Report produced by Grupo Jaragua for EPIC, Spring 2022; study funded by
SPAW Protocol Regional Activity Centre (SPAW-RAC)

Offsetting Impacts of Black-capped Petrel Collision and Grounding Hazards Along the Rio Pedernales Flyway

Objectives:

Overall:

Expanding the strategies to address threats from strikes and groundings. The threat from strikes and groundings has been documented in various locations on Hispaniola, but there are data gaps about the full extent of the hazards in the various nesting areas and flyways.

Specific:

Communication and other towers within the Rio Pedernales watershed petrel flight corridor are be inventoried and their specific characteristics (height, lighting, guy wires) assessed.

The location and magnitude of light pollution from the Pedernales population center is being determined using light meters.

Information on strikes and groundings is be gathered from local sources via interviews and through observation of towers, baseball stadiums, and brightly lit buildings.

This information will be synthesized with specific recommendations for towers and light sources and shared with appropriate parties, e.g., local communities, communication companies, Ministry of the Environment, and conservation organizations including the Ecological Society of Pedernales.

Activities:

Field team was constituted, informed and trained on work in December 2021.

Three persons were recruited for the project:

Rosa Nilvania Gomez: social worker from Pedernales with excellent knowledge and connections to local organizations and institutions. Rosa has worked for international organizations before and is experienced in working with grass root organizations

Samuel Nossirel: has been working with Diablotin in Haiti. Along with his native Creole he is fluent in Spanish. He is an experienced teacher with administrative qualities, Samuel has been taken part in social studies in Haiti.

Pierre Sanon: has participated in the monitoring of diablotin in Haiti. He ahs also been involved I monitoring of iguanas and amphibians. Along with his native Creole he dominated well Spanish.

The constituted team was informed on the objectives and tasks of the project. The team members received training on the use of clinometers (height meters) and light meters. They were also instructed in the application of semi-structured interviews.

Two questionnaires were developed (see Apendice 1 and 2) – one in Spanish and one in Haitian Creole - to take notes during the interviews on knowledge of the local population regarding the diablotin.

Plasticized photos were prepared containing a duck image as well as the Northern Potoo (Nyctibius *jamaicensis*), Burrowing Owl (*Athene cunicularia*), Perico (*Aratinga chloroptera*), Pitangua (*Caprimulgus ekman*i), Cotorra (A*mazona ventralis*). A photo of the Black-capped Petrel was also included. These photos were used during the interviews to see if the persons – in case they responded positive to having seen a Diablotin – were actually able to identify it. People in the area of study are often inclined to answer any question in a positive form, although they have no idea what they are talking about.

Sountracks of the mentioned bird species were also played to see if the interviewed persons had heard any of them and actually could identify them by sound, especially of course the petrel.

Release protocols (in Spanish and Kreyol) were developed to train people in the communities to respond and act in the correct way to save downed birds (see appendices 3 and 4).

Organization and institutions as well as individual persons were defined to be visited and interviewed. A schedule was developed to visit the different communities.

The following field trips were made (see map 1 for locations)

February 1 to 3: community of Las Mercedes (farmers association)
February 7 to 12: communities of Mencia, Nan Banbou, La Migua, Mencia, Los Arroyos, Aguas Negras y La Altagracia (framers associatioand and association fo coffee growers, avocado growers
February 16 to 19: communities of Aguas Negras y Abila
March 16 to 20: antennas of Loma del Toro
May 22 to June 22: Town of Pedernales and surroundings as well as coast between Pedernales and Cabo Rojo (association of fishermen, Pedernales Ecological Society, local office of Ministry of Environment)

During the field trips the team visited communities, applied questionnaires and informed on release protocol. Interviews were semi-structured and answers recorded on questionnaires.
Communication towers and antennas as well as power line towers within petrel flight corridors were inventoried and their specific characteristics height like height (measured with Lizipai Pocket Climometer) lighting, guy wires) assessed.

