“Brazil’s Supreme Court has begun a historic trial about the environment”: an article by Carlos Joly and Jean Paul Metzger examines the impacts of the new environmental law

By Carlos Joly and Jolana Hanusova

The Brazilian Forest Code, regulating the maintenance of native vegetation on private lands, was introduced in Brazil in 1965. It was valid with some changes until 2012, when it was replaced by the Law for Protection of Native Vegetation (Lei de Proteção da Vegetação Nativa). The introduction of the new law provoked widespread protests, with protesters demanding the then-president Dilma Rousseff to use her right of veto to reject it – which did not happen.

5 years later, in 2017, the Supreme Court (STF) met up on the 14th of September to discuss the legal grant of four legal actions submitted against the law once it was approved by the Brazilian Congress. On the same day, the newspaper Folha de São Paulo published an article authored by Carlos Joly and Jean Paul Metzger explaining to the general public what changes the new law brings and their impacts on the environment.

In general terms, the Law for Protection of Native Vegetation made the rules for protection of vegetation on private land more flexible than the relatively strict Forest Code. According to the authors, the new law does contain some important and positive changes – such as the requirement for the private owners to register in the CAR (Cadastro Ambiental Rural), which allows mapping the boundaries of their land and any changes to the native vegetation on their land. However, the new law went too far in making the rules flexible. As a result, sensitive environmental areas such as riverbanks, water springs and hilltops will not be sufficiently protected, increasing the risks of floods or landslides. The article argues that in this sense the law can be seen as contradictory to the Article 225 of the Brazilian Constitution, which grants the rights to an essential environmental protection and healthy lifestyle. It is also deemed controversial as it grants amnesty to landowners (many of them large agricultural producers) who cleared the native vegetation illegally before July 2008, an area summing up to 41 hectares of land.

The article suggests two ways in which the current law could be improved. Firstly, it could take into consideration the vast areas of pastures with agricultural potential which are currently under-used. These pastures could be used to increase Brazil’s agricultural potential without impacting the cattle farming production. Secondly, the law should take into account the fact that native vegetation increases agricultural production, for example by protecting water springs and promoting pollination and pest control. The benefits of pollination have been estimated between 3.5 and 6.5 billion Brazilian Reals in 2016.

Maintaining the law in its current version will make Brazil even more vulnerable to environmental changes such as floods and climatic extremes. Brazil’s natural resources, however, have the potential to benefit all sectors of the society, including agriculture.

Unfortunately, due to the fact that the Supreme Court is overwhelmed with legal processes around denouncements of corruption in the highest levels of Brazilian politics, the judgment regarding the Law for Protection of Native Vegetation was not finalized on the 14th of September, being adjourned without a new date to be resumed.
Light profiles along a gradient of disturbance in the Atlantic forest  by Sophie Fauset

Our hard work measuring light profiles in the Atlantic forest sites (intact, logged, secondary and fragmented sites) has resulted in a new paper in Ecosphere – Tropical forest light regimes in a human-modified landscape. The paper is in press and will have DOI 10.1002/ecs2.2002. There is also a data package on the NERC EIDC with the light profiles – please use this data if it can help your studies, available at this link https://doi.org/10.5285/4f3cf9f6-d7e5-4ae0-87c9-064b4e66a92a. We found interesting patterns in the results. The logged plot still shows the impact of logging in the light profile with a different shape to the intact plots (despite the logging occurring over 40 years ago and having a similar biomass). The secondary plot has a more similar profile to the intact plots, so for small trees the light environment in the secondary forest is actually more similar to an intact forest than in the logged forest. The fragments were only slightly lighter than the continuous forest at ground level, and show quite steep light absorption in the canopy. Some of the individual profiles show that very dense tree crowns (likely with many epiphytes) and high liana coverage can absorb almost all the light in a few metres at the canopy top.

Thanks to all the collaborators on the project – Manuel Gloor, Carlos Joly, Marcos Aidar, Helber Freitas, Nikos Fyllas, Mauro Marabesi, André Rochelle, Alexander Shenkin, Simone Vieira – and all those who helped in the field.

Figure - Observed mean light profiles with height (left panel) and depth below the canopy (right panel) for forest plots along a disturbance gradient. Purple line - extinction coefficient fit to mean light profile using height above the ground. Green line - extinction coefficient fit to mean light profile using depth from top of canopy. Middle panels show histograms of the sample tree heights within each plot.
A new study on impoverishment of Amazonian biodiversity through selective logging by Filipe França and Jos Barlow

A new study by Filipe França and Jos Barlow entitled ‘Identifying thresholds of logging intensity on dung beetle communities to improve the sustainable management of Amazonian tropical forests’ finds that even low levels of logging in the Amazon rainforest may lead to great losses in biodiversity. More than 403 million hectares of tropical forests worldwide have been earmarked for timber concessions with selective logging a common economic activity. The Brazilian Amazon alone holds around 4.5 billion m³ of commercial timber volume, and the demand on Amazonian hardwood is increased as African and Asian timber stocks are exhausted.

