Gorongosa National Park

Bird Diversity on Mount Gorongosa, Mozambique

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Summary

Mount Gorongosa in Central Mozambique is a unique habitat, marked by a high level of endemism (including bird endemism) and the presence of rare plant communities, such as Afromontane meadows and alpine rainforest. In the 1970's the forest vegetation of Gorongosa Mountain covered 14,193 hectares but by 2015 32.23% of the forest was lost to a combination of slash-and-burn agriculture, habitat fragmentation due to pressure from the local population, and the effect of the civil war of 1976-1992. The result was a severe reduction in the diversity and abundance of the fauna and flora of the mountain, including the complete loss of the large mammal population. To reverse the negative effects of the forest loss and provide the local population with an alternative to slash-and-burn agriculture, the Gorongosa National Park has implemented a program of shade-grown coffee cultivation that uses native forest species. Such approach to reforestation has been successful in East Africa and Central America.

The purpose of this project was to provide a measure of the effectiveness of this approach by monitoring species composition and abundance within bird communities in shade-grown coffee plantations, in comparison to both undisturbed forest and areas under traditional agricultural regime. Samplings were conducted by placing automated sound recorders (Song Meter SM4) in each of the habitats (1-year old coffee plantation, 4-year-old, degraded area without coffee plantation, and natural forest). Recordings were then scored for species diversity. We also supplemented the sound recorders by including visual surveys.

Project justification

The aim of this proposal was to evaluate the effectiveness of shade-grown coffee plantations as a mechanism for retention and/or restoration of bird communities on Mount Gorongosa, Mozambique. Mount Gorongosa is a unique formation, partially covered with evergreen mountain rainforest, with rainfall above 2000 mm per year. The Gorongosa National Park and its buffer zone are drained by a multitude of rivers and streams from the mountain and the nearby Cheringoma Plateau. In 1970 the forest vegetation of Gorongosa Mountain covered 14193 hectares of vegetation cover, but by 2015, 32.23% of this forest had been lost. There is local community living on the mountain, which carries out activities such as shifting agriculture, firewood exploitation, and exploitation of construction materials, and uncontrolled fires. For decades, these activities have threatened this ecosystem, endangering many animals (especially birds) and plants that

depend on forest, and the mountain water that it sheds.

Mount Gorongosa exhibits high degree of endemism, being home to, among others, 2 endemic bird taxa in Southern Africa: Greater Double-Collared Sunbird (*Cinnyris afer amicorum*), Green-headed Oriole (*Oriolus chlorocephalus speculifer*), and rare species: White-chested alete (*Pseudalethe fuelleborni),* Swynnerton;s Robin (*Swynnertonia swynnertononi),* and Near Threatened East Coast Akalat (*Sheppardia gunningi*). There are also numerous endemic reptiles, crustaceans, insects, and plants recorded from the mountain. All these taxa are highly threatened by habitat loss due to uncontrolled slash-and-burn agriculture and wood extraction.

Methodology

Location

The study was conducted between March and September 2019 on Mount Gorongosa, located in Sofala Province in central of Mozambique. The park covers 10,000 km^2 (1,000,000 ha) within the Great African Rift. It was proclaimed in 1960 and is the flagship National Park in the country.

Gorongosa National Park has recently introduced shade-coffee plantations, grown in the shade of native plants typical of the local montane forest, as a mechanism to recover this degraded area, bring back the forest as well its fauna, and provide a viable economic alternative to slash-and-burn agriculture.

We tested the hypothesis that the areas with coffee plantations provide an alternative, temporary habitat to the mountain bird fauna. This hypothesis predicted that areas with coffee plantations and the presence of native shade trees attract more birds and present a greater species diversity in relation to degraded areas without coffee plantations. To test this, we evaluated the diversity of birds in four habitats (1-year-old coffee plantation, 4 years old coffee plantation, degraded areas without coffee plantation, and natural forest), by setting up sound recorders and analyzing the acoustic data for species richness.

To document species richness in each habitat we used Song Meter SM4 automated recorders (Wildlife Acoustics) to record songs of birds at regular intervals for 10 minutes (at 4:30, 7:00, 9:00, 12:00, 17:00, and 21:00) once a month. We also supplemented the sound recorders by including visual surveys. Sound data will be analyzed using software *Raven 1.5* and the sound reference library at the E.O. Wilson Biodiversity Laboratory at Gorongosa.