Coordinates of location of towers and antennas were taken with GPS (Garmin eTrex 10). Structures with intensive lights had their light intensity on the ground measured with a light meter (881DDigital Illuminance Meter).

Information of questionnaires was inserted into an Excel table and analyzed according to the specific criteria. Data of antennas and other structures Data was registered, analyzed, and mapped.

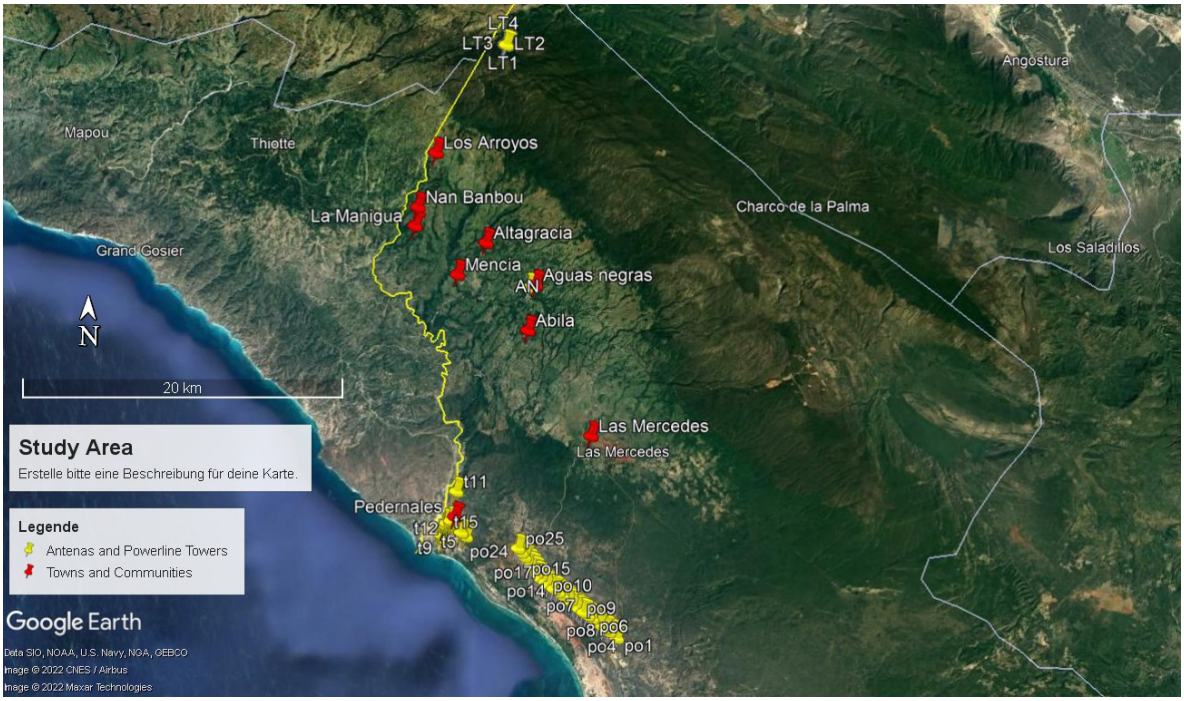
Data and results of the study were shared with the Department of Biodiversity of the Ministry of the Environment

Results:

