

Annual Report 2019

The Biodiversity Research Consortium Brazil-Norway (BRC)



BRC with more cooperation and results. Top: The 2019's edition of the Tropical Ecology course Between Brazil and Norway (Photo: Rafael Assis). Bottom: The jaguar team in the field tagging a captured jaguar with a GPS Iridium satellite collar (Photo: Cris Oliveira).

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1. Introduction and background

The Biodiversity Research Consortium Brazil-Norway (BRC) carries out research on biodiversity and climate change issues in the Brazilian Amazon. Established in 2013, the consortium comprises the Federal University of Pará (UFPA), the Emilio Goeldi Museum of Pará (MPEG), the Federal Rural University of the Amazon (UFRA), the University of Oslo (UiO) and the Norwegian mining and aluminum company Norsk Hydro (Hydro). The BRC Consortium Agreement initially lasted for five years (2013-18), but it has been extended for a new five-year period (1 November 2018 – 31 October 2023).

BRC is the result of a Hydro initiative. In 2012, not long after taking over Vale's aluminium operations in Pará, Hydro approached the Natural History Museum (NHM) at the University of Oslo. NHM was given the responsibility to facilitate the creation of a research cooperation based on the recommendations in the Hydro technical report "Reforestation and Wildlife Program - HYDRO Paragominas, Pará, Brazil" by Salomão et al. (2012).

In the BRC Consortium Agreement, the main aim of the cooperation is "to develop research activities both applied and basic, and build a strong base of outputs in biodiversity and climate knowledge" among the partners. The consortium shall also contribute to "increased university – industry partnership". In addition to joint research and publications, "graduate education (master and PhD) will be important elements of the consortium activity."

This report is prepared by the BRC secretariat. It presents the consortium's main results and activities in 2019. In the final section, important lessons learned are presented. We refer to minutes from BRC Board and Scientific Committee meetings and specific event reports for further details.

2. Main results 2019

In 2019, BRC made substantial progress on all defined aims – research, partnerships and student involvement – as well as on the consortium's long-term sustainability. The main results in 2019 were:

- Promotion of seminars, which are important to disseminate results provided by projects supported by BRC and to facilitate discussions between associated researchers
- Implementation of most projects that were approved in the last call, from 2018.
- Extension of the bilateral MoU between UiO and UFRA for another five years
- Conclusion of projects that have been ongoing since the first BRC call, being the first projects to successfully conclude their activities
- Strength of the student exchange initiative, encouraged mainly through the continuation of the Field Course in Tropical Rainforest Ecology.
- Promoting of the research group's internal events (such as academic course and thematic seminar), making possible the propagation of the group's activities and academic training
- Promotion of the BRC research projects in International events and being awarded in one of its sections.
- Some ongoing projects are now very interesting results, and there are good expectations for

important products in a near future.

- The relevancy of BRC has been recognized by other divulgation media (non-academic), meaning that a more general public are now accessing BRC's project outputs.
- Continued increasing the number of researchers and students supported by BRC, highlighting the importance of the consortium for the Institutions involved, as well for the science developed in the region.

3. The BRC board

The BRC board consists of one representative from each member institution. In 2019, the board members have been: professor Marcos Piedade (UFRA), professor Marlucia Martins (MPEG), professor Leonardo Sena (UFPA), Domingos Campos (Head of HSE - Hydro B&A) and Fridtjof Mehlum (Senior Researcher - UiO). Leonardo Sena (UFPA) exercised the function as chair of the board.

The board had its annual meeting on 28th February 2019 (Figure 1). The development of a long-term strategy for BRC, an update from Hydro about the incident in Barcarena and the internet access in the dorms of the Paragominas mine were amongst the topics discussed during the meeting.



Figure 1: BRC Board meeting at the Hotel Regente in Paragominas, February 2019. Photo: André Carvalho.

4. The BRC scientific committee

The BRC scientific committee takes all the overall scientific and operational decisions. It consists of two representatives from each member institution and normally meets two times every year. In 2019, the members of the committee have been: professors Gracialda Ferreira and Danielle Pinto (UFRA), researchers Maria de Lourdes Ruivo and Rogerio Rosas Silva (MPEG), professors

Ana Cristina Mendes de Oliveira and Leandro Juen (UFPA), Patrick Brading (Environmental Manager – Norsk Hydro), Domingos Campos (head of HSE, Hydro B&A), and senior researcher Fridtjof Mehlum and professor Øystein Wiig (UiO). Danielle Pinto (UFRA – Paragominas) was member of the Scientific Committee (SC) in the first meeting (February 2019), but was replaced by Norberto Cornejo Noronha (UFRA – Belém). Norberto is currently one of the two members representing UFRA at the BRC Scientific Committee.

The first of the annual BRC SC meeting took place in Paragominas – Pará (Hotel Regente), on February 19th (Figure 2). Fridtjof Mehlum (UiO) exercised the function as chair of the committee for this meeting. The following attended this meeting: Marlucia Martins (replacing Lourdes Ruivo from MPEG); Rodrigo Silva (replacing Danielle Pinto from UFRA), Gracialda Ferreira (UFRA), Øystein Wiig (UiO), Fridtjof Mehlum (UiO), Ana Cristina Oliveira (UFPA), Leandro Juen (UFPA), Patrick Brading (Hydro), Domingos Campos (Hydro). Several other persons from the BRC partners participated as observers. The main discussions focused in the status of the new and the ongoing projects, activities related to the Project Management Group, importance of addressing external funding sources for BRC projects, the importance of adding the BRC publication series for the upcoming production. Also, Hydro presented an update of the incident in Barcarena in 2018, and gave an overview of new environmental projects initiated in the surroundings of Alunorte.