Conservation impact

Biodiversity is declining in tropical forest due the pressure on natural resources, conversion of natural forests into agricultural areas and fragmentation of habitats. For tropical biodiversity conservation to be successful, it needs to promote and ensure viable rural livelihoods. In this context, tropical agro-ecosystems and in particular shade coffee agro-forests have received considerable attention, given their potential benefits for both conservation and livelihoods.

Birds play important functional roles in ecosystems, as pollinators, predators and ecosystem engineers, thereby providing a direct link between biodiversity and ecosystem functions and services. They play a very important role in the dynamics of a native forest by transporting seeds in their stomachs for hundreds of miles from the mother plant, thus helping plants to avoid competition for nutrients and light and increasing their chances of survival.

In Mozambique, few studies have documented the abundance and diversity of birds. The restoration program of Gorongosa National Park through the park's scientific program is

documenting the biodiversity of the park so as to know how much and what species of fauna and flora the park has. It has developed scientific research, workshops and environmental awareness that involves communities and youth, and is focusing on conserving biodiversity. This study is another tool that will be dissipated in the local communities, universities and other institute of research, and it will highlight the importance of birds in general.

For Gorongosa, as well as other conservation areas in Mozambique, the knowledge about the importance of seed dispersal agents by park managers is a useful tool in habitat management programs and the rehabilitation of degraded areas.

Results

During the survey on the mountain 82 species of birds were found, of which nine were frugivores, 41 insectivores, 17 omnivores, seven granivores and eight nectarivores (Lopes et al. 2016). Nine savanna species, 22 are found in the woodland and savanna and 51 are forest birds (Chittenden et al. 2016) (Table 1).

Species of concern in different habitats

Two southern Africa endemic subspecies were found (O. *chlorocephalus speculifer* and *C. afer amicorum*) in 1-year-year and 4-year-old coffee plantation.

Two near threatened species were found *Geokichla gurneyi* (found in the forest) and *Lonchura fringilloides* (found in 1 year old coffee);

Resident species in Mozambique: *Sheppardia gunningi* (found in forest and coffee 4 years old);

Highland Afrotropical biome species: *Apalis chirindensis* (found in the 4-year-old coffee plantation and forest) and *Swynnertonia swynnertoni* (found in forest).

Five migratory species were found, of which 4 were found in a coffee plantation (*Halcyon albiventris, Cecropis abyssinnica, Hirundo rustica, Terpsiphone viridis),* one in the forest (Cucu*lus clamous*) and two in the abandoned agricultural area (*Cecropis abyssinnica, Hirundo rustica*).

The greatest richness of birds was found in the forest (49 species), followed by the 4-year-old coffee plantation (34 species), 1-year-old coffee (28 species), and finally the abandoned agricultural area (15 species). The composition of bird species differed greatly between the forest

and the abandoned agricultural area, and the most similar communities were the 4-year-old coffee plantation and the forest (Morisita Index = 0.62; Table 7).

Table 1. List of species found on the Moutain

Grupo	Espécie	Nome científico	Raridade	Espécie migratória
Akalats	Eastern coast akalat	*Sheppardia gunningi*	Residende em Mocambique	
Alethes	white chested alethe	*Pseudaletje fuelleborni*	resident e não comum	
Apalis	black headed apalis	*Apalis melanocephala*	não comum	
Apalis	bar-throated apalis	*Apalis thoracica*	comum e residente	
Apalis	chirinda apalis	*Apalis chirindensis*	razoavelmente comum	
Apalis	yellow breasted apalis	*Apalis flavida*	comum	
Barbets	black collared barbet	*Lybius torquatus*	comum	
Barbets	white eared barbet	*Stactolaema leucotis*	razoavelmente comum	
Batises	cape batis	*Batis capensis*	comum	
Batises	pale batis	*Batis soror*	comum	
Bee-eaters	european bee-eater	*Merops superciliosus*	razoavelmente comum	
Bee-eaters	little bee-eater	*Merops pusilus*	vangrats	
Boubous	tropical boubou	*Laniarius ferrugineus*	comum	