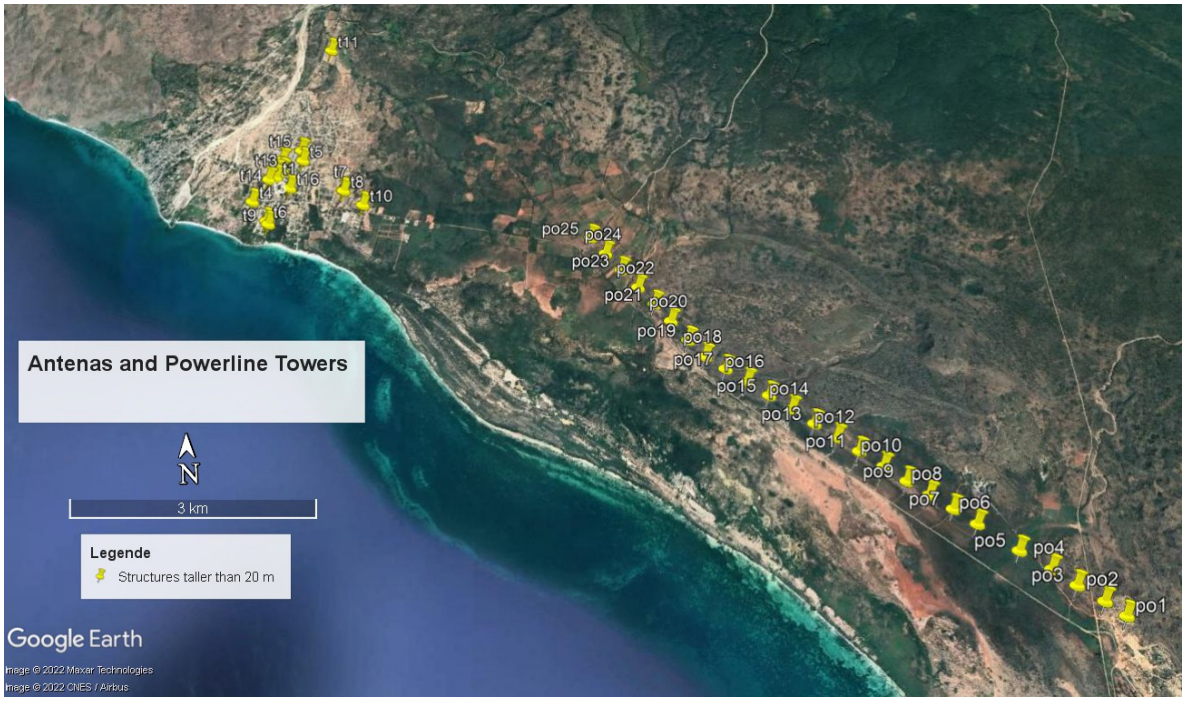
Communication and other towers within petrel flight corridors inventoried and their specific characteristics (height, lighting, guy wires) assessed.

Data of total of 21 antennas and communication towers was registered (see table 1 and map 1).

Sixteen structures were encountered in Pedernales (see map 3), with a major concentration in the center of the town and close to the coast. Antenna height measured ranges from 22.5m to 38.5 m with a calculated average of 33.5m. Ten of the antennas have guy wires ranging from three to fifteen cables per antenna. The majority of the antennas do not have positioning lights, only the military fortress antennas and the ones of the communication companies did have small lights at the top.
Along the flight pathway inland, only one additional major antenna was registered with its location in Aguas Negras (see map 1 and table 1). It has a height of 35m. Two lights on the ground illuminate the surrounding area for security reasons. It has no positioning lights.
Four antennas are installed at Loma del Toro, the highest point of the Sierra de Bahoruco mountains (see map 1 and table one). As special account is given below on these structures and their impact on petrels,



Map 1: Communities as well as antenas and powerline towers within flight path



Map 2: Antennas in Pedernales and Power Line along the coast

Since 2019 a new power line is being constructed to supply electric energy to Pedernales. The electricity is being generated in a wind park about 70 km east of the town. During the study period the final touches have been made on this power line. It is located along the highway which stretches along the coast and leading into Pedernales from the southeast (see map 1 and 2). 25 towers are spaces along the highway, with a distance of approximately 330m between each tower. Each tower is 48m high and the line consists of seven power cables (see table 2). The whole coastal line serves the petrels as entering area to the flight path, and the effects of the power line with its seven cables may well be negative - not only the towers and the cables being obstructions to the flight of the petrels, but also the high voltage cables electrocuting the birds. Examples of electrocuted white-crowned pigeons (*Patagioenas leucocephala*) have already been reported from the town of Oviedo after the installation of the power line.