The second meeting occurred on October 10th, at the UFPA (Belém – Pará). Participants were: Gracialda Ferreira (UFRA), Rafael Assis (UiO), Øystein Wiig (UiO), Fridtjof Mehlum (UiO), Ana Cristina Oliveira (UFPA), Marcos Persio (UFPA - replacing Leandro Juen), Patrick Brading (Hydro), Domingos Campos (Hydro), Norberto Noronha (UFRA - new member SC BRC, replacing Daniela Pinto), Lourdes Ruivo (MPEG). Several other persons from the BRC partners participated as observers. Fridtjof Mehlum (UiO) exercised the function as chair of the committee for this meeting. The main topics discussed in the meeting were the status of the new and the ongoing projects, how to present Hydro support and BRC in the publications (acknowledgement and financial support), publication of the book between BRC and Hydro, professional master's degree for Hydro's employees, establishment of a BRC Indicator's Group. In addition, a discussion about a possible call for new projects in 2020 was initiated. It is likely that this coming call will result in a lower number of new projects compared to the previous call.



Figure 2: Scientific committee meeting at the Hotel Regente in Paragominas, February 2019. Photo: André Carvalho.

5. The BRC secretariat

The BRC secretariat is responsible for coordinating the consortium's activities. It is hosted by the Natural History Museum, UiO. Rafael Leandro de Assis was appointed as the new coordinator of BRC, replacing Torkjell Leira from 1 April 2019. Rafael has a master degree in Botany (from National Institute for Amazonian Research - INPA, Brazil), and a PhD in Ecology and Natural Resource Management (from Norwegian University of Life Sciences - NMBU, Ås).

A second member of secretariat, the environmental engineer André Carvalho, has been based in Belém for a part time position until 1 October 2019. He has been important to strength the secretariat tasks in Brazil. André Carvalho was hired by Hydro Alunorte (Barcarena) as environmental engineer for a full-time job. He started working for Hydro in July 2019 and is no longer part of the BRC's secretariat.

6. New research projects

In 2018, BRC opened a new call for research projects based on the revised BRC Research Program (2018-2023). The Consortium received 22 proposals. After the evaluation process and the final rank, 11 research projects were recommended to Hydro for funding by the Scientific Committee. Several different topics were addressed by the approved projects, such as the re-colonization of wildlife in replanted areas subjected to mining, effects of mining on hydrological resources (chemical, physical and biological), new biodiversity monitoring techniques, for example DNA metabarcoding, dispersal of wildlife due to mining activities, among others.

During the year of 2019, the coordinators of the approved proposals have been dealing

with bureaucratic arrangements in order to have their projects implemented. According to the current status, most of these projects have been already signed by the parties involved (e.g. Universities, Hydro and FADESP) (Annex 1). It is expected that they all start their activities in 2020.

7. Research project activities

Most of the projects that have been approved in previous years (including BRC 2/14 emissions and BRC 4/15 entomology that were delayed due to administrative hurdles) are now fully operational (Annex 2), and great progress has been made. Progress reports have been presented twice a year to the BRC Scientific Committee.

However, two approved projects - BRC 14/17 (Monitoring Reptiles) and BRC 15/17 (topsoil project) - have not have started yet. The first one is delayed because it was needed to perform an adjustment in the budget of the approved proposal. Recently, Hydro has accepted the budget changes and it is expected that the project will be soon signed by the counterparts and be ready to start in 2020. In relation to the second project (topsoil), it has been a change in relation to the funding designed to support the proposal. There is a possibility of this project been supported by external founds. However, at present the funding situation has not yet been resolved. It is expected that these problems will be solved in the near future.

Another case is the BRC 09/15 - Wood-decay fungi, which has not had the expected progress because of administrative problems. The problems seem now to have been solved. Karl-Henrik Larsson, who headed the proposal, has retired from his position at UiO. Professor Hugo de Boer (UiO) will take over as new coordinator of the project. The team of researchers involved is completed by Tatiana B. Gibertoni (UFPE), Adriene Mayra da Silva Soares (MPEG) and Gisele Barata Silva (UFRA). The project's schedule is currently being updated and it should be ready to start in 2020.

Some projects have reached the end and have delivered the final project reports. This is the case of the BRC 06/15 (wood chemical compounds), which submitted its final report just before the 12th SC meeting (October 2019). This project had the involvement of more than a dozen collaborators (including students and researchers) and has resulted, so far in one a course conclusion manuscript, three master thesis, one PhD thesis and two post-doctoral researches. Several manuscripts are being prepared for submission to scientific journals, and hopefully will result in very relevant publications in the near future.

We also highlight another successful case amongst the ongoing projects, which is the case of the Jaguar project (BRC 05/15). Øystein Wiig (UiO) and Ana Cristina M. de Oliveira (UFPA), coordinators of the project, were finally successful in capturing a jaguar in the Hydro's mining area and tagged the animal with a GPS Iridium satellite collar (Figure 3). The transmitter from the collar will give GPS positions for the instrumented animal every 1.5 hours, for more than a year. The purpose is to monitor the movement, habitat use, and living area of the largest feline in the Americas.

