PROGRAMA DE PROYECTOS DE INVESTIGACIÓN Y CONSERVACIÓN
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JAIBUI ISLAND

SIERRA LEONE

SETTING UP A BIOLOGICAL FIELD STATION AND BUILDING CAPACITY FOR RESEARCH AND CONSERVATION ACTIVITIES

FINAL REPORT
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Content

SUMMARY

In 2016, Tacugama Community Outreach Team (TCOP) came across Jaibui Island in southern Sierra Leone during field work near the Moa River. The island is covered in primary forest and is highly biodiverse including endangered species like pygmy hippopotami, chimpanzees and Colobus monkeys. Tacugama recognised the importance of preserving the island and organised meetings with representatives of the seven villages that claim their ownership over the island. In 2017, Tacugama signed a Memorandum of Understanding (MoU) between village representatives and local authorities to protect and conserve the island. During 2017, Tacugama undertook preliminary surveys and started the construction of a field research station on the bank of the Moa River, to the west of the island next to Lower Kambama Village. To access the island, it is necessary to cross the hundred meters that separate the two banks with canoe or boat.

This report describes the activities carried out between November 2018 and September 2019 with the funding provided by the Fundació Barcelona Zoo under the PRIC 2018. During this 10- month period, we have hired and trained four bio-monitoring technicians to patrol the island; furnished the research station; deployed 35 camera traps systematically across the island and its buffer zone; undertook a chimpanzee nest survey; and set video camera traps in 10 key hotspots for chimpanzees and pygmy hippopotami.

BIO-MONITORING

Designing and installing the SMART© tool

SMART© (Spatial Monitoring and Reporting Tool) is a data collection software aimed at helping protected area and wildlife managers better monitor, evaluate and adaptively manage patrolling activities. SMART includes a powerful software application, CYBERTRACKER©, that improves the ability of ranger-based programs to collect wildlife data, combat poaching and other illegal activities. The SMART tool has been designed in a way that includes pictures for each of the different elements, facilitating the use by people with limited literacy capacities (Figure 1).

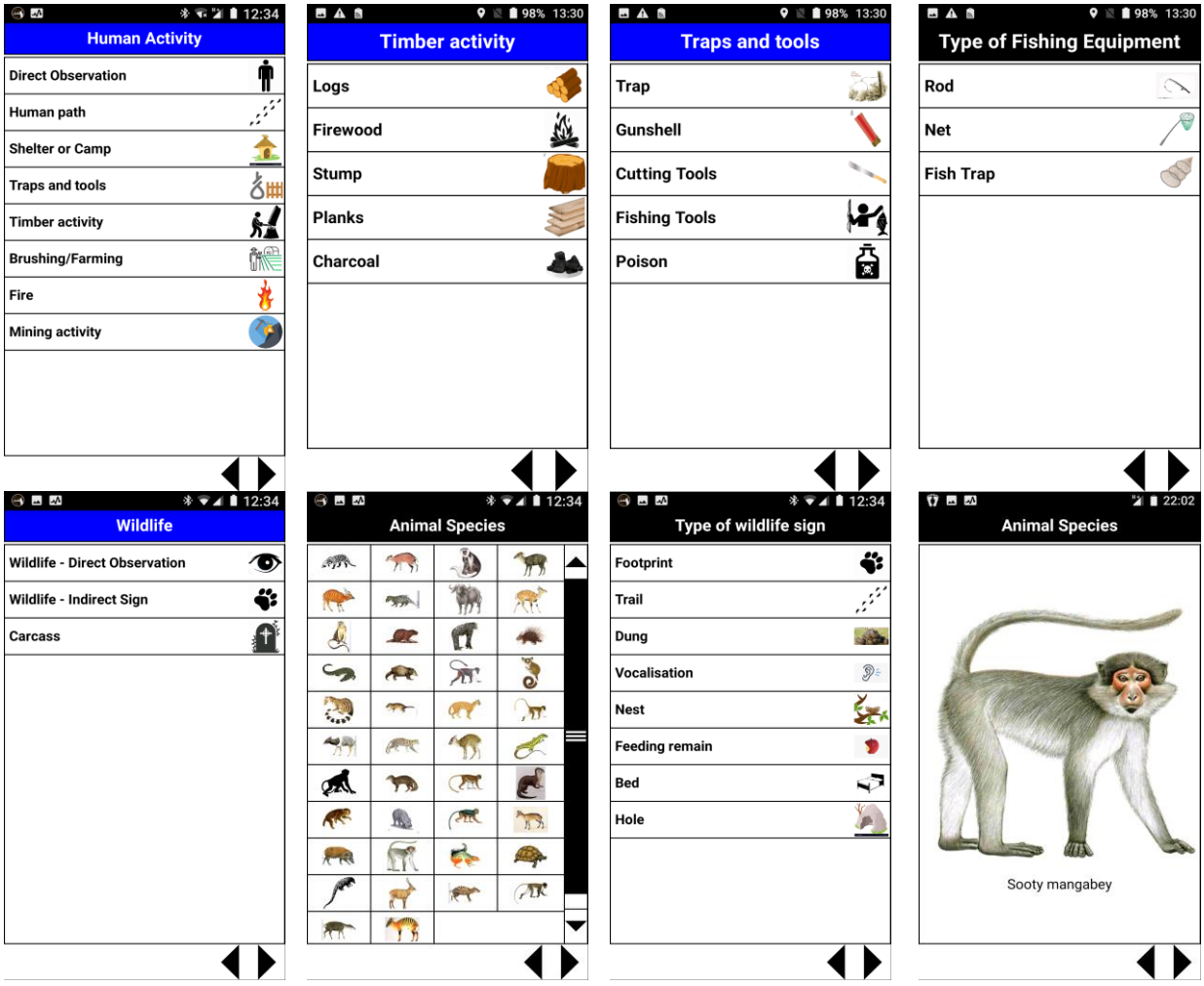

Figure 1: Screenshot examples of some of the pages of the SMART tool designed specifically to enter observational data during the patrols by the bio-monitoring technicians.

We designed and installed the SMART tool in 3 Blackview® digital devices. These terminals are very resistant to harsh outdoor conditions, waterproof and rugged. Their battery is long life and solar charging units are being used to recharge the device when electricity is not available.

Bio-monitoring technicians: selection, training and capacity building

For an effective and functional project, it is paramount that local people are directly involved in the protection and conservation of the island. The island of Jaibui is being used by the seven communities located on the mainland around the western side of the island. Traditionally these communities have used the forest resources of the island such as medicinal plants and honey, but also practice fishing, artisanal diamond mining, logging and hunting. The MoU signed in 2017 between Tacugama, the local authorities and the representatives of all the seven villages, specified the complete stop of hunting and logging activities to protect the habitat and its biodiversity. However, in the last few months, we have encountered some problems with influential individuals in the village of Taninahun. They have prevented us from doing any research on the island's southern site and have not wanted to appoint any of their fellows as a bio-monitoring technician. We believe this issue is due to mining interests on the island. We are in negotiations with them and the local authorities, but despite all, one of our camera traps, set towards the southern site, was stolen. Because we do not want to engage in local disputes and to prevent confrontations, we decided not to survey the southern side of the island. We continue negotiations with the local authorities and hope to reach a consensus with them and provide protection for the entire island.

Therefore, four local people from the communities around the northern and central parts of the island were selected and hired as bio-monitoring technicians (Table 1). The technicians were selected and trained in the use of the digital data collection devices (Figure 2). Their function is to patrol the island and collect data with the SMART tool installed in the Blackview devices. The island has been divided in three zones, north, central and southern sites, to define the areas being patrolled by each team (Figure 3). Patrolling and data collection started in March 2019 three times a week. The technicians also assist the TCOP field officers whenever other research activities are being carried out such as setting of camera traps, transect surveys, habitat surveys, etc. The TCOP field officer in charge monitors their performance and provides regular training to build their capacity.