The study looked at the impact of logging by examining its effect on forest dung beetles and the way in which the beetles remove dung and disturb the soil, considered as good indicators of forest and soil health.

The research, published in the scientific journal *Biological Conservation*, looked at 34 different plots situated in the state of Pará - an area two times that of Spain and a focal point for Amazon protection efforts in the last decades. They found that even low levels of logging led to negative effects on dung beetle diversity and rates of dung beetle-mediated soil removal. For context, the activity of almost 5,000 dung beetles from 53 species was recorded within the largest logging concession in the Brazilian Amazon, covering 544,000 hectares of native forest – an area 3.5 times that of London. There was a rapid reduction in biodiversity up to a logging intensity of around 10 -20 m³ of timber removal per hectare after which it flattened.

These results demonstrate that sensitive dung beetle species and important processes may be lost following even low intensity anthropogenic forest disturbances. According to Jos Barlow, these results suggest that production forests in the tropics need to reconsider the scale at which logging intensity is regulated, and put in place measures that further incentivise land sparing to enhance biodiversity conservation.
Herbivory levels across a disturbance gradient in Amazonia

By Julia Barreto

Herbivory is a fundamental ecosystem process across the world. Most tropical forests are disturbed to some degree, and any changes in herbivory could have big impacts on our understanding of globally relevant nutrient pathways. We undertook an extensive survey of herbivory levels from canopy leaves collected in 1102 stems of 268 species across 20 ECOFOR sites in eastern Amazonia along a disturbance gradient. All sampled individuals had signs of herbivory from at least one of the three forms, still overall levels of herbivory were low and about one third of leaves examined had no damage at all. We found no overall changes in herbivory levels along disturbance in Amazonian forests surveyed (Figure 1); these results can be explained by interacting regulatory factors. Chewers dominated herbivory levels, followed by miners and gall-formers. This hierarchical order probably is possibly determined by success in exploitation of the great range of resources in these plant rich communities. Herbivory levels along disturbance may be caused by both bottom-up effects and smoothed of top-down control of herbivores by birds or predatory arthropods. Apparent lack of variance in herbivory seem to be the case where disturbance and/or bottom-up control are offset by top-down mechanisms while increased chewing levels may be justified by joint relaxations. Weak link between herbivory and environmental disturbance variables (Figure 2) evokes a clue that herbivory may be more responsive to biotic components (intra- and inter-specific interactions) than to environmental cues. Marked different responses between forms of herbivory seem to relate to feeding habits, endophagous forms had no apparent response to disturbance probably due to sheltering under plant tissues. Our results bring insights for tropical forest functioning, tropical forest landscapes are suffering unprecedented rates of disturbance and we found evidences slight effect of light pressures of disturbance.

![Figure 1](herbivory_levels.png)

**Figure 1** Herbivory levels along the disturbance gradient, forest classes shown in legend box scaling through green tones. Darker green stand for less intensively disturbed forest classes. Invertebrate-mediated herbivory forms are represented per columns: chewing (A and D), mining (B and E) and galling (C and D). For each form, above we show incidence results - displaying proportion of leaves damaged by each form of herbivory. Plots below indicate mean leaf area damaged – severity level- by each form per stem. Notice that severity plots’ y-axes are not on the same scale.
Monkeys and peccaries fatally harvest endangered palm (*Euterpe edulis* Mart.)

By Luis Carlos Quimbayo Guzmán

XIII Brazilian Congress of Ecology was held in the city of Viçosa (Brazil) between 8 and 12 of October of 2017. In the congress, I presented a poster entitled “Monkeys and peccaries fatally harvest endangered palm (*Euterpe edulis* Mart.)” (picture). The work was authored by Luis Carlos Quimbayo Guzmán, Rafael Flora Ramos and Simone Aparecida Vieira.

*Euterpe edulis* (the heart of palm) is a monopodic Atlantic Forest native palm. It fructifies yearly and its fruits are eaten and dispersed by a wide range of animals, from birds to mammals. *E. edulis*, which lacks the capacity to resprout, has been so viciously harvested by local people for its heart of palm, that is listed vulnerable in the Book of Brazilian Flora. We found that, besides humans, peccaries (Family: Tayassuidae) and monkeys (Family: Atelidae) also fatally harvest *E. edulis* for its heart of palm. The fieldwork was performed in three old-growth forest inventory plots (NSV-01, NSV-02 and NSV-03, size: 1 ha each), that were installed in nucleus Santa Virginia of “Serra do Mar” state park in 2007 and have been monitored since. Peccaries consume young palms (here, ⌀ at soil height 2 to 5 cm; but they might consume smaller individuals), which they uproot before eating. In 2016, they harvested up to 52 individuals ha⁻¹ year⁻¹, which represent 18 % of the total pool of individuals in that size class, and consumed between 0.002 and 0.01 m³ ha⁻¹ of actual heart of palm. On the other hand, monkeys harvest bigger individuals (⌀ at breast height ≥ 4.9 cm); they climb the palms and break the crown to access the heart. This behavior suddenly increased after the 2014 drought, resulting in a rise of 85% in *E. edulis* mortality: 24 individuals ha⁻¹ year⁻¹ (6% of individual’s pool); while in years with normal climatic conditions, mortality was 13 individuals ha⁻¹ year⁻¹ (3% of individual’s pool). From an *E. edulis* conservation perspective, these kinds of harvest are an additional threat. Nonetheless, preserving healthy populations of *Euterpe edulis* is important for the maintenance of local fauna, as it serves as an alternative source of food in times of change.
Article on necromass stocks in the Brazilian Atlantic Forest published in the journal “Ciencia en Desarrollo”

