

**CONSERVATION, ECOLOGY AND GENETICS OF THE CAPE
VERDE WARBLER
*Acrocephalus brevipennis***

Report for African Bird Club
on fieldwork in Cape Verde
November 2013 to January 2014



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**Helena Reis Batalha
University of East Anglia
April 2014**

Project details

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April 2014

Funding and support



Table of Contents

Project details	2
Funding and support	2
1. Introduction and aims	4
2. Project activities and outcomes	5
Conclusions.....	9
Appendix	10
1. Expenses	10
2. Tables	11
3. Maps	13
4. Fieldwork photos	17
Santiago.....	17
Fogo	19
São Nicolau.....	20
5. Feedback from our field assistant	22
References	23

1. Introduction and aims

The Cape Verde warbler *Acrocephalus brevipennis* is an endemic bird of the Cape Verde archipelago classified as "Endangered" (BirdLife International 2013). Until recently, it was thought that this species was confined to the island of Santiago. In 1998 and 2004 new populations were discovered on Fogo and São Nicolau, respectively (Hazevoet *et al.* 1999; Hering & Hering 2005), with overall population size estimated at 1000–1500 mature individuals (BirdLife International 2013).

Phylogenetic relationships between insular populations have not yet been assessed, although genetic, ecological or behavioural differences between populations could impair the effectiveness of conservation measures (Phillimore *et al.* 2008). To evaluate these differences, we collected blood samples and took morphometric and physiological measurements of 95 individuals belonging to the three different populations, between November 2013 and January 2014. We identified each bird individually with metal and colour-rings and collected data on song and the habitat where they were found. This was undertaken in collaboration with all relevant national stakeholders in Cape Verde. The data collected will now be analysed with molecular and statistical techniques to assess the degree of difference between populations, and to inform future conservation measures. In this report, we present the data collected during this field season.

The main aims of the field season were to:

1. Build collaborations with local stakeholders to initiate and develop the project
2. Start training local technicians to ensure that the species monitoring will continue
3. Obtain blood samples of a minimum of 30 birds per island
4. Record data on biometrics, moult, breeding stage and parasites
5. Record songs of a minimum of 10 male birds per island
6. Make a first assessment of habitat features
7. Test methods for censusing population numbers

2. Project activities and outcomes

Collaboration with national stakeholders

The fieldwork for the study and conservation of the Cape Verde Warbler *Acrocephalus brevipennis* took place at the end of the breeding season, starting on November 17th, 2013 and ending January 28th, 2014. After arriving in Cape Verde, I and my field volunteers contacted all national authorities for permission to undertake the work and kept them informed of progress throughout the fieldwork. Where possible we took local biologists to the field with us to follow the work. Moreover, at our invitation several technicians and directors from the National Institute for Agrarian Research and Development (INIDA) and the Natural Parks of Serra Malagueta, Fogo and Monte Gordo accompanied the team on field trips, whenever possible. We also collaborated with the NGO Biosfera I to incorporate our methodology into the national bird ringing scheme that is being developed jointly with the General Direction for the Environment (DGA). Thanks to funding from the African Bird Club, we hired a Cape Verdean biologist (Jaelsa Moreira), recommended to us by Biosfera I, who did excellent work as a field assistant on this project for two months. All stakeholders showed great interest in learning and helping to carry out the work, which contributed to the success of this fieldwork. The exchange of information between the technical team and Cape Verde partners was excellent, facilitating learning for both parties and effectively contributing to the collection of high-quality data in the field. For example, Gilson Semedo (INIDA) showed us how to identify Cape Verde warbler nests, while we showed him how to set up mist nets and ring birds.

Training of local technicians

A key aspect of the success of long-term *in situ* conservation projects is the involvement of local partners from the start. Hence, the team included local technicians in our field trips, so that they would become familiar with the avian monitoring techniques used. We were accompanied by some directors and technicians of INIDA (Gilson Semedo, Ruben Rocha) and Natural Parks of Serra Malagueta (Evaldino Pereira), Fogo (Alexandre Nevsky, Herculano Dinis) and Monte Gordo (Lindaci Oliveira, Maria Auxiliadora do Nascimento, Nelson Rosário Santana, Floriano Cruz Duarte), who had initial training in bird ringing (Figures 9 to 18, in the Appendix).

All these Cape Verdean biologists learned about:

1. Bird ringing and colour ringing as monitoring techniques;
2. Choosing appropriate locations, setting up and closing mist-nets
3. Extracting birds from nets

4. Handling and ringing birds, and dealing with possible accidents
5. Collecting biometric parameters and their biological significance (e.g. moult, brood patch, etc.).
6. The importance of collecting blood samples for genetic studies on population divergence and viability

Importantly, our Cape Verdean field assistant Jaelsa Moreira accompanied us for enough time to enable her to develop technical skills in all aspects of bird ringing, as well as in monitoring the Cape Verde warbler (see her feedback in the Appendix). It was also interesting to realize that most Cape Verdeans, regardless of social status or education level, share a deep love for nature. They were always curious about what we were doing, wanted to help and participate, and asked many questions. It was always a priority for us, when possible and appropriate, to include them in our fieldwork. For example, on Fogo we worked with a local farmer, Nené, who knows the coffee plantations very well and showed us many sites where we could find Cape Verde warblers and their nests.

The field trips and ringing training sessions given so far were too few to provide sufficient training to enable the other biologists to carry out ringing work independently in the future. However, we feel this was a good starting point for many of the people we worked with, and we strongly encourage them to continue to develop their skills in monitoring methods involving capture-mark-recapture techniques.