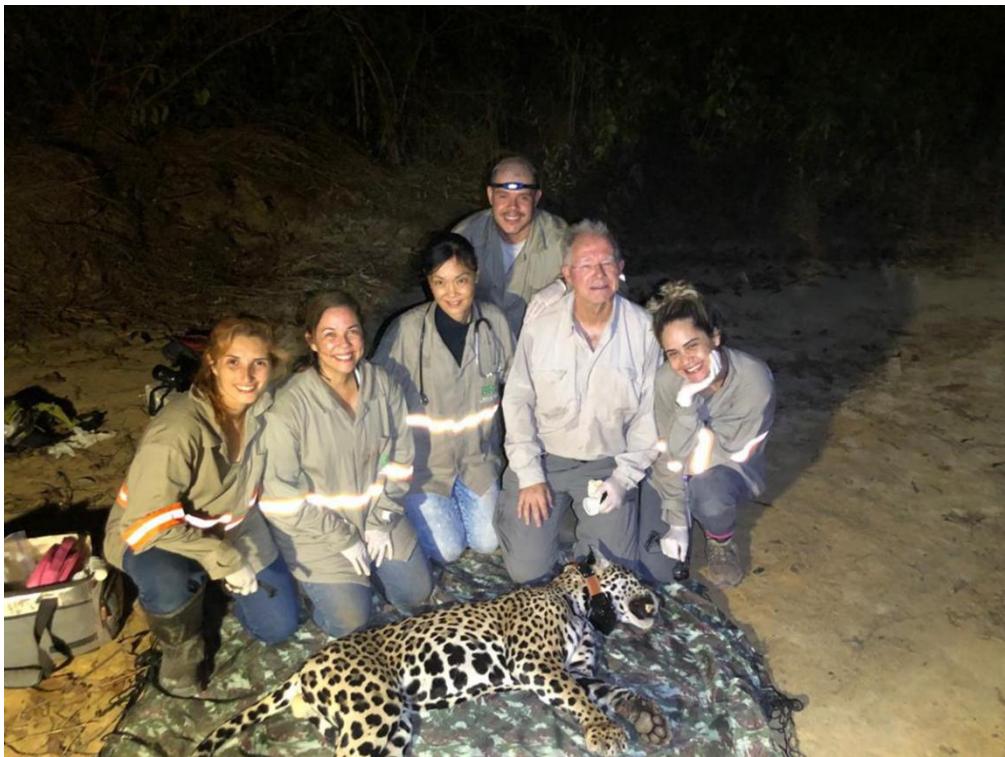


Figure 3. Researchers of the jaguar project with a jaguar, just after it being trapped and tagged the animal with a GPS Iridium satellite collar. Photo: Cris Oliveira.

8. Fundraising activities

BRCA is actively seeking other funding sources for new projects. In 2018 BRCA has been successful in obtaining a new bi-lateral project funded by CAPES and The Norwegian Centre for International Cooperation in Education (SIU). The project entitled “Transnational training in environmental DNA for biodiversity assessments and restoration ecology” is a collaboration between UFPA and UiO. This project is now ongoing, and even made possible the exchange of students from Norwegian Institutions to take part of their master thesis in Brazil. Another possibility of external funding was raised to support the topsoil project (BRCA 15/17). However, to date, we are still waiting this funding to be confirmed in order to start the project’s activities.

9. Seminar about restoration indicators

Throughout BRCA's five years of activity, many projects have concluded that it is necessary to define criteria and indicators to monitor forest restoration in areas mined for bauxite extraction. Also, it is necessary that these criteria to be standardized in relation to the characteristics of each environment (phyto-physiognomy) where this type of mining has been practiced.

For this purpose, the Research Seminar: *Criteria and Indicators for Forest Restoration in areas degraded by bauxite mining in Pará* took place on February 26th, 2019, at the Federal Rural University of the Amazon, campus Paragominas. The seminar aimed to bring together technical and academic experiences on forest restoration to define criteria for forest recovery

based on different techniques, as well based on existing experiences and in accordance with the relevant legislation. It was organized by Professor Gracialda Ferreira (UFRA), and approximately 80 people, among students, professors and other collaborators of BRC attended the seminar (Figure 4).



Figure 4. Seminar about restoration indicators. *Top:* plenary with people involved in the discussions. *Bottom:* participants of the seminar. Photo: André Carvalho.

10. BRC represented at the XIV Pará Industry Fair (FIPA)

BRC was part of Hydro's stand at the XIV Pará Industry Fair (FIPA), which took place on May 15th –

18th, 2019 at the Amazon Convention Center, Hangar (Figure 5). FIPA is a biannual event that started 28 years ago and since then has been part of the official calendar of events in the State, being important for presenting a diversified program with news, services and training aimed to the industry sector. FIPA's theme in 2019 was industry 4.0, which seeks technological innovations for the automation and control of industrial processes. Overall, the event had more than 70 stands with more than 100 exhibitors from the most diverse industrial sectors, as well as companies of all sizes.



Figure 5. BRC being represented at the Hydro's stand on the XIV Pará Industry Fair. Photo: André Carvalho.

11. Field Course in Tropical Rainforest Ecology and Biodiversity

The Field course is conducted by the BRC partner institutions and it is part of the post-graduation programs of the participating institutions. Specific funding for the course was obtained from the Norwegian Centre for International Cooperation in Education (DIKU), throughout the UTFORSK call, and will finance the course for four years (2018-2021). The course includes two parts: one in Brazil, and another in Norway. In the first, eight students from Norway (NMBU and UiO) travel to Brazil and join eight students from Brazilian Institutions (UFRA, UFPA and MPEG) for field-work in the Amazon forest. For the second part, they take the opposite direction: students from Brazil travel to Norway and work together with students from Norwegian Institutions.