Map 3: Antennas en Pedernales

Table 1: characteristics and location of antennas and other high structures in Pedernales and flight path, including at nesting site of petrels at Loma del Toro

Nº	Location of Antenna or Structure	Coordinates (UTM, WGS84)		guy wires/ cables	Height (m)
		E	N		
t1	Gobernacion Provincial / in front of municipal park of Pedernales	209242	1996327		29,5
t2	La Sindicatura / El Ayuntamiento	209302	1996422	6	36
t3	branch of bank BANRESERVAS in Pedernales	209335	1996417	3	25
t4	Instituto Agrario Dominicano. (INDRHI)	209102	1995729	8	22,5
t5	Radio JADIPA radio station	209613	1996601	11	31
t6	Radio Television Pedernales	209150	1995629	9	34,5
t7	roof top of military fortress of Ejercito Nacional Dominicano 1	210089	1996054	12	28,5
t8	roof top of military fortress of Ejercito Nacional Dominicano 2	210090	1996053	12	38,5
t9	Radio Pedernales / Primera (Trueno)	209219	1995534		33
t10	Cable de Dago	210468	1995849		29
t11	Villas Don Fey & Andres	209905	1998522	6	29
t12	Genesis Electronica / Q UBIT (Un mundo de Inovacion)	209583	1996768	6	26
t13	Government Building / behind Salon del Reino de los Testigos de Jehova	209173	1996289		36,5
t14	Casa de Eduardin (next to Gobernacion) main antenna madre for the Internet	209206	1996359	15	25
t15	Antenna (CLARO Dominicano) next to Comercial Ortiz.	209327	1996625		38
t16	Antenna of TELEMICRO (next to cooperative)	209462	1996155		38
AN	Antenna (CLARO Dominicano) en Aguas Negras	214426	2011000		35
LT1	Altice communication tower	212850	2024408		40
LT2	Claro communication tower	212884	2024381		40
LT3	Antenna of the Ministry of the Environment	212870	2024400	21	50
LT4	Civil Defense Antenna	212862	2024403	9	12

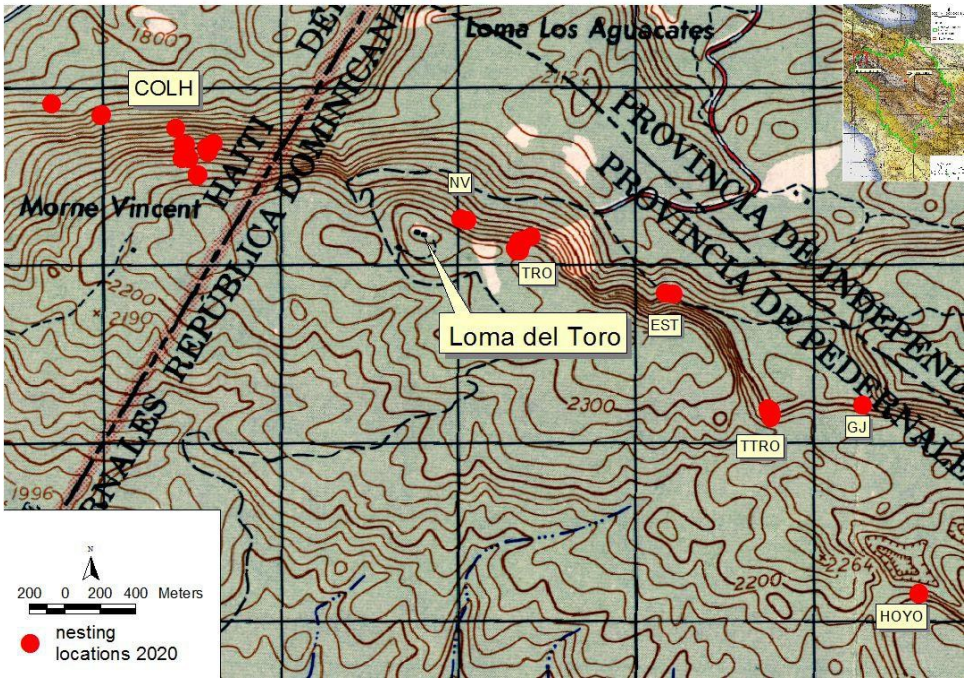
Table 2: location and characteristics of power line towers