Figure 2: Left: Bockarie, TCOP field officer, training Vandi and Mustapha in the use of the SMART tool. Right: Rosa G. supervising data collection by Ansu.

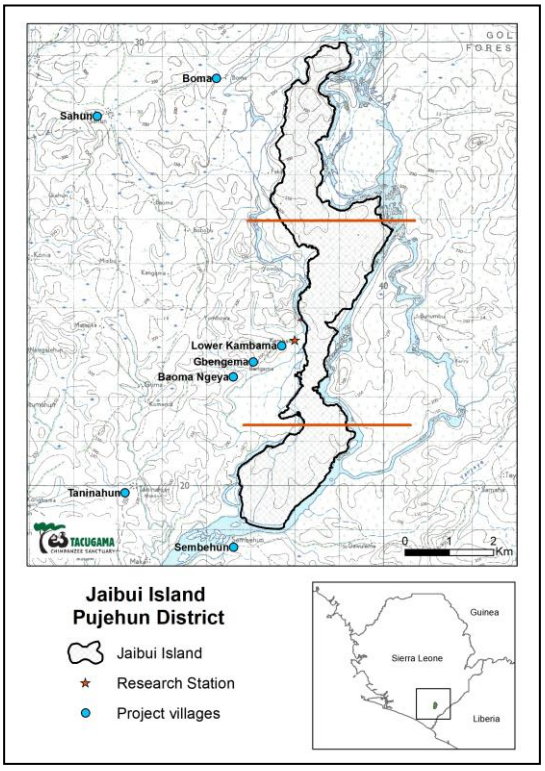

Figure 3: Jaibui island and the seven project villages that use the island's resources. The red lines are the patrol zones. The southern part, used by Taninahun and Sembehun, is not being patrolled.

From June to September, patrolling the island was ceased due to the rainy season and the rise of the river level and strong currents impeding the river crossing by canoe. During this time, the technicians were in charge of setting up and maintaining two tree nurseries (one in Boma and one in Gbengama). We distributed 600 polythene bags to each nursery in which to plant indigenous tree seeds collected during patrols. The bio-monitoring technicians are expected to resume data collection on the island when the conditions are safe for them to cross the river. Unfortunately, one of the Blackviews malfunctioned (overheated) and we have had to provide a new one.

Table 1: List of the four bio-monitoring technicians hired by the project patrolling the north and central island and the villages they are from.

Bio-monitoring technician's name	Village
Mustapha Sesay	Gbengama
Vandi Kallon	Baoma Ngeya
Abdulai Sheriff	Sahun
Ansu Kallon	Boma

Patrol summary from March to June 2019

After several sessions of field training in data collection, the technicians started patrolling without TCOP supervision and collecting data with the digital devices following a weekly plan. Tables 2 and 3 summarises the patrols and the observations recorded between March and June. The data was downloaded and revised once a month by the TCOP officer.

The SMART tool creates maps with the data recorded showing the location of the observations collected during the patrols. Figures 4 and 5 show an example of maps with the points where chimpanzee and pygmy hippopotami signs respectively were recorded by the technicians during this period.

Table 2: Summary of the patrols carried out by the bio-monitoring technicians.

Team	Number Patrols	Number of Patrol Hours	Average hr/patrol	Distance (km^2)	Human activity observations	Wildlife observations
Boma – Saahun	44	198	4.5	341	56	471
Baoma Ngeya – Gbengama	44	193	4.4	387	73	743

Table 3: Summary of the observations recorded with the SMART tool by the bio-monitoring technicians during the patrols. Voc: vocalisation; FR: Feeding remain; FP: Footprint.

Species	Trail	Dung	Voc	Nest	FR	Bed	Hole	FP	Total
African Civet		1							1
Bay duiker						6		2	8
Black & White Colobus			19		21				40
Black duiker	1	3				1		1	6
Bongo		3				1		2	6
Brush Tailed Porcupine					4		3		7
Bushbuck	3	13				4		11	31
Campbell's monkey			2						2
Cane rat					1				1
Chimpanzee	8	10	6	2	22				48
Crested Porcupine		1			2		5		8
Crocodile	1	2					9	1	13
Cusimanse	1	1			7		3		12
Diana Monkey			15		10				25
Galago			1						1
Genet		7			1			5	13
Golden Cat	5	2						5	12
Green monkey			5						5
Jentink's duiker		3				3			6
Maxwell duiker	11	145	3		3	43		8	213
Monitor Lizard					1				1
Monkey		1	4		186				191
Mongoose		1			4				5
Olive Colobus			5		8				13
Otter		6							6
Pygmy Hippopotamus	37	53			4	6		55	155
Red Colobus			9		9				18
Red flanked duiker		2				1			3
Red river hog	43	14	2		43	13	1	43	159
Sooty Mangabey			20		18				38
Squirrel			3		10				13
Tortoise					2				2
Tree Pangolin			1		3				4
Water chevrotain								1	1
Waterbuck		2				1		1	4
White Nose monkey			7		1				8

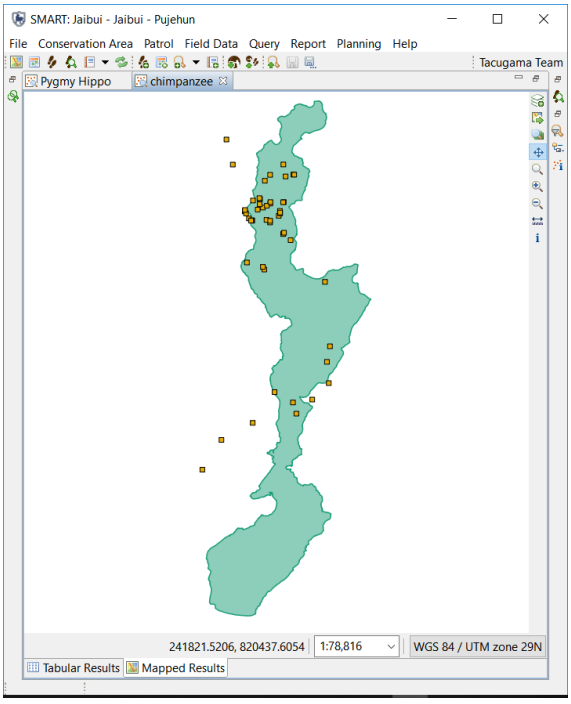

Figure 4: Map showing the location of the chimpanzee signs recorded by the technicians during their patrols carried out between March and July.

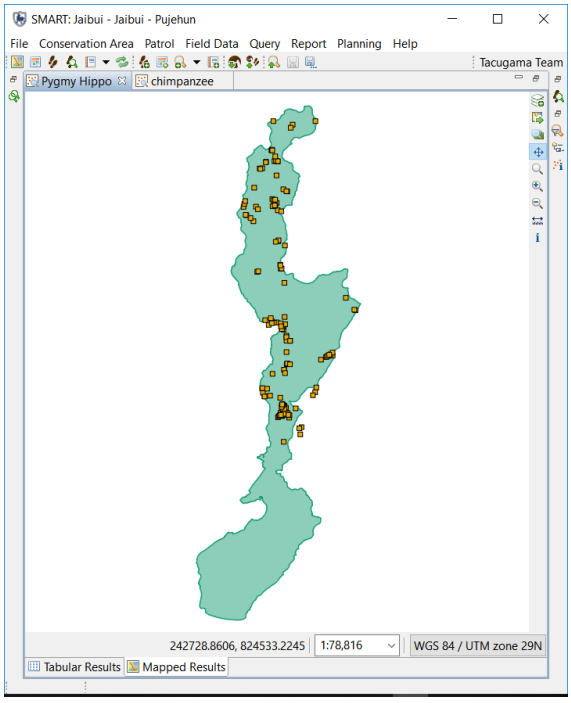

Figure 5: Map showing the location of the pygmy hippopotamus signs recorded by the technicians during their patrols carried out between March and July.