The second edition of the course took place between August and November 2019. Firstly, the Norwegian students and professors from UiO and NMBU (Norwegian University of Life Sciences) came to Belém, Brazil and met with students and professors from UFRA, UFPA and MPEG. The group travelled by boat to a field station in Caxiuanã National Forest - Amazonia

(Figure 6) where they had classes on tropical ecology and had a chance to develop their own short-term field projects (supervised by the professors in the field). After concluded this stage, the students returned to Belém, and visited the zoological collections at the Goeldi Museum. In the end of this first phase of the course, in Brazil, the students also had a chance to visit the Hydro mining area in Paragominas (Figure 6).

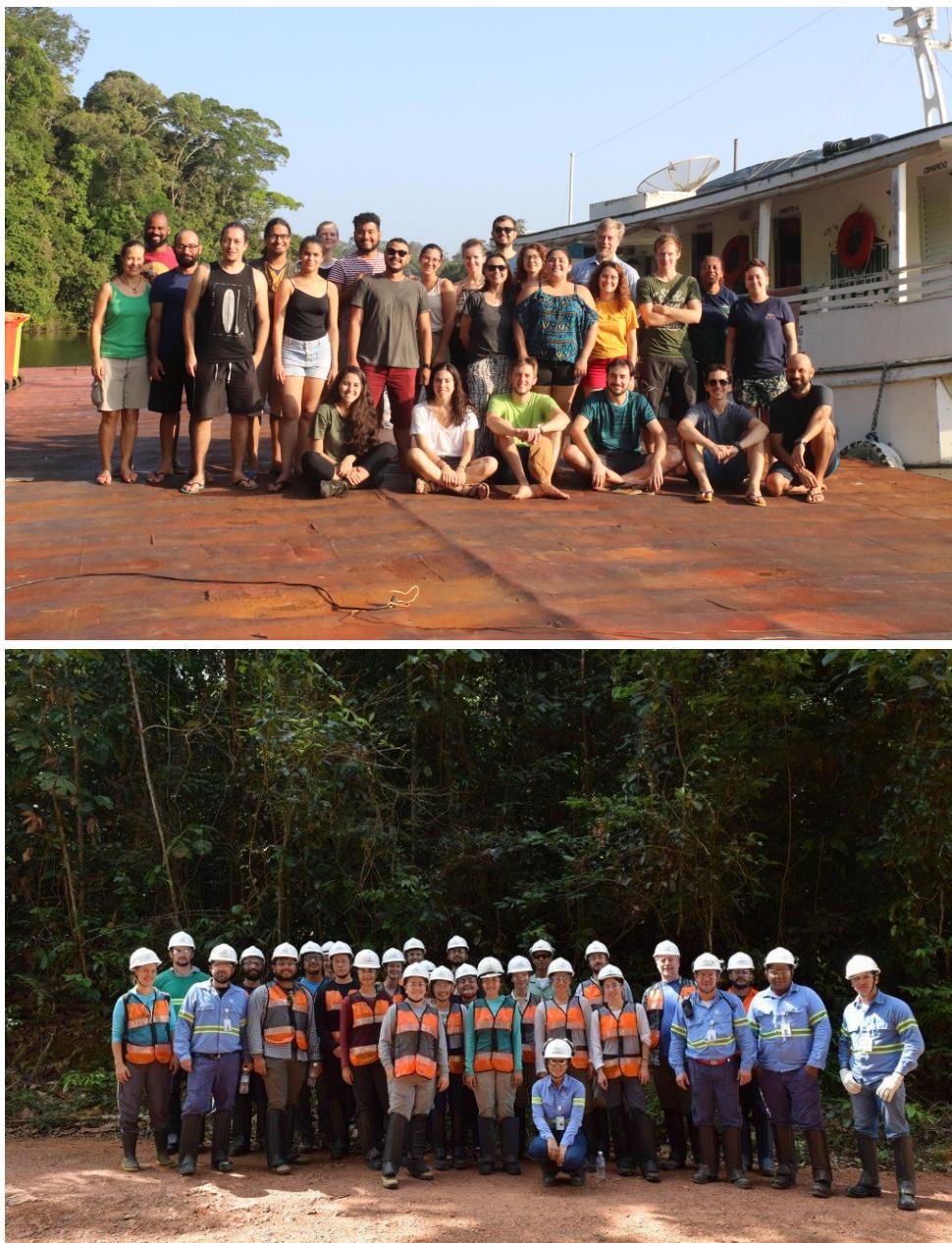


Figure 6: The 2019 Field Course in Tropical Ecology and Biodiversity. *Top:* Students and professors at the field station, in Caxiuanã National Forest (Brazilian Amazon). *Bottom:* Visit at Hydro Paragominas. Photo: Rafael Assis.

The second part of the course took place between October and November 2019, in Norway. Students and professors from both countries had a chance to meet each other once again, this time in Norway. The group developed lab activities related to DNA extraction and analysis of samples collected in Brazil at the University of Oslo. They also had classes and visited the campus of the Norwegian University of Life Sciences (Ås), and visited the Hydro plant in

Holmestrand (Figure 7).



Figure 7: The 2019 Field Course in Tropical Ecology and Biodiversity, – phase Norway. *Top:* Students and professors at the Natural History Museum, Oslo. *Bottom:* Visit to Hydro plant in Holmestrand, Norway. Photo: Rafael Assis.