Blood samples

We caught Cape Verde warblers with mist nets, attracting them with a male song recorded in Assomada, Santiago, in 2005, by Antero Lindholm (available at <http://www.xeno-canto.org/>). To identify the birds, each received a numbered metal ring and a unique combination of three colour rings resistant to UV radiation (Redfern & Clark 2001; see Table 4 in Appendix). All rings had an internal diameter of 2.3 mm and were applied to the birds' tarsus. The metal rings were created especially for Cape Verde, together with Biosfera I, with the address *die M. Amb. C. Verde* (Cape Verde Ministry of Environment). The colour ringing scheme has been submitted to the platform *European Colour-ring Birding*, and is available online at <http://www.cr-birding.org/node/2651>.

We captured, ringed and collected blood samples and biometric data from 95 Cape Verde warblers (Table 5), 50 on Santiago, 30 on Fogo and 15 on São Nicolau, in a total of 62 different locations (Figure 1). Blood samples were collected by puncture from the the brachial vein and stored in 100% ethanol. In addition, we measured and ringed other birds that were accidentally caught and

whose tarsus could fit rings of the same size, and emailed the information to Biosfera I (data not shown here). On Santiago, birds were captured in three main areas: North, Centre and South (Figures 2–5). On Fogo, we chose to sample the birds around Pai António (Figure 6), as this area has a high density of birds and the rest of the island does not have suitable habitat for this species. On São Nicolau, we sampled various locations within the small area this species presently occupies (Figure 7). During the last week of January 2014, we thoroughly searched five sites with potential suitable habitat on Brava (Figure 8). Unfortunately, no warblers were found, confirming previous findings by the biologist Herculano Dinis (Fogo Natural Park) and the naturalist Cornelis Hazevoet (Cape Verde Zoological Society).

Morphological and physiological data

Standard biometric measurements were taken from every bird caught (summaries in Tables 6–8), including measurements of the physical condition of the bird (muscle, fat), breeding season and moult. Parasite data were also collected, by counting the number of mites on flight feathers (Table 9) and collecting faecal samples when possible. We collected 34 faecal samples, 16 on Santiago, 14 on Fogo and four on São Nicolau. Parasite data will be combined with genetic data to assess the health of the birds' immune system.

Song

We recorded a total of 123 sound files at 56 different locations across the islands; 87 in Santiago, 17 in Fogo and 19 in São Nicolau. These files correspond to at least 55 Cape Verde warbler males (40 from Santiago, 11 from Fogo and 4 from São Nicolau). On São Nicolau it was quite difficult to record male songs because (1) the birds were hard to find and (2) they vocalized little. The reaction of the birds on São Nicolau was very weak: often they did not react to playback, despite being present in territories (as confirmed by observations or captures). It is unclear whether this was due to: (1) the sampling on São Nicolau being done after the end of the breeding season; (2) differences in the behaviour of birds of this population; or (3) a combination of these two factors.

Habitat data

During this field season we prioritized collecting blood samples from birds, so although some habitat data were collected, this was not done systematically. Cape Verde warbler habitat seems to be very different both between and within the islands, in terms of plant species and abiotic variables such as altitude, average temperature or cloud cover. We noted (1) the presence or absence of trees, water and agriculture, (2) the type of terrain (valley bottom or slope), (3) the percentage of area covered

with undergrowth and percentage of shaded area and (4) a summary of the type of vegetation found. All estimates were made only in the area that the birds were seen using. It was not possible to estimate any territory sizes but all re-sightings and recaptures of colour-ringed birds were recorded. A preliminary evaluation of these features will serve as the basis for designing an appropriate protocol for the next field season. We are currently developing a protocol that will allow us efficiently to quantify the diversity of habitats that the Cape Verde warbler uses, to determine common features. This is important for predicting the potential distribution of the species.

Censusing methods

During this first field season we used Global Positioning System (GPS) Garmin eTrex® H to record the location of all birds detected by sight or sound, all nests and all explored sites where birds were not observed (negative points). Most nests were discovered by Gilson Semedo (INIDA, Santiago) or by Nené (Pai António, Fogo). Throughout the field season we informally assessed the efficiency of transects and point counts, with or without the use of playback, to detect Cape Verde warblers (Bibby *et al.* 1992; Showler *et al.* 2002). On Fogo, no trial censuses were conducted outside the north-eastern areas, as there is clearly no suitable habitat.

We have now sufficient information to design a programme to undertake a complete census, using robust methods adapted to the detectability of birds in different populations. Cape Verde warblers are more easily detected by sound than by sight, because they use dense shrubby vegetation. These birds are not easy to observe, and are much more conspicuous on Santiago and Fogo than on São Nicolau. It is possible that numbers of individuals have been underestimated in the past (on Santiago and São Nicolau) and over-estimated (on Fogo). On Santiago and São Nicolau we sampled more birds than expected based on the published literature (Donald *et al.* 2004; N. Wilkinson, pers. comm.; Hazevoet 1995; Hazevoet *et al.* 1999), for different reasons: on Santiago, because we looked for the birds in places previously unexplored (C. J. Hazevoet, pers. comm.), and on São Nicolau because we did a thorough exploration with intensive use of playback. By contrast, the population on Fogo may have previously been overestimated. After colour-ringing the birds, we noticed that individuals seem to use larger areas than previously suggested (Hering & Fuchs 2009; Hering & Hering 2005). Possibly previous studies have recorded the same bird at several different locations as several different birds. This highlights the importance of colour-ringing for correct estimates of population and territory sizes. For conducting censuses, we discourage using methods that rely on visual observations along transects, especially on São Nicolau. A complete census should include identification of sounds (male song, females and juveniles calls, and alarm sounds), and use

playbacks to trigger male replies. We recommend that censuses are made by experienced observers who are familiar with the species and its sounds.

