

Assessing Traditional and Ecological Knowledge for Tinamou (Tinamidae) Conservation in an Amazonian Landscape

TCD Field Research Grant Report – Summer 2019

ABSTRACT

Ground-dwelling birds play important ecological roles in tropical forests, and at the same time represent key protein sources for indigenous and local communities. Assemblages of terrestrial birds attain peak diversity in the Amazon, mainly attributed by the heterogeneity within forests, which increase availability of microhabitats and, therefore, support higher niche segregation that allows the coexistence of several sympatric (overlapping) species. However, in most Amazonian landscapes terrestrial birds are embedded in complex sociocultural systems that shape their populations. Ethno-ornithology is the field that studies the interconnection between humans and birds, where humans are part of avian ecosystems. This research aims to (1) understand how a group of understudied terrestrial birds (Tinamidae) coexist in a mosaic landscape, and (2) assess the cultural/ecological importance of terrestrial birds by an indigenous community in southeastern Peru. Understanding patterns of coexistence of 11 tinamou species will disentangle processes that may facilitate high diversity in the tropics. Finally, ethno-ornithological studies will provide insights into the development of sustainable management and conservation strategies for avian conservation in the tropics.

I. Visit to the native community Santa Rosa de Huacaria (June 2 – June 7)

The main goal of this visit was to present my research project idea to the community of Santa Rosa de Huacaria (Fig. S1). I did a poster (Fig. S2) to explain the concept of ethno-ornithology, the main objectives of my research and finally to request their permission to conduct my research. In the meeting was present the President of the community, Mabel Ramos-a Wachiperi indigenous woman-, and nine community members including the three most elder indigenous members of the community. While presenting the poster, showing the camera trap photos and videos of some terrestrial birds, the elders named some of the birds on their language [Machiguenga], and others indicated the seeds and fruits they eat, and where they are found. Other adult members expressed how younger generations (i.e., their children and grandchildren) do not know the fauna and flora of their lands and instead learn about elephants, giraffes, and others animals that are not present in the area. Alberto, a Wachiperi healer man, indicated that when he was a child he used to go hunting with his dad. Now, his grandchildren do not know what are the animals living in the forest, ‘they are bothered by mosquitos’ – Alberto said. Most members showed enthusiasm about this research project that aims to learn about the ecological knowledge they have of terrestrial birds. The President expressed her interest and manifested that this research could help them to preserve the vast knowledge they -mostly elders- have about these animals, and also what are the birds that remain on their lands [they acknowledged that they have hunted most of the gamebirds]. I left the poster in the community; the President was going to use it for their next community meeting to share the project idea with the entire community.

I spent part of my days walking through the forest in Huacaria, trying to identify some of the most common terrestrial birds. I was unable to see much fauna near the community. As some community members mentioned, they have hunted most of the fauna, and to see more of these animals they have to go very deep in the forest (~1-day walk). Some of the terrestrial birds I heard in the community were Little tinamou (*Crypturellus soui*), Cinereous tinamou (*Crypturellus cinereus*), and I saw a Blue-throated Piping-Guan (*Pipile cumanensis*) as a pet owned by a Machiguenga family.

I learned more about their culture and their way of living. I acknowledged the amount of knowledge that indigenous people possessed, a treasure that perhaps mostly elders have, and sadly only a

small percent of it is being transferred to younger generations. I spent time with Nancy, a young woman, who doesn't probably know all what her father –a Wachiperi healer- and her mother –a lovely Machiguenga woman- knew at her age. Fortunately, Nancy learned how to do handicrafts and the main plants used for this activity as natural dyes, seeds, and other forest resources to do bracelets, earrings, etc. Handicraft making is one of the activities performed solely by women in Huacaria and helps them to sustain their families. Nancy used leaves of a plant called “*pitirishi*” in Machiguenga or “*shamba*” in Wachiperi, which produces a purple dye, to draw and paint indigenous designs on a crown. She crushed wet leaves with a small rock, and then let it stand in hot water for a few minutes. The material used for the crown comes from the bark of the *ojé* tree trunk. Nancy's ancestors used this material to create blankets and cover themselves. There is so much to learn from these forests but also from the people that inhabit them.

In my last day in the community, I walked to Amalia, which is a small village within the Huacaria territory and located three hours walk away from the main plaza. The President of the community told me that because just two or three families are living in that area, there might be more fauna. I went to Amalia with a Machiguenga young guy, Rene, and spent an amazing time with a Machiguenga family. Many of them were shy and know just a little bit of Spanish, so Rene helped me communicate with them. I showed them drawings of terrestrial birds using the “Birds of Peru” app, and while going through some of these species the Machiguenga's adults and younger kids started naming these species in their language.