Canary	yellow fronted canary	*Crithagra mozambica*	comum e residente	
Chat	African stonechat	*Saxiocola rubetra*	comum	
Cistocola	lazy cistocola	*Cistocola aberrans*	local comum e residente	
Cistocola	rattling cistocola	*Cistocola rufilatus*	muito comum	
Cistocola	singing cistocola	*Cistocola cantans*	razoavelmente comum	
Coucals	Senegal coucal	*Centropus senegalensis*	não comum	
Cuckoo	black cuckoo	*Cuculus clamous*	razoavelmente comum	intra-africana
Cuckooshrikes	black cuckooshrike	*Campephaga flava*	resident e não comum	
Cuckooshrikes	grey cuckooshrike	*Coranina caesia*	resident e não comum	
Doves & Pigeons	African green pigeon	*Treron calvus*	comum	
Doves & Pigeons	blue spotted dove	*Turtur afer*	resident e não comum	
Doves & Pigeons	cape turtle dove	*Streptopelia capicola*	comum	
Doves & Pigeons	emerald spotted dove	*Turtur chalcospilo*	local comum e residente	
Doves & Pigeons	lemon dove	*Columba lavarta*	razoavelmente comum	
Doves & Pigeons	red-eyed dove	*Streptopelia semitorquata*	comum	

Doves & Pigeons	tambourine dove	*Turtur tympanistria*	local comum e residente	
Drongos	fork tailed drongo	*Dicrurus adsimilis*	comum	
Drongos	square tailed drongo	*Dicrurus ludwigii*	razoavelmente comum	
Firefinch	African firefinch	*Lagonosticta rubricata*	comum e residente	
Flycatchers	African paradise flycatcher	*Terpsiphone viridis*	comum	intra-africana
Flycatchers	blue mantled crested flycatcher	*Trochocercus cyanomelas*	não comum	
Flycatchers	Southern black flycatcher	*Melaenornis pallidus*	comum	
Greenbuls	sombre greenbul	*Andropadus importunus*	comum e residente	
Ground Thrush	orange ground thrush	*Geokichla gurneyi*	quase ameaçada	
Honeyguide	greater honeyguide	*Indicator indicator*	não comum	
Hoopoes	green wood hoopoe	*Phoeniculus purpureus*	comum	
Hornbills	silver cheeked hornbill	*Bycanistes brevis*		
Hornbills	trumpeter hornbill	*Bycanistes bucinator*	local comum e residente	
Kingfisher	brown hooded kingfisher	*Halcyon albiventris*	não comum	intra-africana
Leaf Warblers	yellow-throated woodland warbler	*Phylloscopus ruficapilla*	local comum e residente	
Mannikins	magpie mannikin	*Lonchura fringilloides*	quase ameaçada	

Mousebird	speckled mousebird	*Colius Striatus*	muito comum
Nicator and Bulbul	dark capped bulbul	*Pycnonotus capensis*	muito comum
Nicator and Bulbul	eastern nicator	*Nicator gularis*	razoavelmente comum
Orioles	black headed oriole	*Orioluus lavartus*	comum
Orioles	green headed oriole	*Oriolus chlorocephalus*	endémica no monte gorongosa
Pipit	African pipit	*Anthus cinnamomeus*	comum
Prinia-like Warbler	red-winged warbler	*Heliolais erythropterus*	razoavelmente comum
Puffback	black backed puffback	*Dryoscopus cubla*	comum
Robin-chat	white-browed robin-chat	*Cossypha heuglin*	comum
Robins	swynnerton's robin	*Swynnertonia swynnertoni*	localised but comum
Rock Thrush	miombo rock thrush	*Monticola angolensis*	não comum
Scrub Robin	white browed scrub robin	*Cercotrichas paema*	razoavelmente comum
Sunbird	amethyst sunbird	*Chalcomitra amethustina*	comum
Sunbird	collared sunbird	*Hedydipna collaris*	comum
Sunbird	greater double-collared sunbird	*Cinnyris neergaardi*	endémica e comum
Sunbird	grey sunbird	*Cyanomitra veroxii*	razoavelmente comum