Conclusions

The first field season of this project had excellent results and all key objectives were achieved.

1. We initiated close collaboration with all national authorities involved in the conservation of the Cape Verde warbler (DGA, INIDA and Natural Parks of Serra Malagueta, Fogo and Monte Gordo).
2. Initial training in bird ringing and various field techniques was given to technicians from all these authorities.
3. We obtained the minimum number of 30 blood samples from the Cape Verde Warbler on the islands of Santiago and Fogo, and 15 samples on São Nicolau.
4. Additional morphological and physiological parameters were recorded for all birds sampled.
5. We recorded songs of a minimum of 10 males on Santiago and Fogo, and 4 on São Nicolau.
6. We collected baseline data on habitat features on all islands.
7. We tested various methods of bird censuses and adaptations of these methods to the case of the Cape Verde warbler.

Appendix

1. Expenses

Table 1 – Expenses for the full-time Cape Verdean field assistant Jaelsa Moreira during the field fieldwork season of 2013–2014, in Cape Verdean Escudos (CVE).

Full-time field assistant's expenses CVE			
type	amount	Initial date	Last date
salary	60,000	15/12/2013	28/01/2014
equipment	3,031	03/12/2013	23/01/2014
transportation	62,440	24/11/2013	16/01/2014
accommodation	16,105	10/12/2013	15/01/2014
food	22,973	27/11/2013	15/01/2014
TOTAL CVE	164,549		

Table 2 - Expenses for other local services during the field fieldwork season 2013–2014, in Cape Verdean Escudos (CVE). These expenses include money paid directly to Cape Verdean citizens for their help with work or logistics and money spent directly on services from Natural Parks or the local organization Associação Pai António.

Other local services CVE			
type	amount	Initial date	Last date
field assistant Fogo	2,000	01/01/2014	01/01/2014
water transportation	2,000	20/12/2013	01/01/2014
tickets to Natural Parks	900	28/11/2013	25/12/2013
accommodation with local association in Pai António, Fogo	10,000	20/12/2013	01/01/2014
cleaning services Praia	1,600	26/11/2013	09/12/2013
petrol Natural Park Monte Gordo	3,300	18/01/2014	18/01/2014
accommodation in Natural Park of Monte Gordo, São Nicolau	24,750	04/01/2014	17/01/2014
TOTAL CVE	44,550		

Table 3 – Fieldwork expenses for local services in pounds sterling (GBP), using the conversion rate on 21 March 2014.

Expenses in GBP (rates 21-03-2014)	
salaries + other local services	510
food	176.26
accommodation	389.89
Transportation + equipment	527.38
Total expenses with local services GBP	1,603.53
African Bird Club Contribution GBP	1,500

2. Tables

Table 4 - Colour ring colours used to individually recognize Cape Verde warblers. The position of the metal ring differs between islands to facilitate identification of potential dispersing birds.

Colour	Abbreviation	Leg (left/right)
<i>Dark blue</i>	B	L/R
<i>White</i>	W	L/R
<i>Orange</i>	O	L/R
<i>Red</i>	R	L/R
<i>Yellow</i>	Y	L/R
<i>Cabo Verde (Ministério do Ambiente) metal ring</i>	X	Santiago: bottom right Fogo: bottom left São Nicolau: upper left

Table 5 – Number of Cape Verde warblers sampled per island, after the breeding season of 2013, by age and sex. Date of sampling indicated under each island name. Age was assessed using the criteria typically employed by BTO ringers. Sex was molecularly determined by PCR following Griffiths (1998).

Sex	Age			Total
	Unknown	Juvenile	Adult	
Santiago 18/11/2013 - 14/12/2013	2	9	39	50
Centre	1	5	22	28
♀	0	3	9	12
♂	1	2	13	16
North	0	0	15	15
♀	0	0	4	4
♂	0	0	11	11
South	1	4	2	7
♀	0	3	1	4
♂	1	1	1	3
Fogo 19/12/2013 - 31/12/2013	6	3	21	30
♀	1	3	4	8
♂	5	0	17	22
São Nicolau 04/01/2014 - 19/01/2014	0	2	13	15
♀	0	1	2	3
♂	0	1	11	12
Total by age	8	14	73	95

Table 6 – Summary of Cape Verde warbler biometrics, collected on each island, grouped by sex; in each cell, the average is followed by the standard deviation, between brackets.