FURNISHING AND MAINTENANCE OF THE JAIBUI RESEARCH STATION

To improve the operability of the research station, we furnished it with beds, tables, chairs, shelves, cupboards and benches. The furniture was produced by a local carpenter therefore minimizing the environmental impact of transporting it from the capital and benefiting the local economy. We have also equipped the kitchen and improved the toilet/shower facilities (Figure 6).

We hired a house keeper, Alhaji Kallon, from the nearest village, Lower Kambama, to watch over the research station and to maintain the facilities.

Figure 6: A - Jaibui research station main building; B - toilet facilities; C – maintenance of the path to the station; D - furniture for the station.

SYSTEMATIC CAMERA TRAP SURVEY FOR THE MEDIUM-LARGE TERRESTRIAL MAMMALS

Camera trap study design

We conducted our camera trap survey over eight weeks in the dry season between 14th of December 2018 and 9th of February 2019. We used ArcGIS 10.3 (ESRI, Redlands, USA) to design a sampling grid with cell sizes of 1x1 km^2. The grid design included a buffer zone around the island to determine whether chimpanzees cross to the mainland or they are year-round residents on the island. During the dry season (November to June), the Moa River runs low and rocks are exposed possibly permitting chimpanzees to cross. We set one camera within each block however due to the river bends and meanders, two locations could not be reached and fell outside the planned grid. In each grid, cameras were adjusted at approximately 1m high to tree trunks at sites with evidence of animal activity within 100-m of the centre of each grid. Vegetation 5m in front of the camera was brushed to minimise the risk of false triggers and cameras were secured with python locks. To prevent local disputes and confrontations, we decided not to survey the southern side of the island.

Therefore, a few locations were not sampled during the sampling period. We used 35 infra-red digital camera traps Reconyx HC500, HC600 and PC800 (Reconyx Inc., Holmen, WI, USA) and all were programmed with the same settings, i.e. high sensitivity, three consecutive pictures, no delay, resolution of 3.1 MP, 24h operational, with date and time stamp and infra-red mode (Figure 7).

We defined an independent event (IE) every 30 minutes as the minimum time interval between photographs before a 'new event' is recorded for a species. We obtained 5,826 pictures of which 4,476 were of identifiable wildlife and a total of 476 independent events of wildlife species not including the birds.

Results

One camera malfunctioned and another was stolen. The 33 cameras were operational for a total of 1,533 trap-days with an average of 46 trap-days (range: 4 - 56 trap-days) per location.

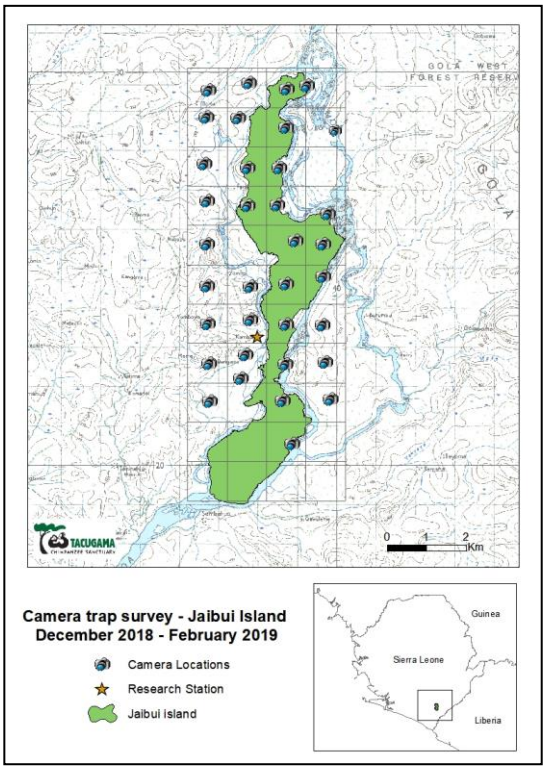

Figure 7: Maps showing the locations where camera traps were set on the island and mainland.

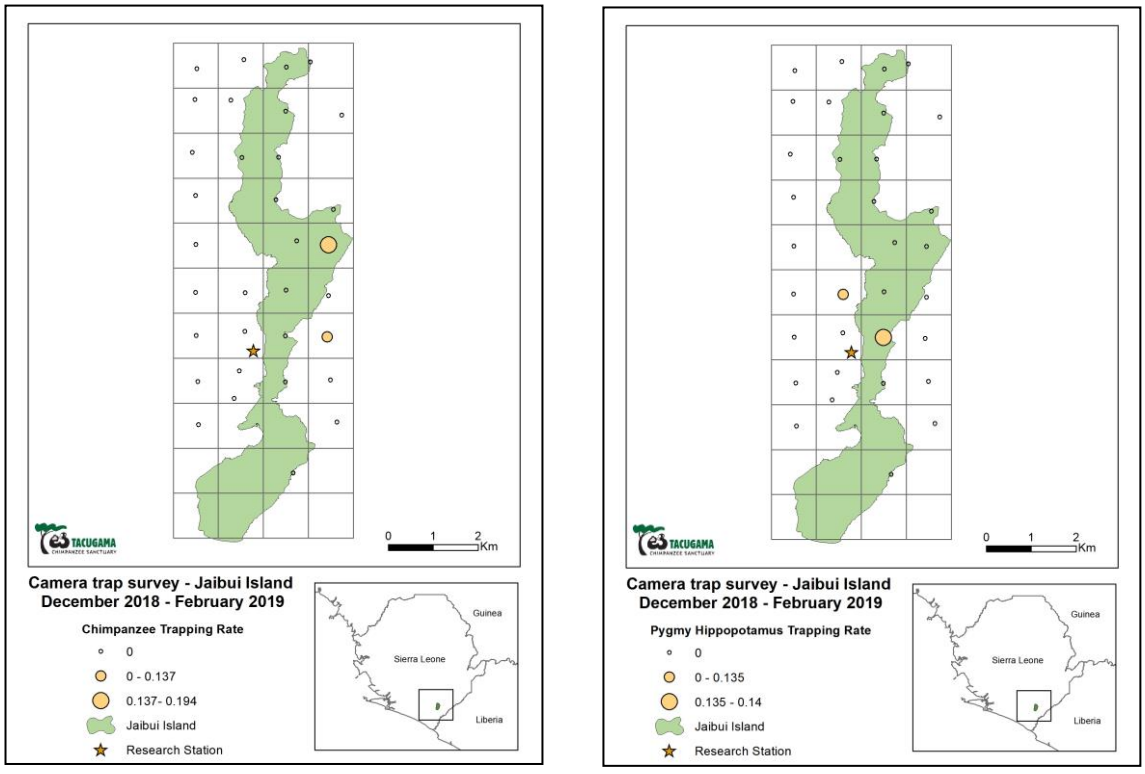

Figure 8: Trapping rates and locations where chimpanzees (left map) and pygmy hippopotami (right map) were recorded.

We recorded 21 mammal species, three bird species and humans (Table 4). Chimpanzees were recorded three times in two different locations (Figure 8). One event showed a group of six individuals in a camera located in Jaibui island: two adult females with their offspring (Figure 9), one juvenile and another adult possibly a male. The other event, with one adult male chimpanzee, was captured in the island located east to Jaibui. We have not been able to identify this individual as being part of the Jaibui group. Therefore, we don't know if this chimpanzee belongs to the Jaibui group and therefore able to cross the river, or else forms part of another group.

Table 4: List of species detected with the camera traps, trapping rates (TR) and independent events (IE) and the number of stations in which they were recorded.

