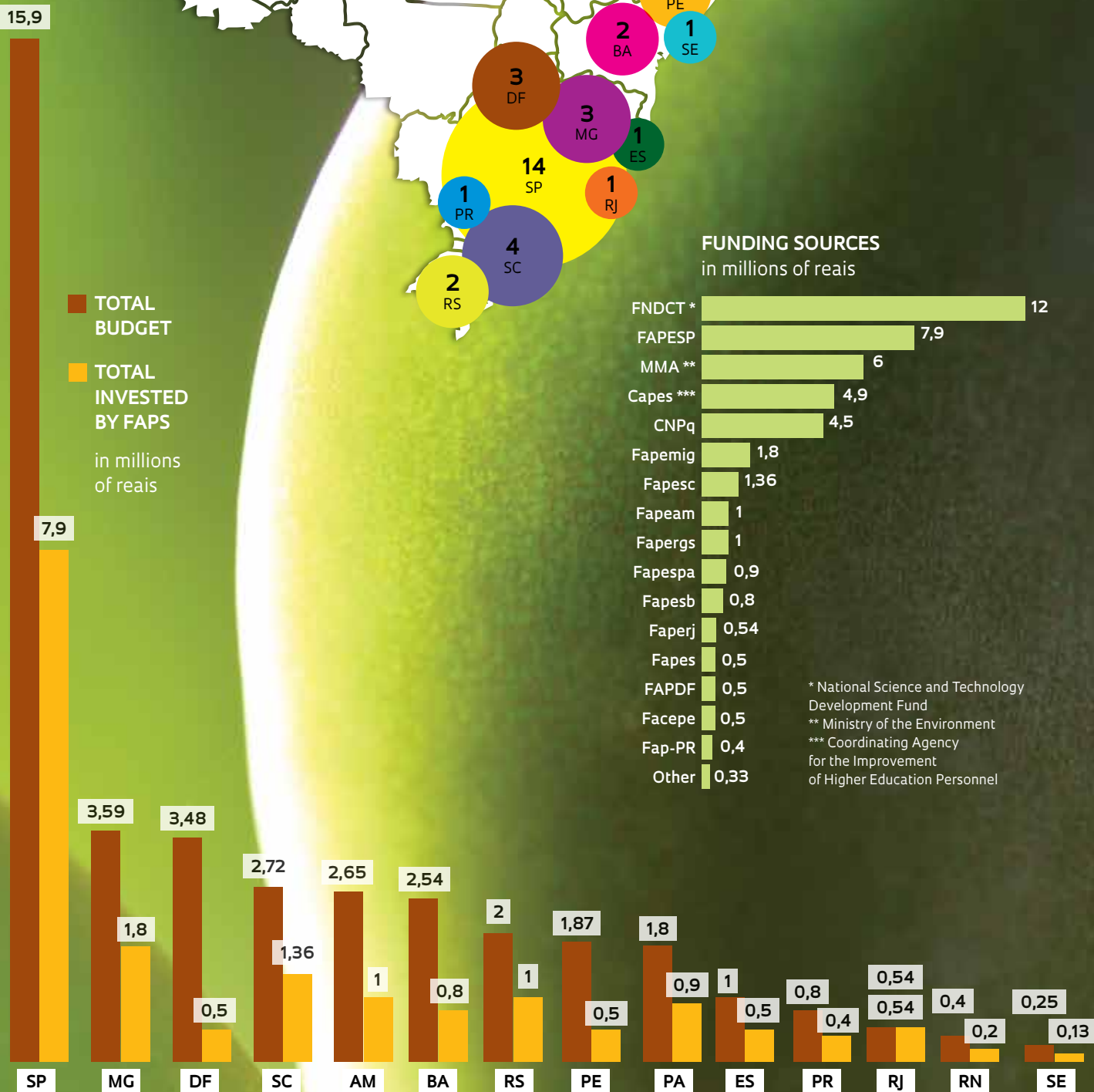
FUNDING SOURCES

in millions of reais



* National Science and Technology Development Fund
 ** Ministry of the Environment
 *** Coordinating Agency for the Improvement of Higher Education Personnel

TOTAL BUDGET
 TOTAL INVESTED BY FAPS
 in millions of reais



that can be used in biorefineries to produce bioethanol from bagasse and sugarcane straw. To date, approximately 1,000 fungi have been isolated, 40% of which showed good levels of enzyme production.