Average by sex and island (Standard deviation)								
Measurement	Wing length	Tarsus length	Head plus bill length	Bill length (to nostril)	Bill depth	Bill width	Weight	Total
Santiago	64.0 (2.0)	26.7 (1.2)	38.5 (1.2)	11.2 (0.8)	3.5 (0.3)	5.3 (0.5)	17.2 (1.4)	50
♀	62.6 (1.5)	25.7 (0.8)	37.8 (0.9)	11.0 (0.6)	3.5 (0.2)	5.1 (0.6)	16.2 (1.3)	20
♂	65.0 (1.6)	27.4 (1.0)	39.0 (1.1)	11.4 (0.9)	3.5 (0.3)	5.3 (0.4)	17.9 (1.0)	30
Fogo	64.6 (2.1)	26.7 (0.9)	39.2 (0.9)	11.3 (0.5)	3.6 (0.2)	5.3 (0.2)	17.4 (2.1)	30
♀	62.4 (1.3)	26.1 (0.9)	38.3 (0.8)	10.8 (0.6)	3.6 (0.2)	5.2 (0.2)	16.6 (1.2)	8
♂	65.4 (1.70)	27 (0.9)	39.5 (0.6)	11.5 (0.4)	3.7 (0.1)	5.4 (0.2)	17.8 (2.2)	22
São Nicolau	64.4 (1.3)	26.0 (0.9)	39.8 (0.9)	12 (0.7)	3.6 (0.1)	5.3 (0.2)	18.1 (1.6)	15
♀	63 (0.0)	24.5 (0.4)	38.7 (1.0)	11.1 (1.0)	3.4 (0.1)	5.2 (0.1)	16.5 (0.9)	3
♂	64.8 (1.2)	26.4 (0.6)	40.1 (0.6)	12.2 (0.4)	3.6 (0.1)	5.4 (0.2)	18.6 (1.4)	12
Population average	64.3 (1.9)	26.6 (1.1)	38.9 (1.2)	11.4 (0.7)	3.6 (0.2)	5.3 (0.4)	17.4 (1.7)	95

Table 7 – Summary of Cape Verde warbler fat (columns) and muscle (rows) scores, following BTO scoring methods. Fat scores: 0 = absent; 1 = very little; 2= little. Muscle: 2 = normal; 3 = well developed.

Muscle score	Fat score			Total
	0	1	2	
Santiago	30	12	5	47
2	16	4	2	22
3	14	8	3	25
Fogo	22	5	3	30
2	17	2	2	21
3	5	3	1	9
São Nicolau	10	5	0	15
2	6	4	0	10
3	4	1	0	5
Total	62	22	8	92

Table 8 - Summary of Cape Verde warbler moult and brood patch (columns) scores, by sex and island (rows). Moult: O = inactive; S = starting; B = body feathers; M = main moult; E = ending. Brood patch: 0 = absent; 2= starting; 3 = full brood patch; 4 = regressing; 5 = closing.

	Moult score											Total
	O				S		B	M			E	
Brood patch	0	2	3	4	0	4	0	0	4	5	0	
Santiago	20	1	2	3	3	1	0	14	0	3	0	47
♀	2	1	2	3	0	1	0	6	0	2	0	17
♂	18	0	0	0	3	0	0	8	0	1	0	30
Fogo	1	0	0	1	0	0	1	15	1	10	0	29
♀	1	0	0	1	0	0	0	3	1	2	0	8
♂	0	0	0	0	0	0	1	12	0	8	0	21
São Nicolau	1	0	0	0	1	0	0	11	0	0	2	15
♀	0	0	0	0	0	0	0	2	0	0	1	3
♂	1	0	0	0	1	0	0	9	0	0	1	12
Total	22	1	2	4	4	1	1	40	1	13	2	91

Table 9 - Number of Cape Verde warblers, for each feather mite score, per island; A = 0; B = 1; C = 2-5; D = 6-10; E = 11-20; F = 21-100; G = >100.

Feather mites	A	B	C	D	E	F	G	Total
Santiago	7	1	1	4	3	23	1	40
Fogo	0	0	0	2	5	23	0	30
São Nicolau	4	0	1	0	3	7	0	15
Total	11	1	2	6	11	53	1	85

3. Maps



Figure 1 – Overview of the sites where Cape Verde warblers *Acrocephalus brevipennis* were sampled, after the breeding season of 2013.

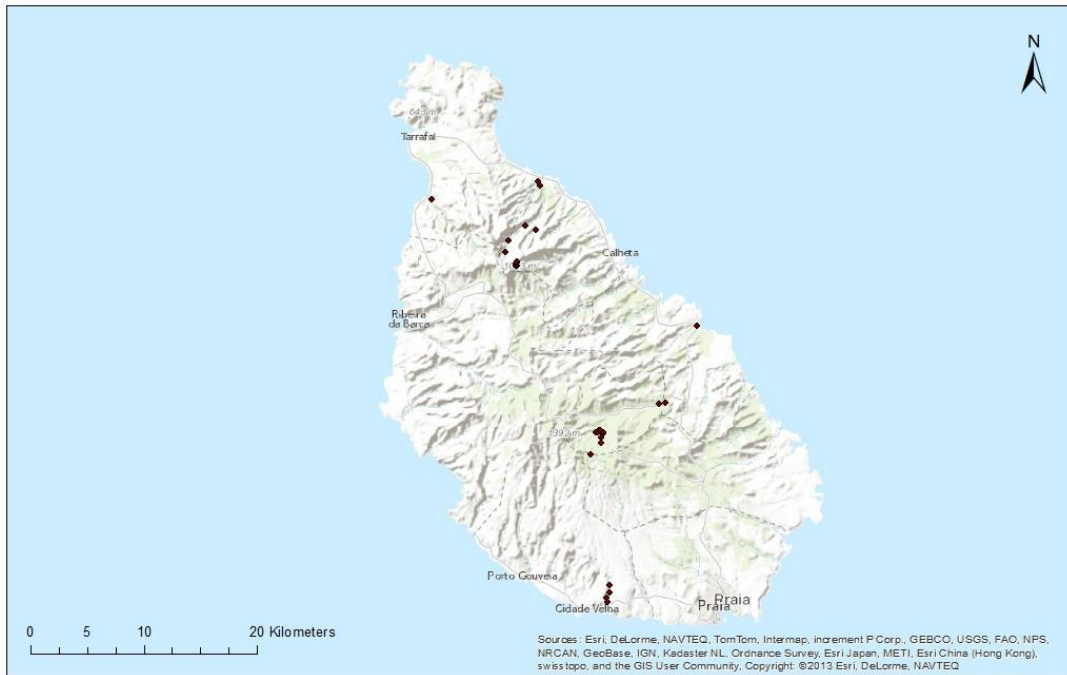


Figure 2 – Overview of the sites where Cape Verde warblers were sampled on Santiago.