Order	Family	Scientific Name	Local Name	TR	IE	No. of Stations Detected in
Mammalia						
Carnivora	Herpestidae	*Atilax paludinosus*	Marsh Mongoose	1.01	16	7
Carnivora	Viverridae	*Civettictis civetta*	African Civet	0.39	7	6
Carnivora	Viverridae	*Genetta spp.*	Genet	2.7	43	13
Cetartiodactyla	Bovidae-Antilopinae	*Neotragus pygmaeus*	Royal Antelope	0.33	5	1
Cetartiodactyla	Bovidae-Cephalophinae	*Cephalophus niger*	Black Duiker	0.33	5	4
Cetartiodactyla	Bovidae-Cephalophinae	*Cephalophus silvicultor*	Yellow-backed Duiker	0.42	7	6
Cetartiodactyla	Bovidae-Cephalophinae	*Philantomba maxwellii*	Maxwell's Duiker	7.36	119	18
Cetartiodactyla	Bovidae-Tragelaphinae	*Tragelaphus scriptus*	Bushbuck	1.36	19	10
Cetartiodactyla	Hippopotamidae	*Choeropsis liberiensis*	Pygmy Hippopotamus	0.07	2	2
Cetartiodactyla	Suidae	*Potamochoerus porcus*	Red River Hog	1.14	19	10
Cetartiodactyla	Tragulidae	*Hyemoschus aquaticus*	Water Chevrotain	1.57	24	5
Pholidota	Manidae	*Phataginus triscuspis*	Tree pangolin	0.2	3	1
Primates	Cercopithecidae	*Cercocebus atys*	Sooty Mangabey	3.36	51	17
Primates	Cercopithecidae	*Cercopithecus campbelli*	Campbell's Monkey	1.77	25	9
Primates	Cercopithecidae	*Cercopithecus petaurista*	Lesser Spot-nosed Guenon	0.21	3	3
Primates	Hominidae	*Pan troglodytes verus*	Chimpanzee	0.21	3	2
Rodentia	Hystricidae	*Atherurus africanus*	African Brush-tailed Porcupine	2.6	38	11
Rodentia	Muridae	*Murid sp.*	Mouse	0.14	2	2
Rodentia	Nesomyidae	*Cricetomys emini*	Giant Pouched Rat	0.91	16	8
Rodentia	Sciuridae	*Funisciurus pyrropus*	Fire-footed Rope Squirrel	2.43	37	8
Rodentia	Sciuridae	*Xerus erythropus*	Striped ground squirrel	0.07	1	1
Aves						
Galliformes	Numididae	*Agelastes meleagrides*	White-breasted Guineafowl	0.2	3	2
Galliformes	Phasianidae	*Francolinus bicalcaratus*	Double-spurred Francolin	0.36	6	5
Galliformes	Phasianidae	*Numida meleagris*	Helmeted guineafowl	1.48	22	8
Non-Wildlife Species						
Primates	Hominidae	*Homo sapiens*	Human	1.13	18	10

Pygmy hippopotami were recorded in two locations (Figure 8). The most common primate recorded was sooty mangabey with 51 events in 17 different locations. Maxwell duiker was the most often duiker recorded (119 IE) across the island (18 locations). Table 4 shows the trapping rates for each species captured.

Figure 9: Event with two chimpanzee females and their offspring photo-captured in Jaibui island.

TRANSECT SURVEY

Transect design

In early April, we carried out a transect survey on the island. Transects were separated 500 m from each other and set west to east. Because the width of the island varies noticeably along its surface, we walked from shore to shore. In total, we surveyed 17 transects and cover a total of 18 km (Figure 10). As mentioned earlier, the four southern transects were not surveyed due to unconformity from one of the villages in the south. Therefore, for the analysis we have taken into consideration the area surveyed and removed the southern portion, giving a study area of 9 km^2 instead of the total island area of 12.5 km^2. The average transect length was 1,063 m (range: 444 - 2300 m). The teams walked along transects following a compass bearing in a straight line at an average speed of 0.46 km/hr (range: 0.30 - 0.59 km/hr). Field teams usually consisted of four people, including one local cutter, one compass/GPS bearer and two bio-monitoring technicians.

One of the observers focused on the ground, looking for signs such as dung and footprints. The other observer focused on looking up for chimpanzee nests and monkeys. The following variables were recorded and geo-referenced using a Garmin GPSMAP 64s:

- **Chimpanzee signs**: Nest number, perpendicular distance to each nest, and nest age were recorded: fresh - vegetation green; recent - vegetation dry and changing colour; old - vegetation dead but nest still intact; very old or rotting - nest beginning to disintegrate (Tutin & Fernandez, 1984). Additionally, other direct and indirect signs were recorded: feeding remains, dung, and vocalizations.
- **Other Mammal signs**: Data was collected on direct and indirect signs of mammal species principally duikers, monkeys and pygmy hippopotami.
- **Human signs**: Including signs of power-saw logging, hunting (hunters, snares, hunting camps, gun shells), human trails, fishing camps, mining pits and camps.
- **Vegetation Types**: Change of vegetation was recorded at each point along the transect, so that the percentage of each vegetation type could be estimated from the total walked distance.

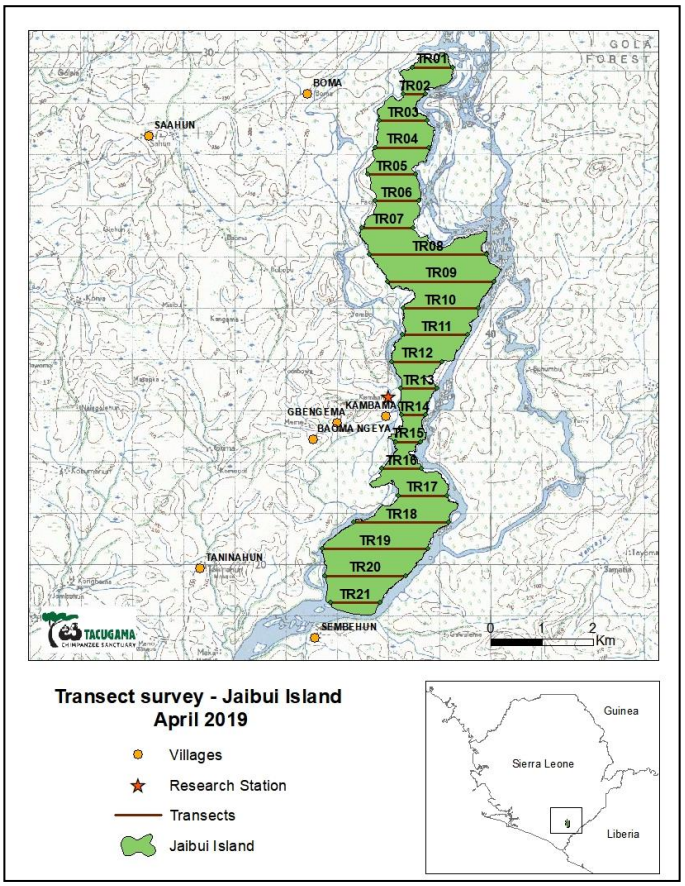

Figure 10: Map showing the transect survey design. Transects 18 to 21 were not surveyed.

Distance analysis

Analysis of the chimpanzee nest data was done using DISTANCE 7.2 software which is designed specifically for estimating animal densities (Thomas *et al.,* 2010). We calculated density estimates with their associated coefficients of variation and 95% confidence intervals. Of the 31 nests observed, four were not seen from the transect and removed from the analysis. Perpendicular distance was not truncated and included all nests observed. The model with the best fit to the data was half-normal function with the simple polynomial adjustment term.

Jaibui island is located on the other side of the Moa river from the Gola Rainforest NP and has the same habitat types. In 2010, the nationwide chimpanzee survey estimated a nest decay rate of 109 days for forests instead of the 91 days from the Tai Forest in Ivory Coast which were used for the chimpanzee survey in Gola NP (Ganas, 2009). Hence, we used the same auxiliary variables used for the 2010 chimp survey (Brncic et al., 2010):

- **Nest duration** - Mean nest duration for forest nests: 109 days (SE = 19.76, 95% CL = 76-154 days).
- **Nest production rate** - the number of nests per day per chimpanzee: 1.143 nests per day.
- **Proportion of nest builders** - 0.83

Results

Types of vegetation

Three quarters of the surveyed island is composed of high canopy forest with tree heights that reach 40 m. Human modified habitats account for less than 20% predominantly regenerating secondary forests (Table 5).