tower	description	Coordenates		number of cables	height (m)
		E	N		
po1	powerline tower	219564	1989874	7	48
po2	powerline tower	219356	1990050	7	48
po3	powerline tower	219079	1990246	7	48
po4	powerline tower	218827	1990445	7	48
po5	powerline tower	218493	1990680	7	48
po6	powerline tower	218060	1991020	7	48
po7	powerline tower	217808	1991215	7	48
po8	powerline tower	217551	1991400	7	48
po9	powerline tower	217309	1991585	7	48
po10	powerline tower	217058	1991784	7	48
po11	powerline tower	216787	1991992	7	48
po12	powerline tower	216539	1992180	7	48
po13	powerline tower	216283	1992375	7	48
po14	powerline tower	216023	1992577	7	48
po15	powerline tower	215760	1992774	7	48
po16	powerline tower	215503	1992975	7	48
po17	powerline tower	215247	1993165	7	48
po18	powerline tower	215001	1993346	7	48
po19	powerline tower	214806	1993589	7	48
po20	powerline tower	214601	1993871	7	48
po21	powerline tower	214408	1994130	7	48
po22	powerline tower	214203	1994384	7	48
po23	powerline tower	213997	1994654	7	48
po24	powerline tower	213800	1994917	7	48
po25	powerline tower	213610	1995170	7	48

Situation and problems of *Pterodroma hasitata* in Loma del Toro

1) Nesting site

Loma del Toro is a key nesting site for the Diablotin. Along approximately seven (7) kilometers of its northern slope there are places where birds have nests (see map 4). These places are located on both sides of the Dominican-Haitian border. To date, more than 50 nests have been detected in the area and it is estimated that there may be twice as many. Considering that the total reproductive population is estimated at between one thousand and two thousand pairs, Loma del Toro can be considered a place of great importance for the survival of the species, since it is home to 5% to 10% of that population.



Map 4: Diablotin nesting sites in Loma del Toro

2) Infrastructure and communication antennas in Loma del Toro

Loma del Toro houses four (4) communication structures. A description of each structure follows:

a) Altice communication tower

It is a typical signal amplification tower with a height of approximately 40 meters (see photo 1). It consists of metal tubes. It has several satellite dishes on its top. Next to the tower there is a small building that contains a diesel plant, which supplies the electrical energy for the operation of the antennas. This plant does not work continuously, but according to a defined schedule, to keep the support batteries charged. The noise emitted is minimal. Apparently it has an effective muffler (muffler) to suppress the noises of the plant, since the plant is hardly felt when it is in operation. The tower has three (3) continuous emitting green lights at the top that possibly serve as locator lights for aircraft air traffic.

b) Claro communication tower

Photo 2 shows the Claro communication tower, it has a similar design to the Altice tower, it has a height of approximately 40 meters. Like a small building that contains a plant that supplies electricity for the operation of the parabolas.

The plant does not have a silencer and emits high intensity noise (estimated above 100 decibels). The combustion gases that are emitted are not being filtered either. The tower does not have location lights on its top.

Photo 1: Altice communication tower in the background

c) Civil Defense Antenna

It is a thin antenna (see photo 3) with a height of approximately 12 meters. It is located on a small building and tied with nine (9) support cables that stabilize it against the force of strong winds and breezes. This antenna does not exceed in height the pine canopy that surrounds this site. It does not have location lights on its top.

d) Antenna of the Ministry of the Environment

It is a thin antenna (see photo 3), with approximately 50 meters and it is the tallest structure in the place. It has 21 guy wires (curb) to keep it stable against strong winds and gusts. It is located next to the booth that is usually the home of the park rangers and guardians of the communication towers. It does not have location lights on its top.