“If we are cataloging fungi, why not explore their biotechnological potential,” she wonders, as she explains the procedures of her work. Polizeli notes that the potential of the fungus for producing enzymes varies with the biome. *Aspergillus niger*, for example, is found in many ecosystems. However, its enzymatic potential is different depending on whether it is in the Amazon or the Caatinga.

The amount financed for the three-year project was R\$2 million, and Sisbiota agreed to extend it until March 2015. According to the professor, networking was an opportunity for her to learn about unfamiliar realities. “In the state of Amazonas, the team had to collect fungi on horseback because many areas are still virgin forest. In many cases, primitive methods must be used to create cutting-edge science,” she says. Polizeli stresses the importance of continuing the program because it is about more than just producing papers: the discoveries should also be worthwhile for industry and generate patents.

The sustainability of the long-term program, by means of new requests for proposals, has yet to be determined.

1 *Scinax machadoi* tadpole, found in Minas Gerais by Rossa-Feres team from Unesp

2 Bombacaceae (*Eriotheca gracilipes*), pasture flower in Pratânia, São Paulo

“The more collaboration we have with other states, the better the work is,” says Vanderlan Bolzani

According to Denise de Oliveira, a science and technology analyst at CNPq and manager of the first Sisbiota funding opportunity announcement, the evaluation committee recommended extending the current projects for another year. “The projects have received many compliments for the way they are being run, but some were hampered by the lack of rain in the northeast, for example. Because of this, deadlines are being extended,” says de Oliveira. “Incorporating research into networks takes a considerable amount of time. The knowledge of biodiversity requires long-term studies.”

The fact that long-term financing is assured helps explain the success of the BIOTA-FAPESP program. As indicated in the Sisbiota background paper, the experience of the São Paulo program helped

“develop a program with a broad geographic base.” “After its tenth anniversary in 2009, BIOTA-FAPESP served as an inspiration for the federal government. It was a successful strategy of the Foundation, which even provided Sisbiota with nearly R\$8 million in project funding,” Roberto Berlinck explains. “With Sisbiota, it was possible to form networks that look at different issues in different biomes, working on a complementary basis and avoiding redundancies, which gives us a more complete framework of knowledge of national biodiversity,” says the professor, who also believes that three years is not much time for consolidating research. “Biota has been around for 14 years, and ideally, Sisbiota would also last that long,” he adds.

Another Sisbiota project co-funded by FAPESP is led by Antonio Carlos Marques, a professor at the USP Biosciences Institute. Marques coordinates a study on the synthesis of knowledge of organisms in Brazilian marine and coastal areas. The project’s name is Sisbiota-Mar, and the network is connected to 15 states and 35 institutions, including the Tamar Project and the National Biosecurity Commission (CTNBio). More than 100 researchers are involved in the project, and 26 of them are responsible for coordinating the network in eight states, including São Paulo, Pernambuco, Bahia and Santa Catarina. The project has also established partnerships with universities in the United States, Germany and Australia.