Table 5: Percentage of each vegetation type within the study area based on transect data

Vegetation type	Total (m)	%
High canopy forest	13,188	72.95
Secondary forest	3,380	18.70
Swamp	1,062	5.87
River - rocks	155	0.86
Bamboo forest	152	0.84
Raphia forest	120	0.66
Farm bush	20	0.11
Total distance surveyed	**18,077**	

Chimpanzee nest survey

Nests were detected in four transects with a total of 31 nests and an ER of 1.7 nests/km. All nests were observed in high canopy primary forest. Chimpanzee signs, including feeding remains, trails, vocalisations and nests were found in seven transects with a total ER of 2.38 signs/km walked. Signs of chimpanzee (50 signs in total) were recorded en route to and from transects (Table 6).

Table 6: Data summary for the analysis of the Jaibui island transect survey.

Number of transects	17
Total transect length (km)	18.077
Study area (km^2)	9
Number of transects with chimpanzee nests	4
Total chimpanzee nests	31
Total chimpanzee nest groups	8
Average nest group size	3.9
Nest encounter rate (nests/km)	1.7
Number of transects with chimpanzee signs	7
Total chimpanzee signs in transects	43
Chimpanzee sign encounter rate (signs/km)	2.38
Total number of chimpanzee signs in transects and en route	50

Chimpanzee density and abundance

The density estimates 0.22 chimpanzees/km^2, a slightly lower result obtained for the chimpanzee survey done in Gola forest NP which was 0.27 chimpanzees/km^2 (Ganas, 2009). However, our %CV is higher (53.74%) due to the low number of nests encountered and therefore, there is a lot of uncertainty in the final population estimate based on this result. The estimated number of chimpanzees in the island is estimated to be two individuals (range 1-6) (Table 7).

Table 7: DISTANCE estimate for chimpanzee density and chimpanzee numbers with 95% confidence intervals for transects. The percentage coefficient of variation (%CV) incorporates variance of nest production and nest duration.

Study Area (km^2)	9
Density (ind/km^2) [95% CI]	0.22 (0.077 - 0.638)
Number of chimpanzees [95% CI]	2 (1 - 6)
% CV	53.74

Other mammal signs: encounter rates

During the transects we collected observations of human activities and other mammal signs. Table 8 shows the encounter rates (signs/km walked) recorded in the 17 transects surveyed. Table 9 shows the observations recorded when walking to and from the transects (en route). Examples of some of the findings are shown in Figure 11. Figure 12 shows the locations and type of all observations for humans, chimpanzees, monkeys and pygmy hippopotami recorded on route to and during transects.

Table 8: Number, habitat category and encounter rates of the observations recorded on the transects.

Species	Bamboo forest	High canopy forest	Raphia forest	River rocks	Secondary forest	Swamp	Total	ER (signs/km)
Chimpanzee		36			2	5	43	2.38
Human	1	33		1	5	1	41	2.27
Red river hog		14		1	6	15	36	1.99
Maxwell duiker		27			4	3	34	1.88
Pygmy Hippopotamus		3	1			6	10	0.55
Bushbuck	1	2			2	1	6	0.33
Campbell's monkey		4			1		5	0.28
Monkey		5					5	0.28
Diana Monkey		4					4	0.22
Sooty Mangabey		2			2		4	0.22
Bay duiker		1					1	0.06
Black duiker		1					1	0.06
Black & White Colobus					1		1	0.06
Crested porcupine		1					1	0.06
Fire-footed rope squirrel		1					1	0.06
Pangolin		1					1	0.06
Water Chevrotain						1	1	0.06
Total	**2**	**135**	**1**	**2**	**23**	**32**	**195**	**10.79**

Table 9: Number and habitat category of the observations recorded en route.

Species	Bamboo forest	High canopy forest	River edge	Secondary forest	Swamp	Total
Black & White Colobus		1		2		3
Bushbuck		1				1
Chimpanzee		6		1		7
Genet				1		1
Human		11	2	3	1	17
Maxwell duiker		2			1	3

Species	Bamboo forest	High canopy forest	River edge	Secondary forest	Swamp	Total
Monkey		1				1
Pygmy Hippopotamus		4		2	7	13
Red river hog		2		1	1	4
Water Chevrotain		1				1
Yellow Back duiker	1			1		2
Total general	**1**	**29**	**2**	**11**	**10**	**53**

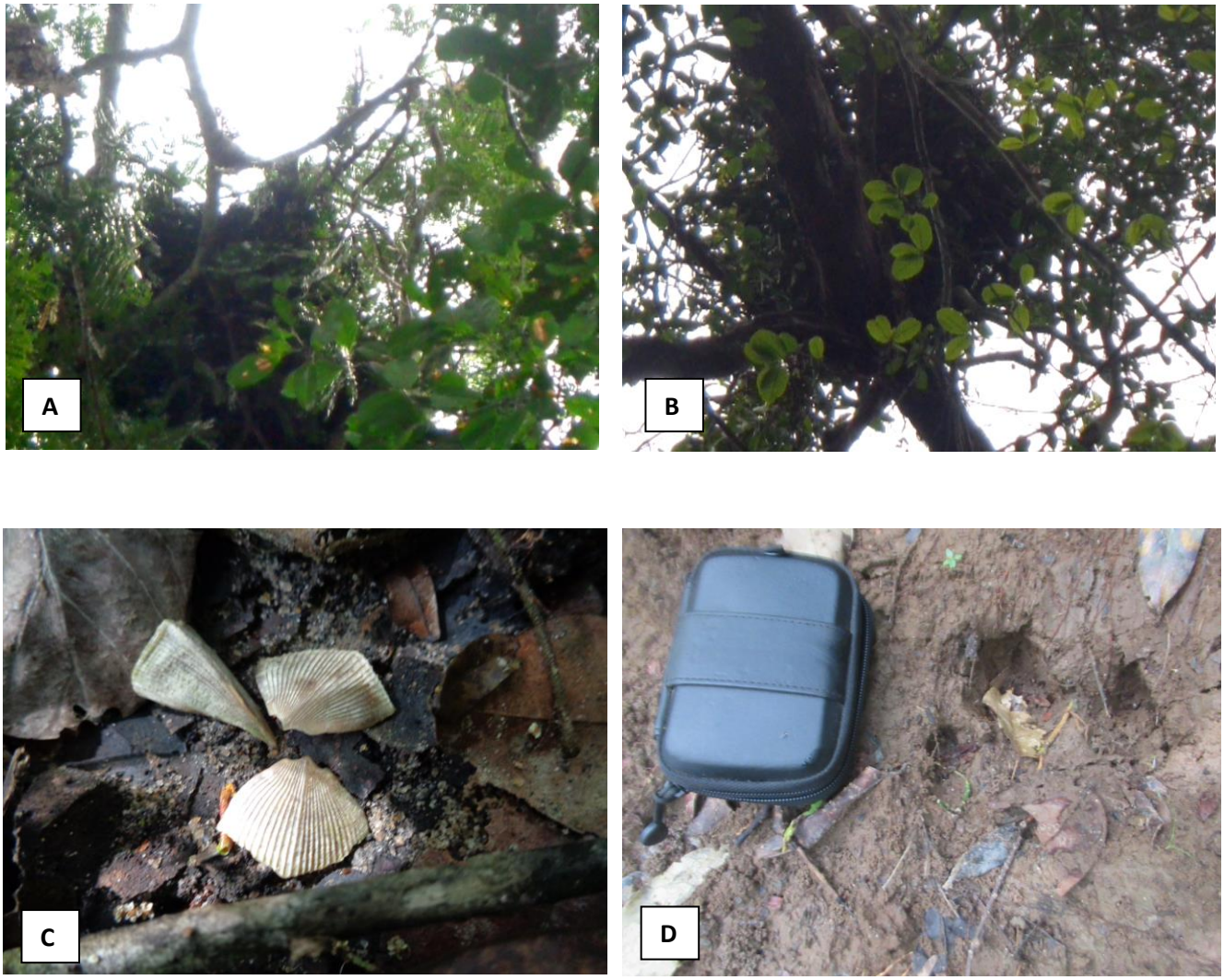

Figure 11: Findings recorded during the transect survey: A & B – chimpanzee nests; C – scales of pangolin; D – pygmy hippopotamus footprint