by Luis Carlos Quimbayo Guzmán

The extended abstract of my oral presentation "Necromass stocks in Brazilian Atlantic forests along a successional gradient" in IX Colombian Botanical Congress was published in the journal “Ciencia en Desarrollo” (ISSN: 0121-7488. Electronic-ISSN: 2462-7658). The authors are Luis Carlos Quimbayo, Carlos Alfredo Joly and Simone Aparecida Vieira.

In this study, necromass (dead wood + fine litter) was quantified along a successional gradient of Montane Atlantic Forest in years 2015 and 2016 - a year in which an abnormally cold temperature was registered in the area researched.

Distribution of fine litter along the grade of disturbance: before and after the freeze

In 2015, a year with normal climatic conditions, the highest fine litter stocks were found in old-growth forest. Selectively logged and late succession forests showed intermediate values; while early succession presented the lowest fine litter stocks. Fine litter presented high water content in all places (> 60%), these areas have low forests fire risk.

After the freeze in winter 2016 when the temperature dropped to -5°C, early successional forest presented a 65% increase in fine litter stock compared to 2015 levels. Other successional stages did not present such pattern (late successions and selectively logged forests even presented a 21% and 29% reduction in fine litter stocks respectively, compared to 2015 levels), which suggests higher susceptibility to extreme weather events in the early stage. Besides the trees, a freeze might affect the community of decomposer organisms (Chapin III et al., 2002). Freezing kills some of the microbes reducing decomposition on the short term; nevertheless, nutrients previously sequestered by those microbes are released and available for the rest of the microbial community. This nutrient pulse accelerates decomposition on the medium term, when temperature returns to normal conditions.

Impacts of the freeze on dead wood stocks

Our results showed that downed dead wood stocks increased with successional stage. In general, dead wood stocks didn’t differ between years 2015 and 2016. Along the successional gradient, selectively logged forest presented the highest dead wood stocks (16.08 and 19.98 Mg ha⁻¹, in 2015 and 2016 respectively). Old-growth also presented relatively high stocks (14.40 and 11.67 Mg ha⁻¹). Late Succession presented intermediate values (12.96 and 10.95 Mg ha⁻¹), and the early stage presented the lowest dead wood stocks (4.88 and 2.83 Mg ha⁻¹) as these are growing forests with low dead wood production. These results are similar to other dead wood stocks reported in tropical forests (Palace, 2012). Despite these figures, the 2016 freeze might still have a long-term effect on dead wood stock through an increase in tree mortality, which was not perceived in 2016 inventory. Dead wood stocks in late successional stage were similar to Old-growth’s, which suggests that the dead wood component might recover its original dynamics only a few decades after disturbance.

Conclusion

Necromass stocks tend to increase with successional stage in Montane Atlantic Forests. Early successional stage presents the lowest stocks of necromass, but is more susceptible to freeze related defoliation.
Sad news: a dead ocelot found near the field station in the Amazon By Liana Chesini Rossi

We have a piece of sad news from Flona. On 4th of October, on our way to the fieldwork, we saw a dead ocelot (Leopardus pardalis) on the road (BR 163). It was probably ran over during the night. Dead animals on the roadside – birds, monkeys, amphibians, anteaters and many others – are a common sight, and the situation is serious especially in Flona do Tapajós, which is bordered by roads all around the reserve. Some of these animals have a large territorial range and walk long distances until their lives are suddenly ended because of a road constructed in the forest. Yet the deaths of some of the animals can be prevented in different ways such as wildlife passages, traffic signs for drivers, traffic education and speed controls, to name a few. These methods are, however, not broadly used, especially in Pará.

Finding the dead ocelot made us sad for a long time especially because we have never seen an ocelot in the forest – until finding one dead near the road. We took the animal to UFOPA to be used for educational purposes.

'Dia da raça': celebrating the day of ethnic diversity in Brazil

By Liana Chesini Rossi

On 5th of September, Brazil celebrates 'Dia da raça', a day dedicated to celebrating all ethnic groups that contributed to forming of Brazilian national identity.

Our partner organization, LBA, organized an event with the participation of several schools from three indigenous groups, Takuara, Marituba and Bragança, all of which belong to the Munduruku ethnic group. The objective of the event was to promote a better understanding of indigenous culture and its importance as well as to recognize its place within Brazilian culture. ECOFOR researchers participated at this event by presenting our work within indigenous lands. The event was very well-attended and it was a great occasion for strengthening our links with the local indigenous communities.

More news in 2 months’ time!

Please contact me at j.hanusova@lancaster.ac.uk with any feedback or suggestions.

Jolana