12. Internal Seminar of Projects supported by BRC

The BRC secretariat organized the First Internal Seminar of Projects supported by the Biodiversity Research Consortium Brazil-Norway, on October 8th and 9th, 2019. The event took place at UFPA (campus Belém), and had as main objective to disseminate the main findings and experiences from BRC projects to the BRC scientific committee, BRC project participants, Hydro and other

partners.

Most of the projects supported by BRC made presentations the seminar. The researchers of the projects were encouraged to present their results and open a channel for discussions, implications and/or suggestions for implementation in the environmental practices of Hydro's mining activities. We estimate that more than 100 people, among students, professors and general interested public attended the seminar (Figure 8). Our aim is to organize a workshop in a near future where researchers and students of different BRC projects can come together and produce relevant papers with multi-thematic topic among the ongoing studies.



Figure 8: The Internal Seminar (September 2019) at UFPA of projects supported by BRC. The meeting included presentations of project results by researchers from BRC, followed by discussions between the researchers and the audience. Photo: BRC.

13. Course on Biological Interactions

The Biological Interactions project (BRC 12/16), in partnership with the Graduate Program in Biodiversity and Evolution (MPEG), offered the course from 16-20 November 2019. Twenty-five

participants attended the course, including many postgraduate students from different institutions (Figure 9). The course comprehended analyzes of biological interactions and how they can be applied to contexts related ecology, conservation and restoration of ecosystems. It also focused on setting up ecological networks and calculating metrics.



Figure 9. The team of students and professors that participated in the course about Biological Interactions, at the MPEG. Photo: Marlúcia Martins.

14. BRC is awarded at a Conference in Russia

On September 2019, Hydro's biologist Victor Barbosa represented BRC in the 37th International Conference and Exhibition of ICSOBA (The International Committee for Study of Bauxite, Alumina and Aluminium) in Krasnoyarsk, Russia. The Conference was a joint event with 25th "Aluminium of Siberia" Conference within XI International Congress & Exhibition "Non-Ferrous Metals and Minerals" (NFM). The conference obtained support from RUSAL, the host sponsor and attracted 546 delegates from 34 countries and continents, including Asia, Europe, Australia & New Zealand, Africa, the America's and Caribbean. During the conference, 50 different companies staged an exhibition of latest technologies, equipment and other devices for the bauxite, alumina and aluminium industry.

In this event, Victor presented a report containing the studies developed by BRC at the Hydro mining in Paragominas. The work, based on the compilation of the BRC's results, was awarded by a Prize "Best Report" at the Alumina Production Section (Figure 10).



Figure 10: Hydro's biologist Victor Barbosa is awarded with a prize in a conference in Russia. The work, based on the compilation of the BRC's results, was awarded in the category "Best Report". Photo: Hydro.

15. Participation in the UTFORSK-seminar

In October 2019, the coordinator of the field course in Tropical Ecology and Biodiversity and BRC's project coordinator Rafael Assis was invited to attend the UTFORSK seminar, in Oslo. This is an annual event where members of ongoing UTFORSK projects (that support our field course) are invited to attend (Figure 11). The aim of the seminar is to allow the participants to share experience and knowledge and give important feedback for further development of UTFORSK and other programs supporting cooperation with the partner countries.

The seminar was opened by Professor Anders Malthe-Sørensen from the University of Oslo, with a talk about quality in education and the link between research and higher education. Diku, which is the Directorate for Internationalization and Quality Development in Higher Education, promoted presentations of results from UTFORSK thus far, and the importance of student mobility with the Panorama countries (which include Brazil). Rafael Assis presented a poster with the main objectives and activities developed by students and professors along the field course, and also attended to debates with other coordinators (Figure 11).



Figure 11. The Field course in Tropical Ecology and Biodiversity was represented at the UTFOSRK seminars in Oslo. *Top:* Presentations during the event. *Bottom:* poster with information of the field course in the event's panel. Photo: Rafael Assis

16. Brazilian newspaper highlights BRC's research

The newspaper *Roma News* (Belém – Pará) published on November 29th, 2019, a report highlighting the importance of the research consortium on forest recovery of the Hydro mining activities in Paragominas. The report emphasized the different techniques to bring back the vegetation to the areas where bauxite was extracted in order to recompose the biodiversity, as

well the program for monitoring the mammals in the region. The newspaper interviewed BRC's associated professor Ana Cristina de Oliveira (UFPA) about the work with monitoring and tracking mammals in both reforested and mature forests at Hydro's mining sites. It highlights the fact that, of the 31 species originally found in the region, 19 have already been spotted by the research team in the area of 2,200 hectares of reforestation. Among them were the jaguar and the tapir which both are classified as Vulnerable on the Brazil Red List of threatened species.

Reporters of the newspaper visited the area and reported that projects of reforestation have started 10 years ago in areas where tons of bauxite, aluminium raw material were removed. It highlights the importance of the BRC studies in order to develop the natural balance of the ecosystem in the mining area. The complete report of the newspaper was published in the printed version, and also in the website. A link for the report can be accessed on the BRC's official website (<https://www.brcbn.com/news>).

17. Promotion of an Event for the *Jaguar Day*

As part of the celebration of the *Jaguar Day* in Brazil, an event was promoted on December 12th at the UFPA. It was organized by the Mammalogy group led by Professor Ana Cristina Mendes de Oliveira (UFPA), with the support of Professor Leonardo Sena - coordinator of the projects represented in the event. The objectives were to disseminate the ongoing research performed by UFPA and BRC in the Amazon for the conservation of jaguars, and to present the project to future students interested in the theme so that they can be involved in this research.