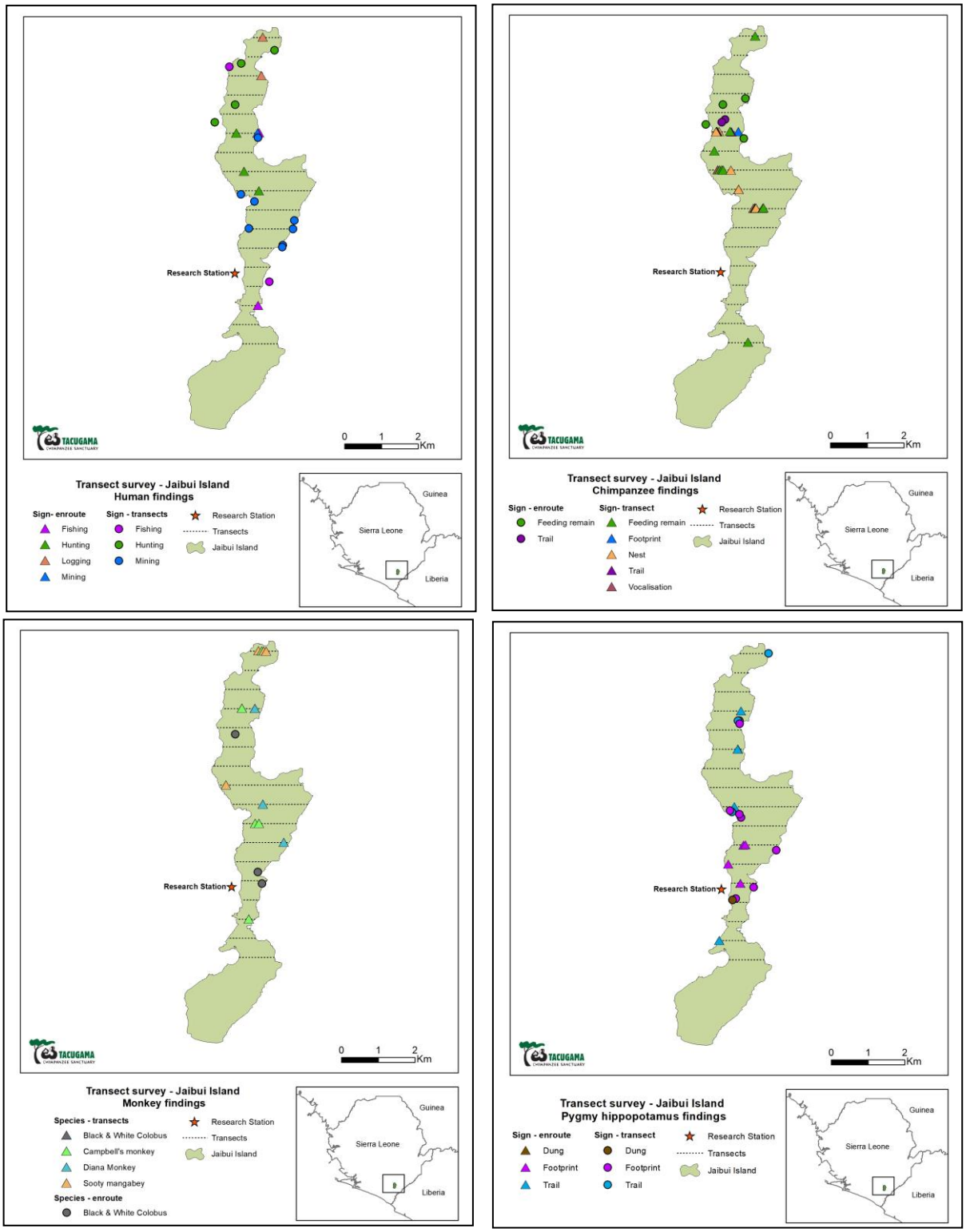

Figure 12: Mapped results of the observations on the transects and en route: A- Human; B – Chimpanzees; C – Monkeys other than chimpanzees; D – Pygmy hippopotami.

TARGETED CAMERA TRAP SURVEY FOR KEY SPECIES

Using all the bio-data collected between camera traps, transects and patrols, we identified several locations that are commonly used by pygmy hippopotami and chimpanzees. In those locations, we set 10 Bushnell™ camera traps in video mode with the aim to obtain more images for individual identification (Figure 13). Cameras were set in April 2019 for four weeks.

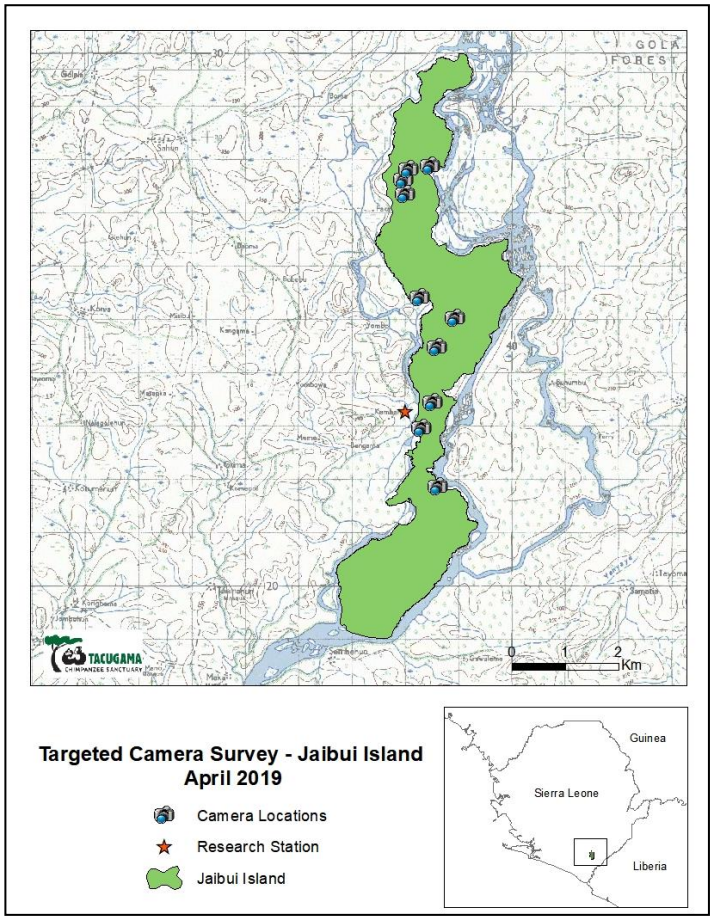

Figure 13: Locations where 10 Bushnell™ camera traps in video mode were set in April 2019.

Results

We obtained 109 video clips in eight cameras and identified 10 different mammal species. Two cameras malfunctioned. Pygmy hippopotami were captured in 50% of the locations (4/8) (Figure 14). No chimpanzees were video-captured (Table 10).

Table 10: Mammal species video-captured at targeted locations.

Species	CL1	CL2	CL4	CL5	CL6	CL8	CL9	CL10	Total cameras
Pygmy Hippopotamus	X	X	X	X					4
Brush-tailed Porcupine	X	X			X				3
Sooty Mangabey	X	X			X				3
Maxwell Duiker			X		X	X			3
Water Chevrotain	X				X				2
Campbell's monkey	X					X			2
Genet	X				X				2
Fire-footed rope squirrel	X								1
Yellow back duiker				X					1
Red river hog				X					1
Number of video clips	24	16	5	15	39	6	3	1	
Total species captured	7	3	2	3	5	2	0	0	

Figure 14: Screenshot of one of the videos with a pygmy hippopotamus.