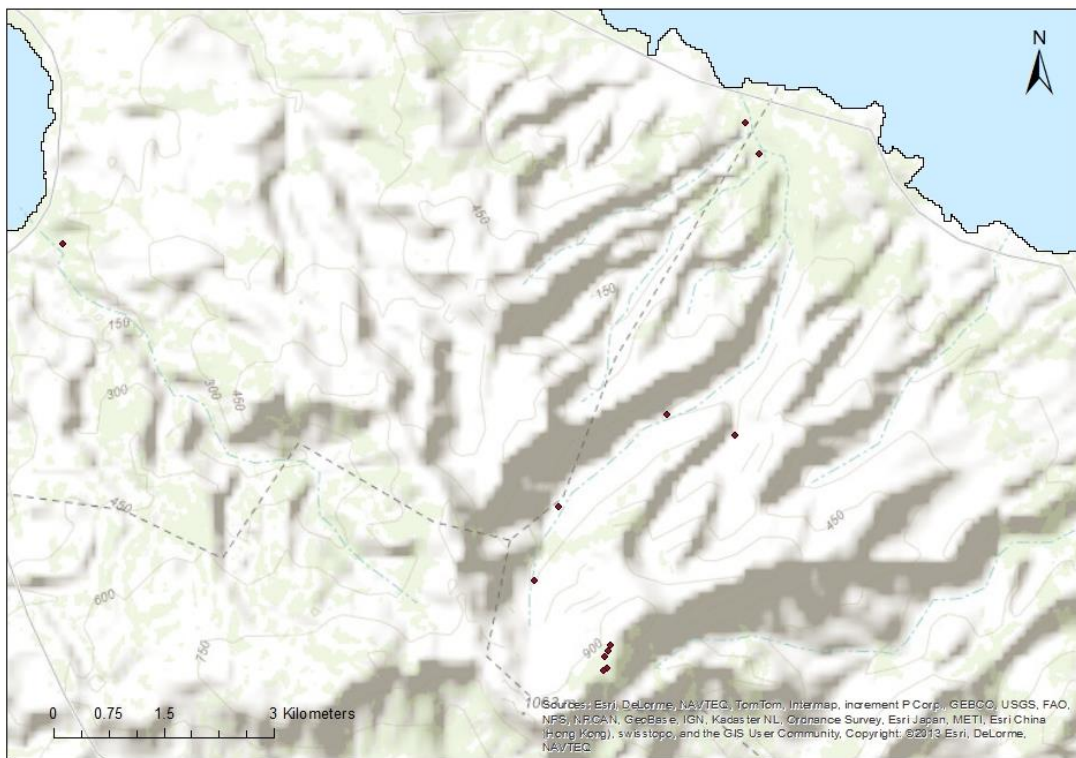


Figure 3 - Sites where Cape Verde warblers were sampled in the north of Santiago.

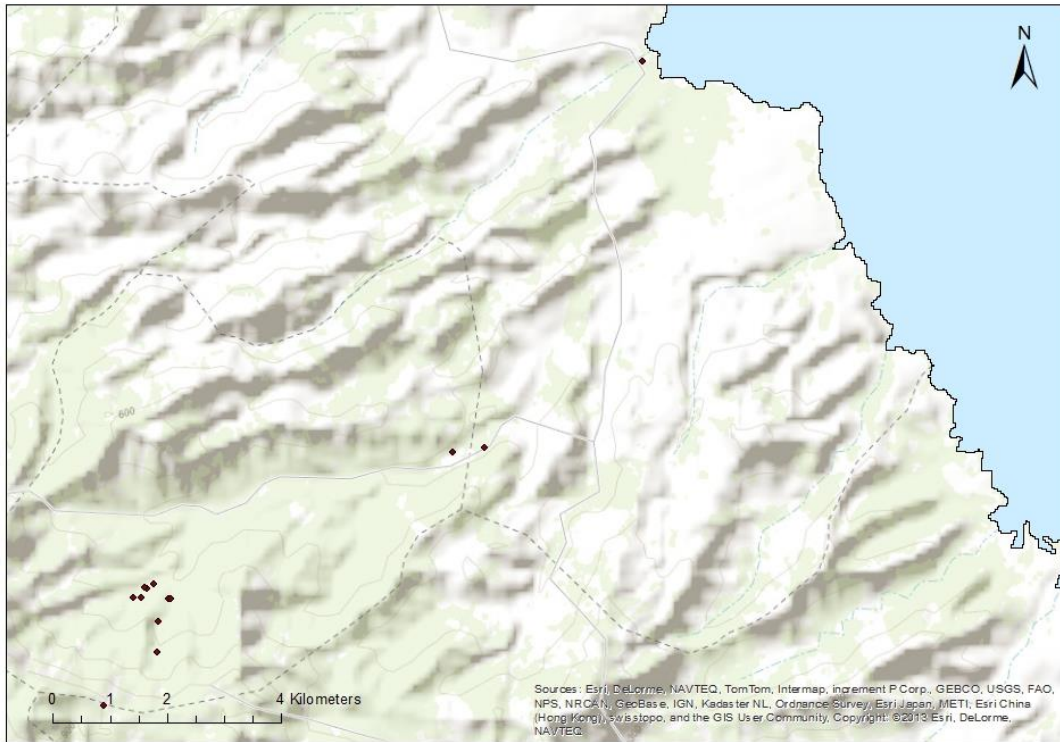


Figure 4 - Sites where Cape Verde warblers were sampled in central Santiago.