Sunbird	olive sunbird	*Cyanomitra olivacea*	comum	
Sunbird	purple-banded sunbird	*Cinnyris shelleyi*	razoavelmente comum	
Sunbird	scarlet chested sunbird	*Chalcomitra senegalensis*	comum	
Sunbird	variable sunbird	*Cynniris venustus*	comum	
Swallow	barn swallow	*Hirundo rustica*	comum	Paleártica
Swallow	lesser striped swallow	*Cecropis abyssinnica*	comum	intra-africana
Tchagras	black crowned tchagra	*Tchagra senegalus*	comum	
Tchagras	marsh tchagra	*Bocagia minuta*	não comum	
Thrush	kurrichane thrush	*Turdus libonyana*	local comum	
Thrush	olive thrush	*Turdus olivaceus*	comum e residente	
Tinkerbird	yellow fronted tinkerbird	*Pogoniulus chrisoconus*	razoavelmente comum	
Tinkerbird	yellow rumped tinkerbird	*Pogoniulus bilineatus*	local comum	
Trogons	narina trogon	*Apaloderma narina*	razoavelmente comum	
Turacos	livingstone turaco	*Tauraco livingstonii*	razoavelmente comum	
Turacos	purple-crested turaco	*Tauraco porphyreolophus*	comum e residente	
Wagtails	mountain wagtail	*Motacilla aguimp*	não comum	
Warblers	fan tailed grassbird	*Schoenicola brevirostris*	não comum	

watle-eye	black throated wattle-eye	*Platysteira peltata*	local comum e residente
Waxbill	orange- breasted waxbill	*Amandava subflava*	local comum e residente
White-eyes	African yellow white-eye	*Zosterops pallidus*	comum
Woodpecker	golden-tailed woodpecker	*Campethera abingoni*	razoavelmente comum
Woodpecker	bearded woodpecker	*Dendropicos namaquus*	razoavelmente comum

- **Main findings**
- Shade-growing coffee plantations provide alternative habitats for native forest birds.
- Shade-growing coffee plantation presented birds communities similar to those in the forest. The bird communities found in the abandoned agricultural area were different from those found in the forest.
- The shade coffee plantation provided refuge for both generalist and specialist bird species and had a greater number of bird species in relation to abandoned agricultural areas. In addition, the coffee plantation was home to two endemic and four migratory birds.
- Coffee plantation cultivated in the shade of native species is an effective approach for maintaining local biodiversity and for accelerating the reforestation process in biodiversity restoration programs and provides economic benefits to local communities, creating alternatives to slash-an-burn agriculture, one of the problems that has caused deforestation in the mountains. Shade coffee planting can be integrated into the planning of conservation strategies

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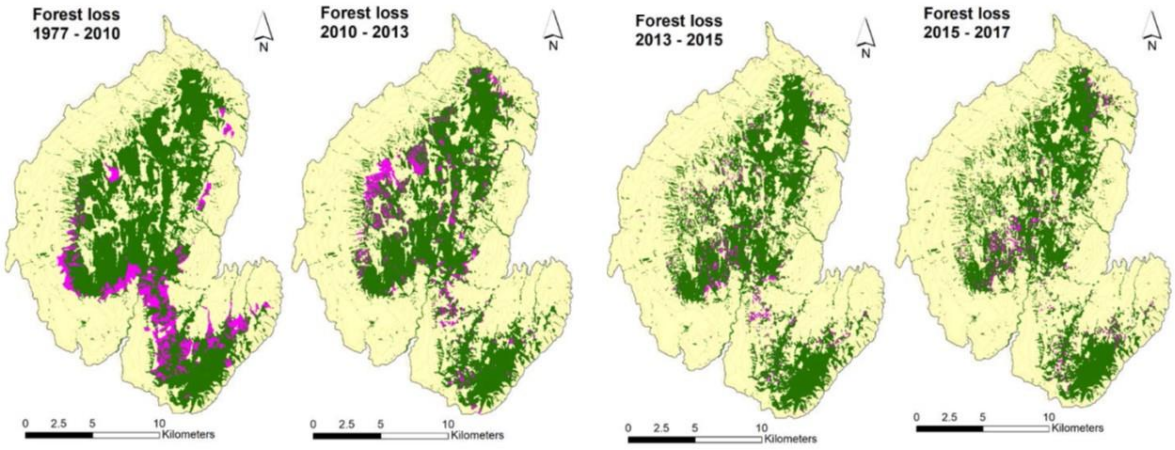

Figure 1. Forest change from 1977 to 2017 (Stalmans, 2018).