OVERALL MAMMAL SPECIES FINDINGS

Combining the findings from transects and camera traps, we have recorded the presence of 24 mammal species of which seven (29%) are listed by the IUCN Red List as Near Threatened (1/24), Vulnerable (4/24), Endangered (1/24) and Critically Endangered (1/24) (Table 11).

Table 11: List of species recorded in transects and camera traps combined with their IUCN status.

Order	Scientific Name	Local Name	IUCN Status	Camera Traps	Transects
Carnivora	*Atilax paludinosus*	Marsh Mongoose	LC	X	
Carnivora	*Civettictis civetta*	African Civet	LC	X	
Carnivora	*Genetta spp.*	Genet		X	X
Cetartiodactyla	*Neotragus pygmaeus*	Royal Antelope	LC	X	
Cetartiodactyla	*Cephalophus niger*	Black Duiker	LC	X	
Cetartiodactyla	*Cephalophus silvicultor*	Yellow-backed Duiker	LC	X	X
Cetartiodactyla	*Philantomba maxwellii*	Maxwell's Duiker	LC	X	X
Cetartiodactyla	*Cephalophus dorsalis*	Bay Duiker	NT		X
Cetartiodactyla	*Tragelaphus scriptus*	Bushbuck	LC	X	X
Cetartiodactyla	*Choeropsis liberiensis*	Pygmy Hippopotamus	EN	X	X
Cetartiodactyla	*Potamochoerus porcus*	Red River Hog	LC	X	X
Cetartiodactyla	*Hyemoschus aquaticus*	Water Chevrotain	LC	X	X
Pholidota	*Phataginus triscuspis*	Tree pangolin	VU	X	X
Primates	*Cercocebus atys*	Sooty Mangabey	VU	X	X
Primates	*Cercopithecus campbelli*	Campbell's Monkey	LC	X	X
Primates	*Cercopithecus petaurista*	Lesser Spot-nosed Guenon	LC	X	
Primates	*Pan troglodytes verus*	Chimpanzee	CR	X	X
Primates	*Cercopithecus diana*	Diana Monkey	VU		X
Primates	*Colobus polykomos*	Black & White Colobus	VU		X
Rodentia	*Atherurus africanus*	African Brush-tailed Porcupine	LC	X	
Rodentia	*Hystrix cristata*	Crested Porcupine	LC		X
Rodentia	*Cricetomys emini*	Forest Giant Pouched Rat	LC	X	
Rodentia	*Funisciurus pyrropus*	Fire-footed Rope Squirrel	LC	X	X
Rodentia	*Xerus erythropus*	Striped ground squirrel	LC	X	

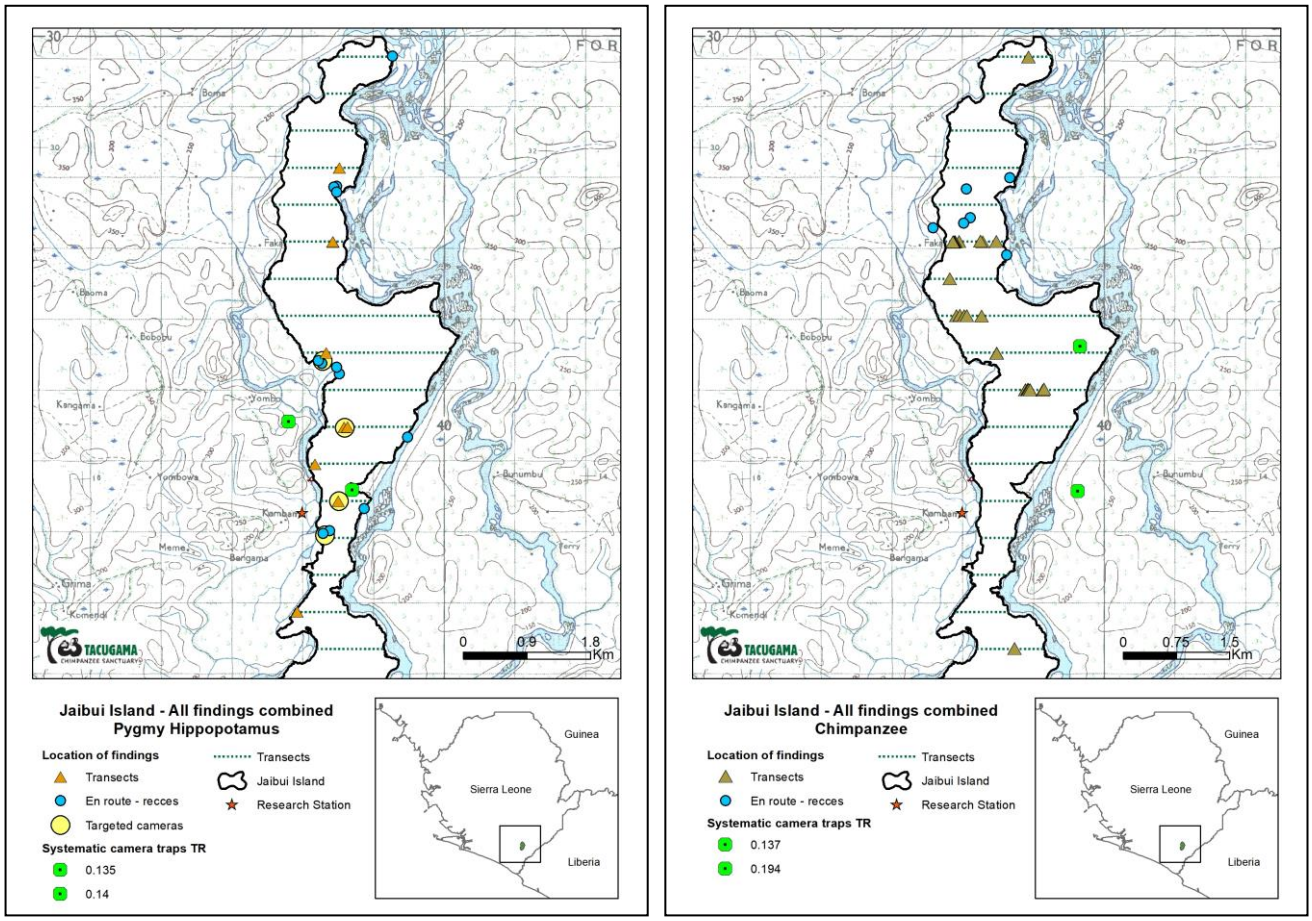

Figure 15: Transect and camera trap findings combined: pygmy hippopotami (left) and chimpanzees (right).

Chimpanzee presence was recorded mostly in the middle of our study area (Figure 15). The estimated density of 0.22 chimpanzees/km^2 results in a total number of 2 chimpanzees with a range of 1 to 6 individuals. The camera traps have captured a group of 6 individuals of which two are mother dependent and therefore, not nest builders. This finding coincides with the average nest group size of 3.9 nest/group recorded on the transects. Hence, we can confirm the presence of a group of 6 individuals in the upper-mid side of the island which provides a density of 0.66 chimpanzees/km^2.

Abundant pygmy hippopotamus signs were recorded towards the southern part of the area surveyed (Figure 15). Most of the observations are along the river bank but we also found signs of their presence towards the interior of the island where the species looks for food.

Pygmy hippos live either alone or in small groups, typically a mated pair or a mother and calf. In all the images recorded with the camera traps show one individual per event except one event with two individuals, however the angle of capture does not allow for a clear identification whether are two adults or a mother and calf.