II. Fieldwork in Los Amigos Biological Station (June 9 – June 30)

I spent three weeks at Los Amigos, conducting preliminary research to assess the spatial distribution of 11 species of tinamous at Los Amigos, and the factors that may influence the spatial distribution pattern. I used three different techniques (i.e. point counts, camera traps and SM4 audio recorders) to obtain preliminary data. I conducted 23 points count surveys during the dawn (starting at 5:30 am) and dusk (starting at 16:00) and surveyed 39 points, four or five times each. The 39 points were located throughout floodplain and terra firme forests (16 points in floodplain and 23 points in terra firme forests, Fig. 1). Rains and “frijajes” (cold air masses arriving from Antarctica causing a drop in temperatures) did not allow me to conduct an equal number of surveys in each point. I recorded eight species of tinamous (Bartlett's tinamou - *Crypturellus bartletti*, Brazilian tinamou - *Crypturellus strigulosus*, Cinereous tinamou - *Crypturellus cinereus*, Gray tinamou - *Tinamus tao*, Great tinamou - *Tinamus major*, Little tinamou - *Crypturellus soui*, Undulated tinamou - *Crypturellus undulatus*, Variegated tinamou – *Crypturellus variegatus*) and other four species of terrestrial birds (Table 1.).

I deployed ten camera traps (Model: Bushnell 8MP Trophy Cam) for approximately two weeks (10 June 2019 – 28 June 2019). Cameras were set on a regular grid with ~1-km separation between stations and placed randomly within the two major habitats (i.e., floodplain and terra firme). There were five cameras in terra firme, and 5 in floodplain forests (Fig. 1). The ten cameras were set an average height of 20 cm above the forest floor. Cameras were operating 24 hrs and set to record 30-sec videos when a motion was detected during intervals of 30 sec. Infrared sensor sensitivity was set to high. Two cameras located in floodplain forests operated for only four days. The cameras recorded 18 captures of medium and large terrestrial birds representing 8 species (Table 2) during 133 trap days (sampling effort). Five species were tinamous, including two *Tinamus* species and three *Crypturellus* species.

I deployed three SM4 audio recorders in the same locations of the camera traps, and set an average height of 1 m above the forest floor and set up to record sound from 5:00 am to 7:30 am and from 17:00 to 19:30. Given the limited number of SM4 audio recorders, I rotated them every two days to cover the ten camera locations. During these coming months, I will analyze the sounds collected by the audio recorders to learn how to use the Kaleidoscope Pro Analyses software, which will allow me to quickly

identify hundreds of acoustic recording files of the 11 tinamou species by clustering similar acoustic frequencies. Learning this method for data analyses will be very important when I start deploying more audio recorders in the field in the upcoming field season.

My advisor, Dr. Eben Broadbent, flew the GatorEye drone over the areas sampled during the point count and camera trap surveys to obtain forest structure data using LiDAR, hyperspectral and multispectral sensors during 4 consecutive days. This data will allow us to measure variables as canopy height, estimation of understory density, canopy openness, leaf area index and other variables that may influence the occupancy of tinamous in lowland tropical forests. Finally, my advisor and I were invited to a technology workshop (June 24-June 27) held at Los Amigos and hosted by Andes Amazon Fund (AAF). Several expert conservationists attended and exchanged knowledge and ideas on how most advanced tech can be used to protect the high biodiverse remnants of the Amazon forests. I was able to present my research project and how different tools (i.e. acoustic monitoring, camera traps and drones) can be used to better inform and protect terrestrial avifauna in lowland Amazonia. To know more about the workshop, please click and read the Mongabay article on the following link:

https://news.mongabay.com/2019/08/precision-conservation-high-tech-to-the-rescue-in-the-peruvian-amazon/?fbclid=IwAR0Ts9fx7VpF7wLcETb0qq8aPm1_bBKHP2zKt8Nq98NuWvVnW-Af-ETdrdE

III. Conclusion

After conducting my preliminary fieldwork to assess occupancy patterns of tinamous at Los Amigos Biological Station, I will need to increase spatial and temporal replications using both methods: camera traps and audio recorders, covering two wet and two dry seasons. For the ethno-ornithology research, I will get in contact with the President of Huacaria to receive the signed SERFOR informed consent document, which will allow me to conduct my research on their territory. Finally, this semester I will investigate how I can integrate the ecological and ethno-ornithological knowledge to better inform tinamou conservation in lowland Amazonia.