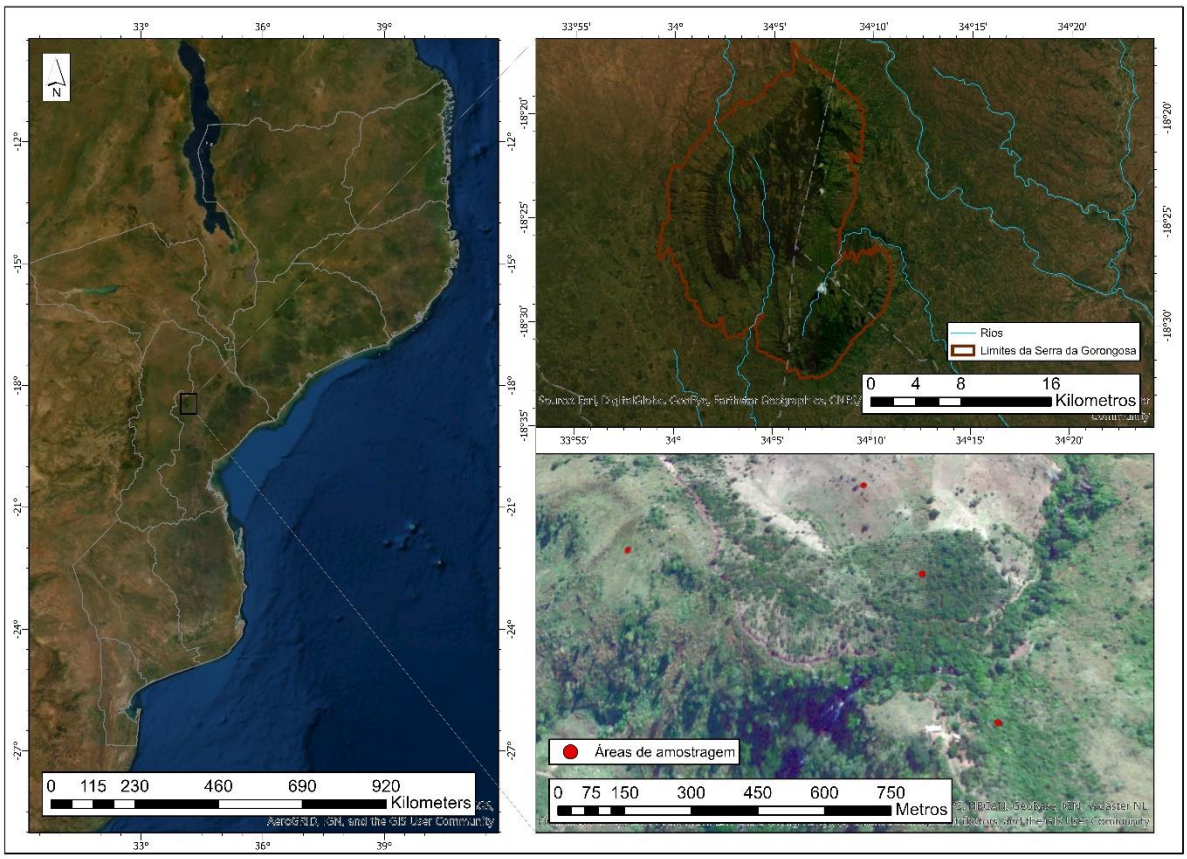

Figure 2. Location of study area

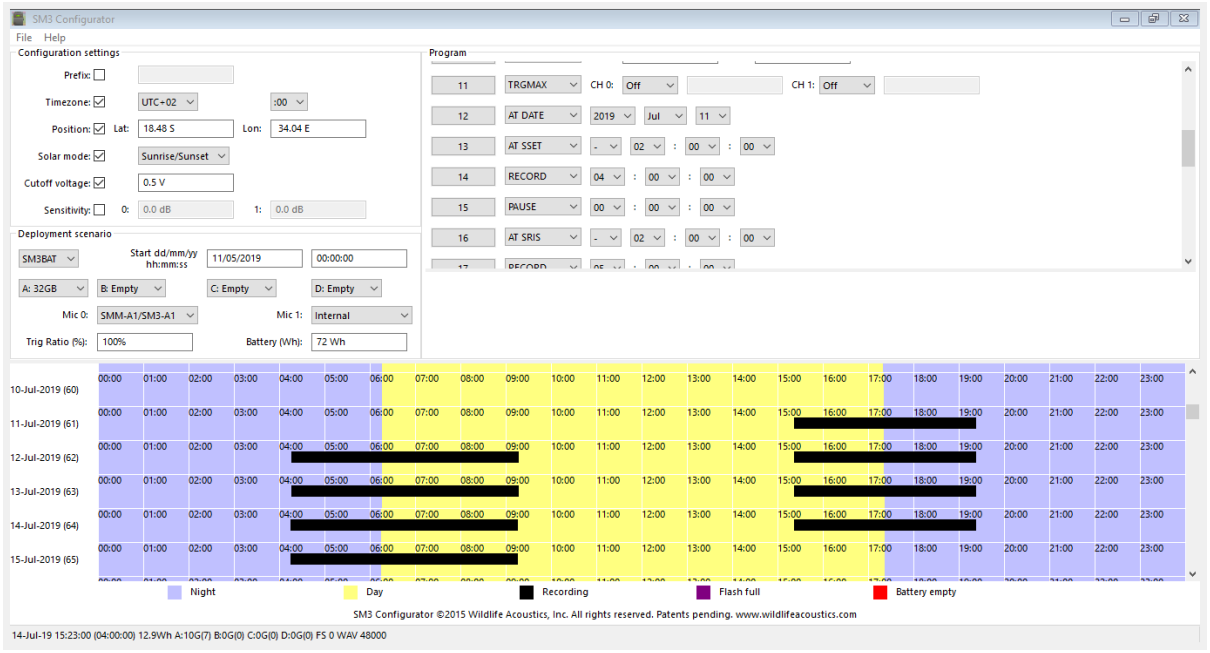