Photo 2: Claro communication tower

Photo 3: Antennas of the Ministry of the Environment (in the background) and the Civil Defense (in the middle)

3) Significant impact of lights on the Diablotin

Various lights are present at night in Loma del Toro. There is a light in front of the Claro tower (see photo 4). It is bright white and illuminates the surroundings of the tower itself. It has no cap or cover to prevent light from shining to the sides and up.

In a corner of the Altice building there is another light (see photo 5) that brightly illuminates the surroundings of that tower. It has a narrow lid, which is not wide enough to ensure that the light does not shine upwards.

4) Noise and polluting emissions

While the Altice power plant works silently without having major visible emissions of polluting gases, the Claro plant works without a muffler and the exhaust gases go directly into the air without any filter cleaning them.

Photo 4. Claro tower security light

Photo 5. Altice tower security light

Impacts suffered by the species P. hasitata in Loma del Toro

Map 4 shows the location of *P. hasitata* nests in the Loma del Toro area. It can be seen that the nests are found in a narrow but long strip along the northern slope just below the top of the Sierra de Bahoruco.

Every year during the entire nesting season, birds in flight can be seen with night vision binoculars in that strip as well as their songs be heard. Birds also tend to fly over the towers and antennas of Loma del Toro.

On occasion, park ranger and antenna surveillance personnel stationed at Loma del Toro have encountered petrels walking on the ground just below or near the towers or antennas. Of those birds there were many with injuries, but also some apparently without injuries. It has not been possible to make a systematic study of fallen birds over the years, mainly due to lack of good communication with the personnel stationed at Loma del Toro. Instructions and information have been provided on how to deal with downed birds and how to document and report grounded birds to the Grupo Jaragua staff. They have also been trained in the handling and release of uninjured birds. Unfortunately, the frequent change of the people stationed in the place or the non-attendance has sometimes prevented a good documentation of the cases.

Even so, cases of fallen birds have been reported, each year a minimum of three (3) grounded birds or more are found. Many of them with cuts on the wings (see photos 8 and 9), which indicate that the birds have collided with one of the cables that support the antennas. We have been able to establish a better direct communication channel this year with the WhatsApp application, which is used by service personnel to maintain contact with the corresponding communication companies and with their families.

To date, three (3) falls have been reported so far in 2022, two were birds without injuries, which were successfully released. The third animal had a wing in very poor condition with the left humerus having multiple fractures.

It is assumed that most of the cases of birds colliding with the antennas and towers, falling to the ground are not reported since these events go undetected. Considering the documentation of Loncore et al (2008) on the causes of death of birds in communication towers, we can identify three (3) that have a negative impact on P. hasitata in Loma del Toro:

1- The topography forces the birds to fly over the area of the antennas and towers.

2- Bright white lights emitted that can disorient birds, especially juveniles with little experience on the spot. Frequent fog and strong breezes in Loma del Toro can strengthen this effect.

3- The support cables with which disoriented birds can collide causing serious injuries to their wings and body.

Another impact must also be mentioned, which can easily be forgotten considering the danger that bright lights and guy wires are to the species. This is the noise emitted by the plant installed to maintain the flow of energy for the Claro company antenna. That noise leaves the surroundings of the plant polluted so heavily that no other sounds are allowed to be heard. The little devils in their courtship flights and during their arrivals at the nests emit songs of very specific sounds (which have given rise to their name "diablotin"). The noise emission from the Claro plant can cover the songs of the species and thus hinder communication between the birds.

The location and magnitude of light pollution from population centers will also be determined for each flyway. Information on strikes and groundings gathered from local sources via interviews and through observation.