During the event, results from two studies financed by BRC, the coexistence project (BRC 24/19), and the jaguar monitoring project (BRC 05/15) were presented. Approximately 25 participants, including undergraduate and post-graduate students from UFPA, MPEG and State University of Pará (UEPA) attended the event (Figure 12).



Figure 12: Students and professors that attended the *Jaguar Day* at the Federal University of Pará. Photo: lara Ramos.

18. Student Involvement and Exchange

One of BRC's main aims is to integrate students in research projects. With research activities expanding, so is the number of students involved. By the end of 2019, a total number of 66 students were involved in BRC research projects: 9 on bachelor level, 25 on master level, 18 on PhD level and 14 Postdoc (Figure 13). In relation to the previous years, we observed not only a continually increase in the number of students associated to BRC projects, but also an increase in the number of higher educated students (e.g. PhD and Post-doctoral levels). This is highly important because may increase the potential for production of articles and other scientific material of BRC related projects. In this context, some of the projects are approaching the end, and it is expected that a number of new theses and papers generated from BRC projects may soon be completed.

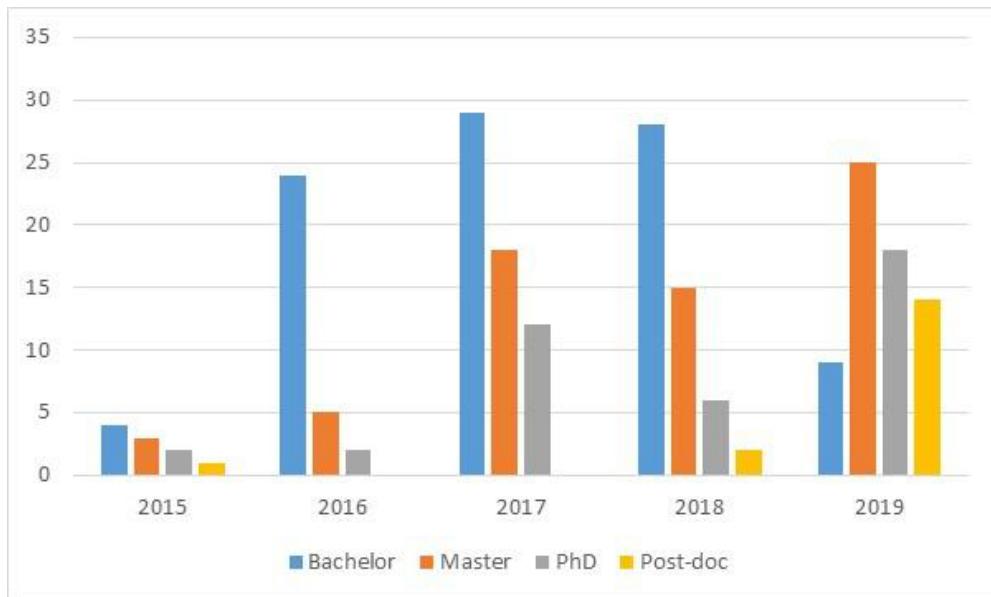


Figure 13: Number of students involved in BRC research projects from 2015 to 2019.

Some of these students had the opportunity to experience part of their studies abroad, being part of the exchange program of the institutions involved in the Consortium. Three Norwegian students that participated in the rainforest field course extended their stay in Brazil in order to develop their master thesis.

One of the students made field work for her thesis related to the activities of the logging company Benevides (Pará), which has been a supporter of the field course since 2018's edition. The student, from the master program in Ecology at NMBU, spent an additional six weeks in Brazil. She developed a study on collateral damage of residual trees as result of selective logging, at a logging concession located in Caxiuanã National Forest. She collected data about the felled trees and relative tree density and related this to the damage seen on trees affected by the felling, and evaluated if current logging activities could affect future crop trees (Figure 14).

The other two students (master program UiO) spent eight more weeks in Brazil after the course for their field work. The objective of the study was to assess the biodiversity in a remnant forest of a heavy land use site in Paragominas using a metagenomic method called metabarcoding. Methods in the field included sampling in five different locations upstream a small river in the center of the forest fragment (Figure 15).

All the students involved in the exchange really appreciated both the professional and the personal the experience achieved, despite the language barrier.



Figure 14. Student (NMBU) in a logging company near Caxiuanã National Forest for developing her master thesis on impact of wood extraction. Photo Malin Aannestad.



Figure 15. Students (UiO) developing their master studies on biodiversity in a remnant forest of Paragominas, using metagenomics techniques. Photo: Rita Olsen.

19. BRC's Website

The BRC's official website has been under constant update in 2019. News, reports, events, and other relevant information concerning the consortium's activities have been almost weekly exposed in the website (brcbn.com). This is an important tool for students and general interested people get to know what BRC is about, but also be informed about upcoming events, such as courses, seminars, opportunities, research teams and others.

Also, a new link with information about the field course was included in the website. The aim is to facilitate the access of the information about the program, projects, pictures and many other applicable information for the students and professors involved. An album with pictures of all participants of the last year's course has been added, and we believe that the visualization of the student activities may increase the relevancy of the course and the BRC as a whole (Figure 16).



Figure 16. Image of the BRC's website, showing page with the participants of the field course in 2019.