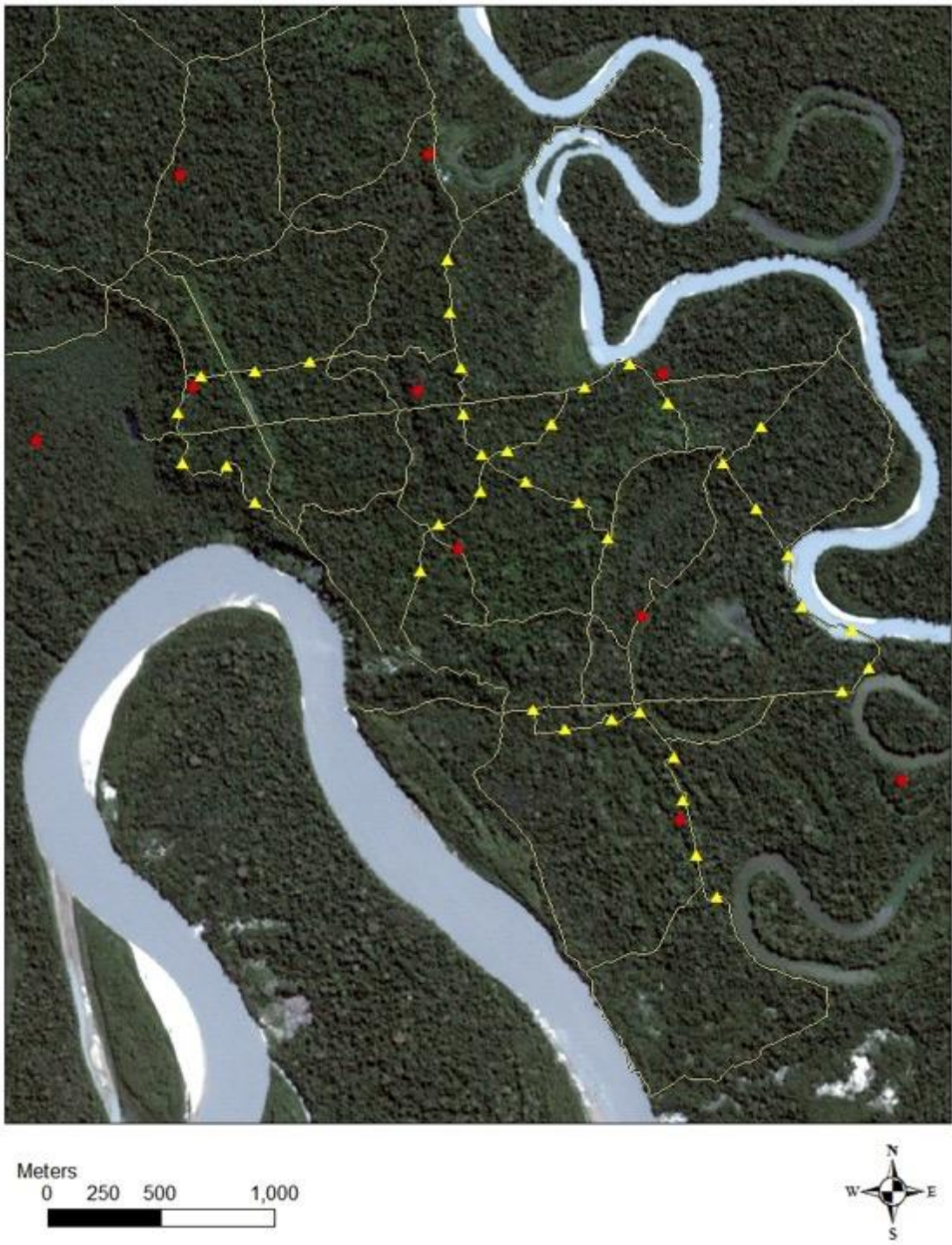


Figure 1. Map of the study area. The triangles indicate the locations of point counts and the circles the locations of camera traps and SM4 audio recorders.

Table 1. Presence and absence data of all the terrestrial birds species recorded in 39 points during point count surveys in Los Amigos Biological Station.