Regarding the observation and knowledge of petrels along the flight path of Pedernales including strikes and possible groundings the following results have been acquired interviewing people in the communities:

A total of 191 interviews were applied.

a) General socioeconomic data

The general data is the following:

number of interviews in the communities:

Communit	Number of persons interviewed
Abila	5
Aguas Negras	23
Altagracia	33
La Manigua	7
Las Mercedes	27
Los Arroyos	37
Mencia	18
Nan Banbou	4
Loma del Toro	2
Pedernales	35

gender: 61 women (31.94%) and 130 men (68.06%)

Less than one third of the persons interviewed were women.

age:

Age class	Number of persons interviewed	Age class percentage

11 – 20 years	23	14.38
21 – 30 years	50	31.25
31 -40 years	31	19.38
41 -50 years	20	12,5
51 – 60 years	14	8,75
61 – 70 years	14	8,75
71 + years	8	5
No age given	31	---

The majority of interviewed persons was below 40 years of age (60%).

nationality: Dominican citizens 75 (39.27%) Haitian citizens 116 (60.73%)

Roughly 60 percent of the persons interviewed were of Haitian nationality. The study shows clearly the strong presence of Haitian nationals on the Dominican side of the border

educational level:

Educational level	Number of persons interviewed	Percentage (%) per educational level
No formal education	46	31,08
primary	61	41,21
secondary	16	10,81
High school completed	23	15,54
University degree	2	1,35
No information given	43	---

More of 30 percent of the interviewed had no formal education, and another 40 percent only attended part of the primary school.

occupation:

occupation	Number of persons interviewed	Percentage (%) per occupation
Small farmer/agricultural worker	98	51,31
fisherman	21	10,99
construction worker	8	4,19
house wife	6	3,14
Small business	9	4,72
taxi driver/motorcycle taxi	5	2,62
police	2	1,05
agribusiness	5	2,62
student	6	3,14
gardener	2	1,05
laborer	10	5,24
watchman	2	1,05
others*	10	5,24
No information given	7	3,66

* includes bank clerks, fire brigadiers, cook, district attorney, official of Ministry of Environment, president of Ecological Society of Pedernales,

More than 50% of the interviewed persons are working in agriculture, mainly coffee and avocado production, or working small subsistence plots in the upper hills of the flight path. Another important occupational group are the fishermen fishing of the coast and mostly living in Pedernales. The rest of occupations show a great variety and reflects the general population diversity.

General information on persons interviewed reflects a good social-economic sample of the population within the flight path of the petrels.

b) Specific data on knowledge of petrels

Regarding knowledge about petrels and encounters with the petrels of the persons interviewed the following results were obtained:

126 persons (65,97%) never had heard anything about the petrel. 65 (34,03%) affirmed they knew the petrel. A detailed revision of the knowledge of these people, using the photographs of different birds and the soundtracks of these species soon revealed, that the majority had no idea of the Black-capped Petrel. Answers like the following were given:

"It is called cucharreta (*Platalea ajaja*). Formerly, they were walking along the seashore ."
"It is a Paloma ceniza, English: Plain pigeon (*Patagioenas inornata*). It is a bird that eats wild eggplant."
"It is similar to a duck, it is gray. I saw it in the farm of my boss."

Based on the results of the reaction of the interviewed persons to the photographs and soundtracks, most of the positive answers regarding the knowledge about the petrel had to be discarded. At the end only three reliable answers were left:

Two came from watchmen at Loma del Toro, who are regularly stationed at Loma del Toro. They have come into direct contact with downed birds (see special section on "Situation and problems of *Pterodroma hasitata* in Loma del Toro") and also have been witnessing the work of the petrel monitoring crew. The third reliable answer came from an official of the local office of the Ministry of Environment in Pedernales. His name is José Luis Castillo. He is the actual supervisor of the coastal and sea side area of Pedernales. José Luis has taken part in the monitoring of the petrels, which explains his knowledge about the species.