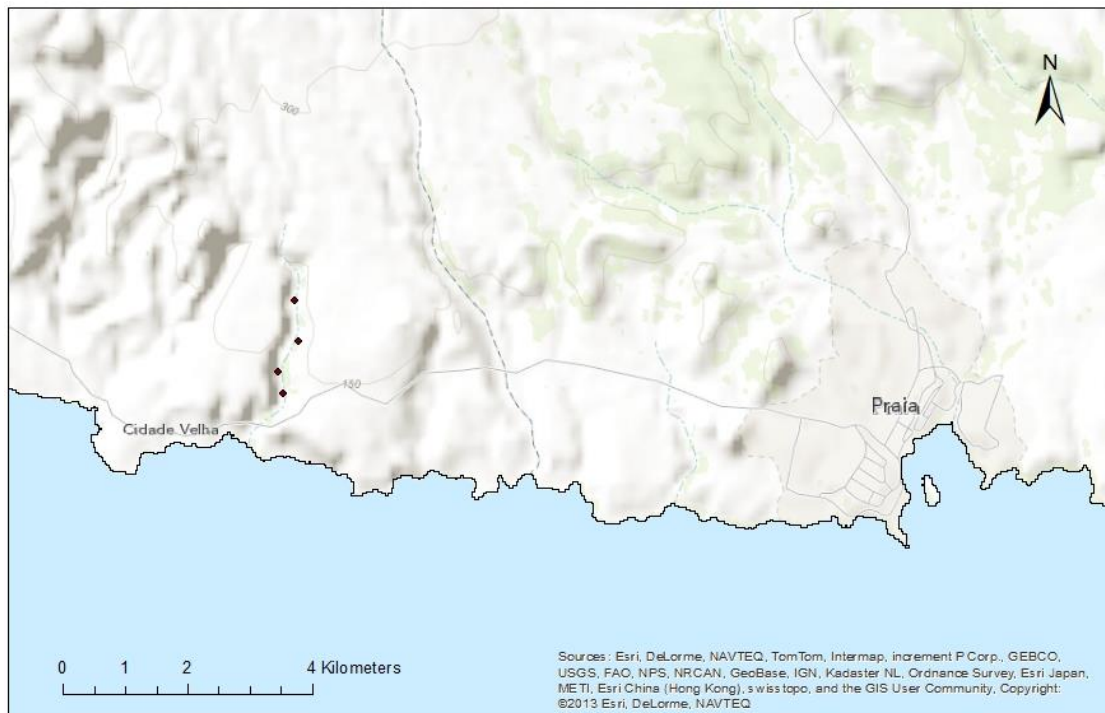


Figure 5 - Sites where Cape Verde warblers were sampled in the south of Santiago.

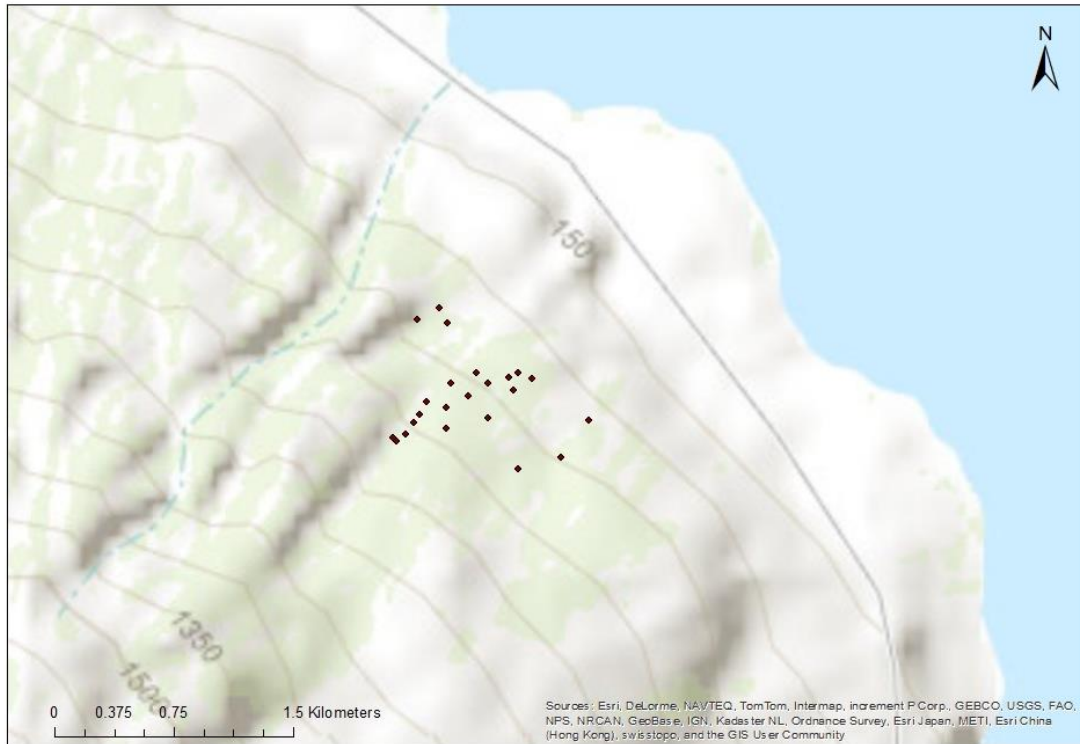


Figure 6 - Overview of the sites where Cape Verde warblers were sampled on Fogo.