20. Student Receives Award with a BRC Project

The student from UFRA Ana Yasmin Gonçalves Santos, under the guidance of Prof. Norberto Noronha, was awarded 2nd place in the category "Mining and biodiversity: ensuring sustainability" at the 17th Scientific Initiation Seminar (Figure 17). The event took place at UFRA - Belém, where she presented the work entitled "Water retention in soils built after bauxite mining and in an Oxisol" in the poster session. The work is the result of the Biodiversity and Soils project carried out by UFRA/MPEG and supported by the BRC.



Figure 17. Students and professors are awarded at the 17th Scientific Initiation Seminar, UFRA - Belém.

21. Lessons Learned

The year of 2019 was another year of progress for BRC. The consortium advanced on the defined main aims of the cooperation, namely to develop research activities, to improve university – industry partnership and to integrate graduate students in research. Still, there are challenges.

- *It takes at least several months for projects supported by BRC to complete contracts, medical examinations, security courses etc. before they can start field work. Still, all these processes are working much better than in the previous years, thanks to the good communication between the parts involved. However, some more concerns about this need to be stressed in the coming calls for new projects. For instance, advice the applicants about potential extra delays when preparing their schedule, such as permits for accessing genetic material of samples, and planning for student exchange between countries.*
- *The promotion of internal events with researchers associated to BRC projects can be highly productive. This can instigate multi-disciplinary discussions on results of the studies, and promote the relevance of projects to a broader perspective. A better integration of the researches may increase the chance of a higher number and more relevant products, both for the academics (scientific papers), as for Hydro.*
- *External funding for research projects continues to be a concern for BRC. The current situation in Brazil for obtaining research grants is difficult. In 2018, the secretariat has reached the conclusion that smaller initiatives, rather than large Amazon Fund proposals and similar initiatives, might be a more effective way to use fundraising resources. However, still little progress has been made so far to motivate researchers associated to BRC to seek more external funding. A better strategy to achieve this*

should be considered for the coming year.

- *Language has always been a challenge for BRC. In 2019, all the with Brazilian and Norwegian participants events (meeting of the BRC board, Scientific Committee and project seminar) had the support of a professional for simultaneous translation. This service was provided by Hydro, and it was very successful in order to removing the language barriers for discussion between the counterparts. It is highly recommended thus to apply the translation service always when possible.*
- *The field course is a great opportunity to promote more exchange of students from both countries. It opens the possibility of Brazilian and Norwegian students to have part of their studies abroad, and therefore strength the collaboration between Institutions, and reinforce the contribution of the consortium for educational sphere. However, this exchange has been quite biased, since mostly Norwegian students had a chance to go to Brazil to perform their studies, than the other way round. Therefore, it is important for the secretariat to stimulate or even facilitate better conditions for more evenness in relation to student exchange.*
- *The secretariat and members of the Scientific Committee have been working intensely to provide new achievements for the consortium, such as establishing a specific team to produce relevant documents for Hydro and BRC (e.g. The Indicator's Group). However, sometimes they start but not make the expected progress in a short- to mid-term period. Thus, there is a need to discuss new strategies to secure that ideas and initiatives are followed up and that realistic time frames are set. Each initiative needs an appointed leader who is responsible for the progress of the work of the team. Members of groups need to fulfill their commitments to their assigned tasks.*

Oslo, 30th January 2020

Rafael Assis and Fridtjof Mehlum

Annex 1: BRC – Status of new research projects 16.01.2020

Code	Coordinator	Proposal	Institution	Status
BRC 16/19	Jonathan Stuart Ready	Measuring biodiversity dynamics using environmental DNA and metabarcoding	UFPA	Documents signed. Budget available. Ready to start.
BRC 17/19	Vladimir Gusarov	Metabarcoding and metagenomics for high throughput inventory and monitoring of terrestrial arthropod	UiO	Budget is fine. Missing documents from FADESP. Need to line up with team in Norway. Permits for DNA extract is an issue.
BRC 18/19	Leonardo Sena	Metagenomic and metabarcoding as a tool for developing One Health In Hydro Area, Paragominas.	UFPA	Documents signed. Budget available. Ready to start.
BRC 19/19	Lilian Lund Amado	Use of native species from different trophic levels and occurring in bauxite mining area to evaluate the toxicity of residues	UFPA	Documents signed. Budget available. Started.
BRC 20/19	Luciano Montag	Aquatic biota monitoring and assessment upstream and downstream of bauxite pipeline Hydro Paragominas - Barcarena	UFPA	Documents signed. Budget available. Started.
BRC 21/19	Marcos Persio	Bird telemetry monitoring to evaluate loss of habitat in mining area in the northeastern Amazon	UFPA	Documents signed. Waiting for availability of the budget.
BRC 22/19	Maria Aparecida Lopes	Effect of large herbivorous mammals on forest regeneration in post-mined areas, in Paragominas,	UFPA	Documents signed. Budget available. Ready to start.
BRC 23/19	Rossineide Martins da Rocha	The use of physical, chemical and biological tools to evaluate the water resources under the influence of the Norsk Hydro Mining Company	UFPA	Documents signed. Waiting for availability of the budget.
BRC 24/19	Leonardo dos Santos Sena	Coexistence plan for human and carnivores	UFPA	Documents signed. Budget available. Started.
BRC 25/19	Raphael Ligeiro	Assessing the integrity of aquatic ecosystems by implementing a next generation DNA sequencing-based method for biomonitoring	UFPA	Waiting signature of documents.
BRC 26/19	Thaísa Sala Michelan	Effects of soil use on diversity and ecophysiology on the riparian vegetation, aquatic macrophytes and plankton in streams and lagoons in mining areas	UFPA	Waiting signature of documents.
BRC 14/17	Youszef Bitar e Kita	BRC 14/17 Monitoring Amphibians and Squamata Reptiles in Reforestation Areas in the Hydro Bauxite Mine Area in Paragominas, Brazil.	UFPA	Budget updated. Waiting signature of documents.
BRC 15/17	Gracialda Ferreira	BRC 15/17 How topsoil collection methods, the origin and storage periods influence environmental restoration in areas of bauxite mining in Paragominas	UFRA	Working in the documents for the external found.