The results of the interview show clearly, that the petrels travel through their flight path practically unnoticed and unperceived by the general public, neither in the town of Pedernales, nor in the rural communities north of the town. No downed birds were reported for the flight path. During the visits to the communities the members of the interviewing team also distributed the rescue protocols for petrels (in both languages), and also gave verbal explanations, since a good portion of the population in the hills is illiterate. It is hoped that in this manner cases of downed birds may become known and possible rescue activities can be initiated.

c) **location and magnitude of light pollution from population centers**

Light pollution of the antennas at Loma del Toro has been intensively treated in the part "Situation and problems of *Pterodroma hasitata* in Loma del Toro". The flight path leading to Loma del Toro does not have major intensive light sources.
In the town of Pedernales normal light sources like street lights and illumination of houses is of typical intensity of towns in the Dominican Republic. Only in the baseball and softball stadium of Pedernales lights are often lit at night with a strong intensity for the naked eye, Measured intensity on the ground of the stadium was 275 lux. This appears a lot much lower compared to a professional baseball stadium, where a minimum of 1000 lux is recommended. Light post are placed around the stadium of Pedernales, each pole with a height of 14m. The direction of the light emission is downwards in direction towards the ground. How strongly the actual light situation of Pedernales affects petrel flight is difficult to judge based on the data available.

More problematic conditions are starting to arise from tourism development. The government of the Dominican Republic has initiated ambitious long-term plans to promote major tourism development in the region, These plans are focused on the coastal area of Pedernales/Cabo Rojo and include several major resort hotels, apartment complexes, golf courses, a major international airport, and a large marina. According to current projections the airport is expected to become the second largest in the Dominican Republic in terms of passenger traffic, with an estimated 1.6 million passengers/year at project completion. Further associated with the development will be an increase

in existing wind turbines in the region and a new 138 kilovolt electrical transmission grid parallel to the coast (see also the part “Communication and other towers within petrel flight corridors inventoried and their specific characteristics (height, lighting, guy wires) assessed.“) Inevitably, a significant increase in the local human population and artificial lighting will be associated with this development, including that associated with nighttime arrivals and departures of commercial and private aircraft, all of which will be located between petrel nesting areas in the Sierra del Bahoruco and the Caribbean Sea and along petrel flight paths to and from such areas.

Conclusions

- The general public living within the flight path has no knowledge of the petrels
- Sixteen antennas in Pedernales, one in La Altagracia, and four at Loma del Toro may obstruct the flight of the petrels. While there is no information of impact of antennas on petrels for Pedernales and La Altagracia, there have been bird strikes recorded at Loma del Toro
- A new power line along the coast may be become a major threat to petrels
- the height above ground which petrels are using while cruising over Pedernales or entering the coast is not known. It would be most important to define this height to determine if it is affected by the antennas in Pedernales or the power line along the coast.
- Light pollution of Pedernales is similar to other Dominican towns. Most intensive light source is the baseballstadium. Direction of light is towards the ground. Impact on petrels is not clear.
- Tourism development projects will create serious problems for the petrels in the near future like disorientation due to lights as well as direct flight obstructions

Recommendations

- Training about petrels for locals should be intensified and rescue protocols promoted. This should not only be done on the Dominican side of the Pedernales, but on the Haitian side as well. In addition it is recommended to include the other known fightpaths within Haiti which lead to the nesting areas in the Massif de la Selle. The training should address the general public, but specifically decision makers. The young people should be of specific focus.School curricula must be developed and executed for the purpose.
- Since there is little chance to halt the development of tourism, lobbying must be done to enhance the mitigation of negative effects of this development. Light attraction and disorientation for petrels (as well as for other bird species) should be kept to a minimum.

Photos

Photo 6: Project team (from left to right: Pierre Sanón, Rosa Gomez, Samuel Nossirel

Photo 7: Interview in Mencia

Photo 8: Interviewing in Avila

Photo 9: Interviewing in Los Arroyos

Photo 10: Interviewing Presidend of Ecological Society of Pedernales

Photo 11: Measuring height of antenna en La Altagracia with clinometer

Photo 12: Measuring height of power line tower with height meter

Photo 13: Light system of baseball stadium

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Appendices

1) questionnaire form in Spanish

2) questionnaire form in Haitian Creole

3) Release protocol in Spanish

4) Release protocol in Haitian Creole