COMPILATION

Based on research conducted in the late 1990s and early 2000s, Marques is able to make a historical comparison. “Much has changed in our perception of marine diversity in the last ten years. We have better frameworks for our work and the collections are more structured, although we have yet to reach the ideal level,” says Marques. One goal of Sisbiota-Mar is ambitious: move at top speed to compile records of all the marine species along the Brazilian coastline. Brazil joined the Ocean Biogeographic Information System (OBIS), a global platform that has already recorded 140,000 points in Brazilian seas. At every point at least one marine species can be found. Marques’ project added over 105,000 points to the OBIS database in just two years



“If we want to learn about our maritime area, we must also investigate our marine biota. This data record of marine organisms will be important for strategic planning, computerization and developing policies for better exploration, and it will also help in proposing and more efficiently setting up conservation units,” the professor says.

DECENTRALIZATION

To organize the different goals of each network, three major lines of research were organized. The first was to summarize and fill the gaps in the knowledge of Brazilian biodiversity with projects from R\$150,000 to R\$600,000. The second line organized the research into thematic networks to expand knowledge of the biota, the functional role, and the use and conservation of Brazilian biodiversity, with projects of up to R\$2 million. The third dealt with understanding and forecasting responses to climate change and land use by financing projects of up to R\$650,000.

“The Sisbiota evaluation was important for us, the researchers, to learn about work that we had no idea was being done. There is a great wealth of data,” says Vanderlan Bolzani. According to Bolzani, in addition to research on plants, there are many other projects underway on insects and fish, including tadpoles. This work is being conducted in the FAPESP-supported network that is studying tadpoles of anurans (amphibians in the adult stage that have no tails, such as frogs or toads) in nine different biomes and associated vegetation types, such as the Atlantic Forest and the Cerrado. Coordinated by Professor Denise de Cerqueira Rossa-Feres, from the Institute of Biosciences, Literature and Exact Sciences at Unesp, the project consists of 14 public universities in 10 states, including the federal universities of Alagoas, Paraná and São Paulo, and cooperating international institutions such as the University of South Florida in the United States and the Gordon and Leslie Diamond Care Centre in Canada. Altogether, there are 25 researchers, two of whom are non-Brazilians.

Rossa-Feres explains that at first, the plan was to collect samples of tadpoles in 320 bodies of water, including ponds, wetlands, lakes and streams. The number soared to 784 as the research pro-



“In the state of Amazonas, the team had to collect fungi on horseback,” says Polizeli

gressed and is expected to reach nearly a thousand bodies of water by the end of the project. As of now, more than 300 species of tadpoles have been recorded, and many are still being identified. “The most important thing is that sampling is being carried out in a standardized manner, from the characterization of the environment to the method and work of collecting tadpoles. The database will be fully integrated and comparable, so that countless analyses of processes and tests of assumptions can be performed,” the researcher explains. The main objective is to understand what factors “assemble” a community and determine which and how many species occur.

INTERDISCIPLINARY RESEARCH

One point that the network coordinators discussed at length during the evaluation meeting was the specific opportunity to conduct interdisciplinary research. According to Denise de Oliveira from the CNPq, because most networks are composed of experts from various fields such as ecology, biology, chemistry and climate, the interdisciplinary knowledge that Sisbiota generates is unique. “But, we have received recommendations to further decentralize the networks because financial management is still problematic for

researchers,” she says. Because each network is composed of subprojects, some coordinators argue that it would be easier if each one were autonomous to deal directly with the funding from CNPq and the research foundation. The problem, says de Oliveira, is that there are legal restrictions on the funding from the FAPs being spent outside their state.

“This discussion is a double-edged sword,” Polizeli thinks. In her opinion, one of the advantages of centralized funding is the possibility of obtaining discounts by purchasing a large amount of equipment all at once. “For the whole group, I bought seven instruments that read enzymatic activity. The fact that I bought everything at the same time made us eligible for the discounted price. If each regional coordinator had bought the instruments on their own, the price would have been much higher.” The downside of centralization, she notes, is that the coordinator is burdened with administrative and logistical issues. “In São Paulo, FAPESP has insisted that institutions have their own offices to manage project funds, such as the Biosciences Institute at USP, which created this unit that can relieve the coordinator of some of the burden,” says Antonio Carlos Marques. ■