Point ID	Habitat	Tinamous species										Other terrestrial birds					
		Bartlett's	Brazilian	Cinereous	Gray	Great	Little	Undulated	Variegated	UnID	Total	Gray-fronted dove	Pale-winged trumpeter	Razor-billed curassow	Spix's guan	Total	
22	Floodplain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
24	Terra firme	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0
204	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
205	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
206	Terra firme	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1
207	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
208	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
209	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
210	Terra firme	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
211	Terra firme	0	0	0	0	0	3	1	0	0	4	0	0	0	0	0	0
215	Terra firme	0	0	0	0	0	1	0	1	0	2	0	0	0	0	0	0
216	Terra firme	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
217	Terra firme	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
218	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
219	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
220	Terra firme	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
221	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
222	Floodplain	2	0	1	0	1	0	0	0	0	4	0	0	0	0	0	0
223	Floodplain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
226	Floodplain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
227	Floodplain	0	0	0	0	2	1	0	0	0	3	0	0	0	0	1	1
228	Floodplain	1	0	0	0	0	0	2	0	0	3	0	1	0	0	0	1
229	Floodplain	1	0	2	0	0	0	1	0	0	4	0	0	0	0	0	0
230	Floodplain	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0
231	Terra firme	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
232	Terra firme	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1
233	Terra firme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
234	Terra firme	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
235	Terra firme	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	1
236	Terra firme	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
238	Floodplain	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
239	Floodplain	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0
240	Floodplain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
241	Floodplain	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
242	Floodplain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
243	Floodplain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
244	Floodplain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Int 11/14 between points	Floodplain	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		1	0	0	0	0	0	0	1	0	2	0	1	0	0	0	1
Total		6	1	7	1	5	5	4	6	3	38	1	5	1	6	13	

Table 2. Terrestrial bird species recorded in the camera trap videos deployed at Los Amigos. UnID indicates unidentified tinamou species.

Camera ID	Habitat	Video ID	Date	Time	Species	# of Individuals	Notes
JB6	FP						
JB7	TF	EK000129	23-Jun-19	8:39	Spix's guan	2	
JB7	TF	EK000132	25-Jun-19	6:24	Pale-winged trumpeters	5	
JB7	TF	EK000134	27-Jun-19	11:40:14	Variegated tinamou	1	Verify ID
JB8	BP	EK000003	12-Jun-19	13:40	Amazonian motmot*	1	
JB9	TF	EK000002	17-Jun-19	11:35	Spix's guan	1	
JB9	TF	EK000004	25-Jun-19	6:59:16	White-throated tinamou	1	Verify ID
JB12	FP	EK000171	11-Jun-19	12:27:47		1	UnID tinamou
JB14	FP	EK000006	18-Jun-19	15:30:24	Pale-winged trumpeters	1	
JB14	FP	EK000013	24-Jun-19	17:18:49	Pale-winged trumpeters	3	
SPECLAB2	TF						
SPECLABA1	PS	6290001	29-Jun-19	16:19:54	Starred Wood-Quail	3	Verify ID
SPECLABB1	PS	6240003	24-Jun-19	10:12:34	Spix's guan	2	
SPECLAB10	TF	6140006	14-Jun-19	12:57:51	White-throated tinamou	1	Verify ID
SPECLAB10	TF	6150009	15-Jun-19	5:59:17	Little tinamou	1	Verify ID
SPECLAB10	TF	6150010	15-Jun-19	7:09:05	White-throated tinamou	1	
SPECLAB10	TF	6160013	16-Jun-19	8:13:49	White-throated tinamou	1	
SPECLAB10	TF	6160015	16-Jun-19	17:14:27	Little tinamou	1	Verify iD
SPECLAB10	TF	6220040	22-Jun-19	9:32:45	White-throated tinamou	1	
SPECLAB10	TF	6230054	23-Jun-19	9:47:24	Great tinamou	1	
SPECLAB10	TF	6230056	23-Jun-19	11:24:42	Great tinamou	1	
SPECLAB10	TF	6240072	24-Jun-19	8:13:07	Cinereous tinamou	1	

* Not considered in this study

FP: Floodplain, TF: Terra firme, BP: Bamboo patch in TF forests, PS: Palm swamps in Floodplain forests

Blank cells indicate no terrestrial birds captured by camera traps



Figure S1. Presentation of the research project idea to members of the community Santa Rosa de Huacaria, Peru.



Figure S2. Poster of the ethno-ornithology project in Santa Rosa de Huacaria.



Figure S3. A Machiguenga family in Amalia, a small village within the community Santa Rosa de Huacaria, Madre de Dios.



Figure S4. Nancy, an indigenous woman from Huacaria, using natural dyes from plants to do handicrafts (indigenous crown).



Figure S5. Deploying audio-recorders in the field at Los Amigos Biological Station, Madre de Dios (left) and going to set up a camera trap across an oxbow lake with the help of my friend and field assistant, Edwin Jurado (right).



Figure S6. Early morning view of Los Amigos forests, after conducting point counts alongside the Los Amigos River, Madre de Dios.



Figure S7. The GatorEye had an accident while flying the last transect of the flight mission, and with the help of a Peruvian researcher (Igor Lazo) we successfully found it nearby the station.



Figure S8. Explaining the use of high-resolution acoustic monitoring device (shotgun microphone to record birdcalls) to the participants of the technology workshop participants, hosted by the Andes Amazon Fund (AAF).
Photo by: AAF



Figure S9. Presenting my research project about terrestrial birds in the technology workshop held at Los Amigos.
Photo by: AAF