Annex 2: BRC – Overview of all research projects 16.01.2020

Project title	Institution / Coordinator	Contract signed	Did it start already?
BRCA 01/14: Arbuscular mycorrhizal fungi in natural areas and areas in restoration after bauxite mining in Pará	UFPA Altamira/Magali Goncalves Garcia UNIFESSPA/Ulisses Albino	YES	YES
BRCA 02/14: Measuring the emissions of trace gases in chrono-sequence of reforestation in areas influenced by bauxite mining in Paragominas	UFPA Braganca/Hudson Cleber Pereira da Silva	YES	YES
BRCA 03/14: Biodiversity, proliferation of plant species and restoration of degraded areas from bauxite mining	UFRA/Marcos André Piedade Gama	YES	YES
BRCA 04/15: Entomology Survey and Bioindicators for Biodiversity Monitoring	MPEG/Rogerio Rosas	YES	YES
BRCA 05/15: Camera trap survey of ground-living mammals in the Hydro bauxite mine area	UiO/Øystein Wiig, UFPA/Ana Cristina de Oliveira	YES	YES
BRCA 06/15: Evaluation of chemical compounds of different forest species stored, susceptible to contamination in the soil.	UFRA/Gracialda Costa Ferreira	YES	YES
BRCA 07/15: Impact study of a biodiversity recovery program in a bauxite mining area on populations of insect vectors	UFPA/Ivoneide Maria da Silva	YES	YES
BRCA 08/15: Bird diversity in three areas in different states of conservation in the Eastern Amazon.	UFPA/Marcos Persio Dantas Santos	YES	YES
BRCA 09/15: Wood-decay fungi in Paragominas and Trombetas: baseline information, monitoring priorities, and how to achieve the “no net loss” target?	UiO/Karl-Henrik Larsson	YES	YES
BRCA 10/15: Aquatic biota monitoring of streams in mining areas of Paragominas SA, Pará, Brasil	UFPA - MPEG/Akama, Juen and Montag	YES	YES
BRCA 11/15: Diversity of the herbivorous insects in four areas of the Hydro mining company	UFPA/José Antonio M. Fernandes	YES	YES
BRCA 12/16: How ecological interactions are influenced by mining activities and efforts for environmental restoration after exploration	MPEG/Marlucia Martins	YES	YES
BRCA 13/16 Tracking jaguars in the Hydro bauxite mine area in Paragominas, Brazil	UiO/UFPA Øystein Wiig /Leonardo Sena	YES	YES
BRCA 14/17 Monitoring Amphibians and Squamata Reptiles in Reforestation Areas in the Hydro Bauxite Mine Area in Paragominas, Brazil.	UFPA/Maria Cristina dos Santos Costa	NO	NO
BRCA 15/17 Rehabilitation techniques in bauxite mining areas - A topsoil study	UFRA/Gracialda Ferreira	NO	NO
BRCA 16/19 - Measuring biodiversity dynamics using environmental DNA and metabarcoding	UiO - Jonathan Stuart Ready	YES	YES
BRCA 17/19 - Metabarcoding and metagenomics for high throughput inventory and monitoring of terrestrial arthropod biodiversity	UFPA/Gustavo Ruiz UiO/ Vladimir Gusarov	NO	NO
BRCA 18/19 – Metagenomic and metabarcoding as a tool for developing One Health In Hydro Area	UFPA/Leonardo Sena	YES	YES
BRCA 19/19 - Use of native species from different trophic levels and occurring in bauxite mining area to evaluate the toxicity of residues	UFPA/Lilian Lund Amado	YES	YES
BRCA 20/19 - Aquatic biota monitoring and assessment upstream and downstream of bauxite pipeline Norsk	UFPA/Luciano Montag	YES	YES

Hydro Paragominas - Barcarena			
BRC 21/19 - Bird telemetry monitoring to evaluate loss of habitat in mining area	UFPA/Marcos Persio Dantas Santos	Yes	NO
BRC 22/19 - Effect of large herbivorous mammals on forest regeneration in post-mined areas	UFPA/Maria Aparecida Lopes	YES	YES
BRC 23/19 - The use of physical, chemical and biological tools to evaluate the water resources under the influence of the Norsk Hydro	UFPA/Rossineide Martins da Rocha	YES	NO
BRC 24/19 - Coexistence plan for human and carnivores	UFPA/Leonardo dos Santos Sena	YES	YES
BRC 25/19 - Assessing the integrity of aquatic ecosystems by implementing a next generation DNA sequencing-based method for biomonitoring	UFPA/Raphael Ligeiro	NO	NO
BRC 26/19 - Effects of soil use on diversity and ecophysiology on the riparian vegetation, aquatic macrophytes and plankton in streams and lagoons	UFPA/Thaísa Sala Michelan	NO	NO