Figure 4. Song meter schedule configurator

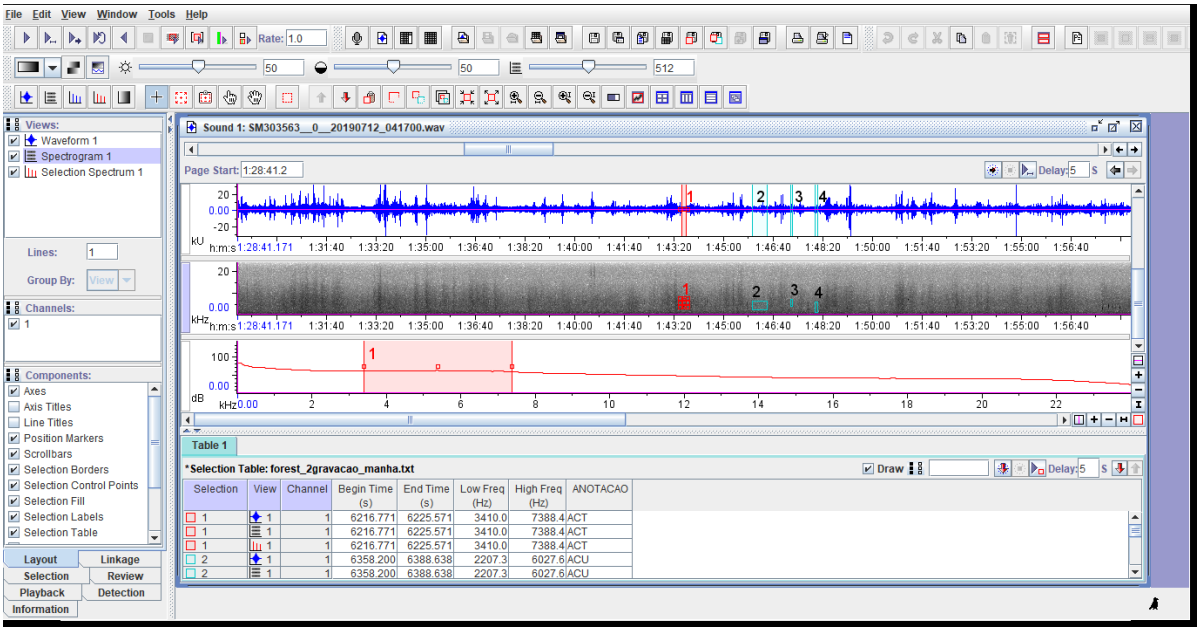

Figure 5. Processing sound using raver software