Not much is known about the behaviour and biology of pygmy hippopotami in the wild. It is estimated that male pygmy hippopotami range over 1.85 km^2 and usually overlap female territories which can range between 0.4 to 0.6 km^2 (Eltringham, 1999). The transects were separated 500 m apart which is the size of a female territory. Individual identification would help determine the minimum pygmy hippopotami population that the island is sustaining. However, it has not been possible because of the limited camera trap images obtained and the difficulties in distinguishing between individuals.

HUMAN ACTIVITY

Cameras captured humans mostly on the mainland near the villages however, evidence of human activities in the island were also recorded during the transect survey (Figure 16). The island has long-term established paths that are used by locals to cross the islands. Also, the paths are commonly used by fishermen and miners to reach their working areas. In fact, artisanal diamond mining is frequently practised by men from the nearby villages. Hunting was the second most often recorded evidence of human activity (Table 12). We found seven gun shells during the transect survey of which four were old and two recent (Figure 17).

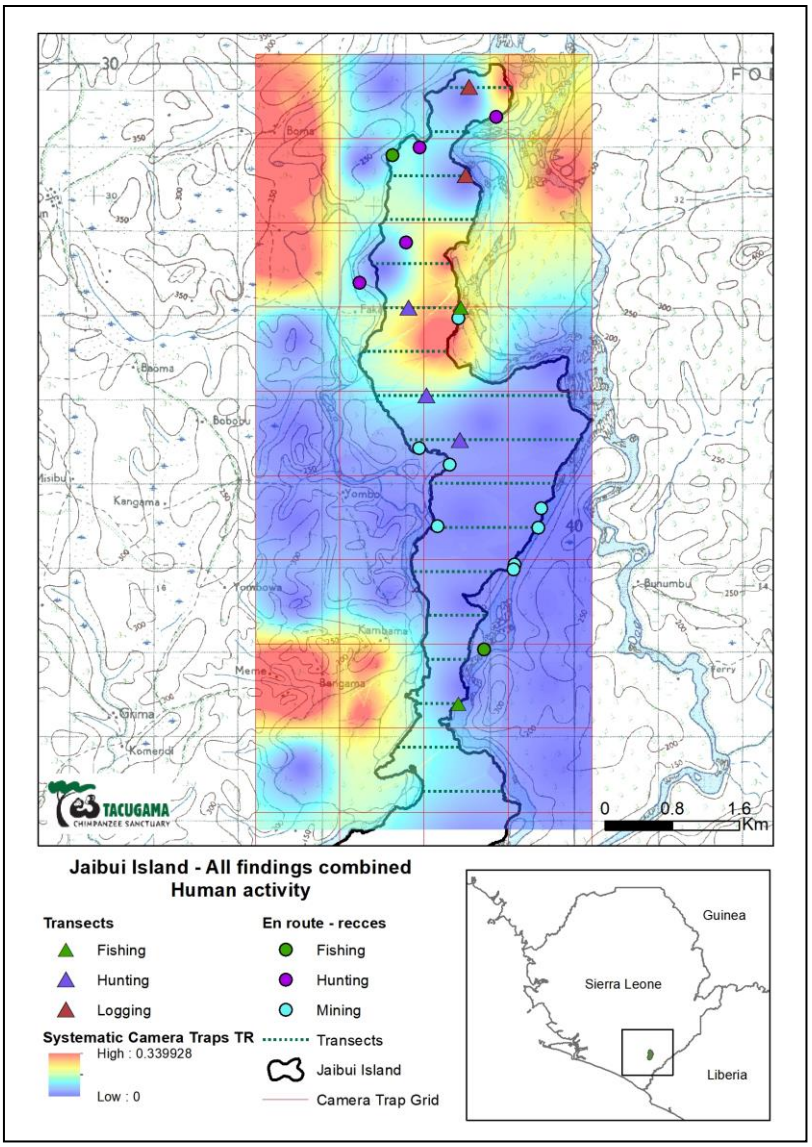

Figure 16: Map shows the location of the observations of human activities on transects and en route interpolated with the photo-captures of human trapping rates (TR) across the camera trap grid. The highest human TR were recorded mostly on mainland.

Table 12: List of type of human signs recorded on transects and en route during the survey

Human activity	Transects	En route	Total
Footpath	31	3	34
Mining	1	8	9
Gun shell	3	4	7
Fishing	3	2	5
Logging	2		2
Total	40	17	57

Figure 17: Signs of human activities recorded during the survey:
A - Women smoking fresh fish on the shores of the island;
B - artisanal mining pits;
C - new gun shell.

CONCLUSIONS

The combination of survey methods has provided abundant data which confirms the importance of Jaibui island as a hotspot of biodiversity in Sierra Leone. Despite the small size, two quarters of the island is covered in pristine high canopy forest, home to a variety of mammal species, of which almost 30% are listed on the IUCN Red List from Near Threatened to Critically Endangered. This study has been limited to medium-large mammals, but other animal and plant species' studies should be encouraged to take place.

The chimpanzee nest survey estimated a density of 0.22 individuals/km^2 however, with the camera traps we recorded a group of 6 individuals (2 adult females with one offspring each, 1 youngster and one adult male), giving a density of 0.66 individuals/km^2. We still need to determine if this is the only group and whether the chimpanzees are capable of crossing to the mainland or to the nearby islands. We photo-captured one adult male on the eastern island but we could not identify him. It could be that there is another chimpanzee group in the eastern island or else the chimpanzees can cross the river at some points when the water level is low.

The island is home to Black and White Colobus, Diana monkey, Red Colobus and Olive Colobus all of them listed in danger of extinction by the IUCN Red List. We have not acquired enough data as to determine their population status. We rely on direct observations and calls to determine their population densities, as these monkey species' rarely come down to the ground, thus terrestrially set camera traps are not a useful tool to survey these species. However, we believe that the hunting pressure on the island over the years has impacted the wildlife population negatively and the animals consequently show cryptic behaviour. We expect that the ongoing patrolling and the villages' commitment to cease hunting in the island will, with time, impact positively decreasing their fear of humans and increasing their numbers.

Pygmy hippopotami are only found in four West African countries and the remaining population estimate is less than 2,500 individuals (Ransom et al., 2015). We have not been able to estimate pygmy hippopotamus densities in our study, but we have found abundant signs of their presence, which indicates the importance of the island for their survival. Their population are decreasing mostly due to conversion of forest habitats and hence the importance of protecting the island. Most of the signs were found near the shore of the river but we also recorded many signs of their presence inland, where hippos travel for feeding. In some areas, we found fresh trails and other signs very close to active mining areas. The artisanal mining occurring on the shores of the island is practised at low scale and seem not to interfere with the nocturnal activity of the pygmy hippopotami.

Out of the seven villages with the right to use the island resources and each proclaiming themselves as owners, only one, Taninahun, has shown a noncooperative attitude. Their reluctancy to get involved in the protection of the island seems to be linked to mining interests by some influential

people. Despite several friendly meetings, they refused to participate by not appointing any bio-technician from the village. They forbid us to survey the southern part of the island, which they claim as theirs. The other southern village, Sembehun, were happy to collaborate with the project but to avoid disputes with Taninahun, we had to postpone our plans until an agreement could be reached with all parts. Tacugama works towards the protection of the island through active conservation with educational activities in the village schools, by sensitising the communities in the economic benefits that the conservation of the island can bring to the area with the presence of tourists and researchers, and by enhancing their local economy by providing alternative livelihoods through agricultural campaigns.

The island is not a government protected area and therefore human activities are not forbidden. However, the Wildlife Act of 1972 protects species such chimpanzees, pygmy hippopotami and some species of colobus monkeys and therefore the purpose of the bio-technicians hired by Tacugama with the agreement of the local people and authorities is to prevent hunting of these protected species by means of patrolling the island, collecting data and continual monitoring. Over the following years we expect to measure the impact of Tacugama educational workshops and environmental campaigns in the area and the technicians constant monitoring. The research station is now equipped and ready to accommodate national and international students and researchers to continue studying the biodiversity of the island.

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