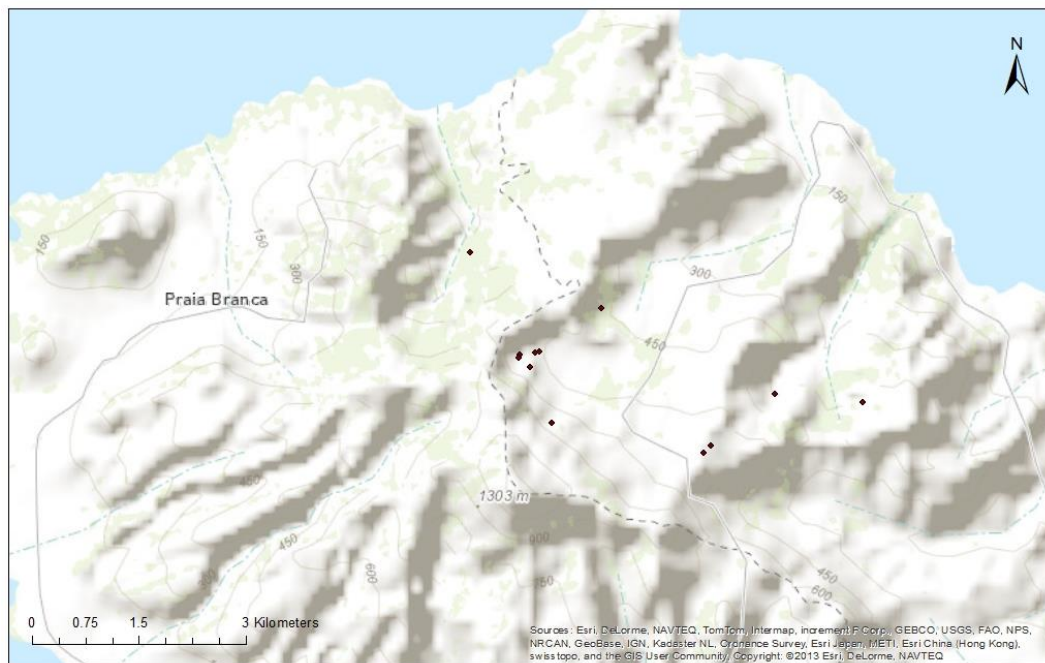


Figure 7 - Overview of the sites where Cape Verde warblers were sampled on São Nicolau.

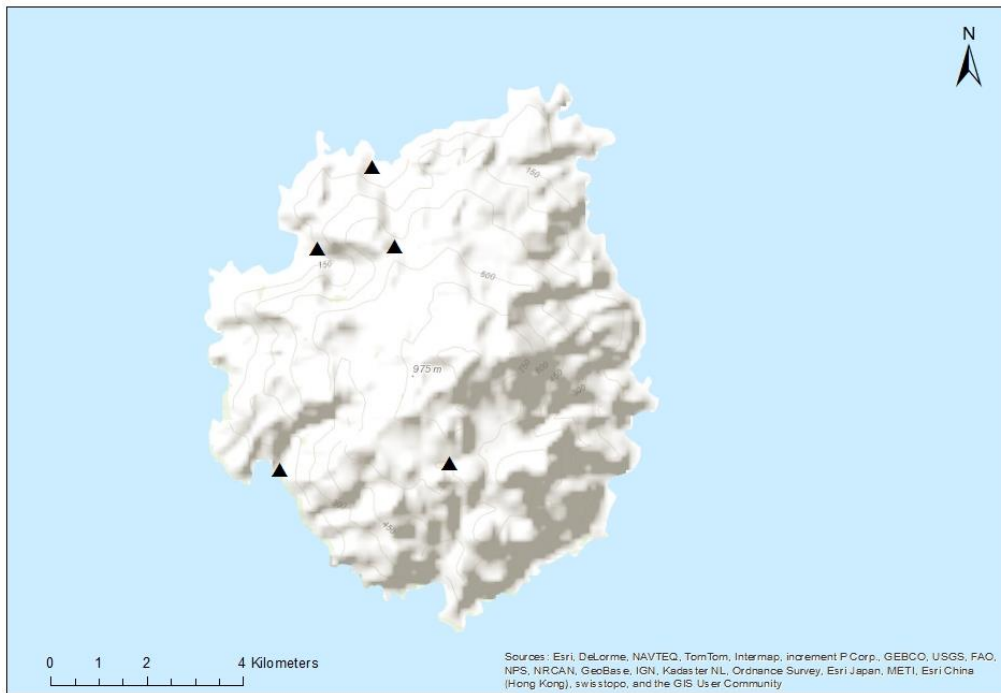


Figure 8 - Sites where we searched for the Cape Verde warbler on Brava.

4. Fieldwork photos

Santiago



Figure 9 - Field assistant Andrew Power looking for Cape Verde warblers (and other birds) in Barragem do Poilão with Gilson Semedo, from INIDA (November 2013). Photo by Helena Batalha.



Figure 10 – Setting up and checking mist-nets, and ringing Cape Verde warblers with José Evaldino Pereira and other staff from Serra Malagueta Natural Park (December 2013). Photos by Jaelsa Moreira.



Figure 11 - Jaelsa Moreira writing down the data in Serra Malagueta (left) and examining a ringed Cape Verde warbler in Cidade Velha (right; December 2013). Photos by Fearon Cassidy and Helena Batalha.

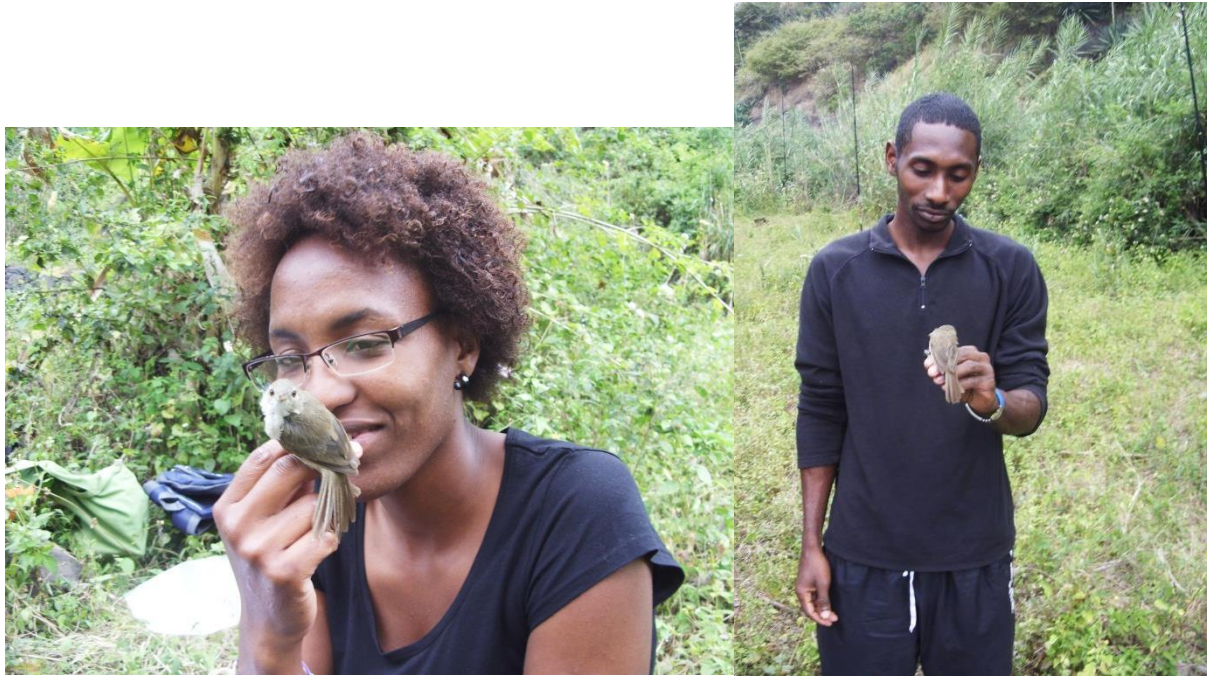


Figure 12 - After helping setting up the mist-nets and processing the bird, Jaelsa Moreira and Gilson Semedo (INIDA) with one of the ringed Cape Verde warblers in S. Jorge dos Órgãos. Photos by Helena Batalha.

Fogo



Figure 13 - The team working with assistance from Alexandre Nevsky and Herculano Dinis from Fogo Natural Park (left); Alexandre Nevsky (Director of Fogo Natural Park) releasing a ringed Cape Verde warbler (right; December 2013). Photos by Josh Jenkins Shaw and Andrew Power.



Figure 14 - The team working with Nené on the coffee plantations of Fogo (December 2013). Photos by Andrew Power.

São Nicolau



Figure 15 - The team going down Ribeira Fragata with Maria Auxiliadora Nascimento (Monte Gordo Natural Park); the first time Maria Auxiliadora Nascimento saw a Cape Verde warbler held in the hand (January 2014). Photos by Helena Batalha.



Figure 16 - Floriano da Cruz Duarte (Monte Gordo National Park) holding a ringed Cape Verde warbler for the first time (January 2014). Photo by Helena Batalha.



Figure 17 - Assessing efficiency of the use of playbacks for Cape Verde warbler censuses: Floriano da Cruz Duarte and Maria Auxiliadora Nascimento (Monte Cintinha, left photo); Jaelsa Moreira and Nelson Rosário Santana (Canto Fajã, right photo; January 2014). Photos by Helena Batalha.



Figure 18 - A rare opportunity: the son of Maria Auxiliadora Nascimento looking at one of the ringed Cape Verde warblers, in Ribeira Tucudo (January 2014). Photo by Helena Batalha.

5. Feedback from our field assistant

Dear Sir/Madam,

I take great honour to write this letter to you to recommend Helena Batalha's application to African Bird Club Expedition Award.

I have had the opportunity to be her campus assistant in Cape Verde as a local people in the project "Conservation, ecology and genetic of Cape Verde Warbler - *Acrocephalus brevipennis* from December 01, 2014 to January 28, 2014.

During the fieldwork here, Helena's paid all my expenses with food, transport and accommodation as well my salary.

I learned the techniques of assembling nets, handling the birds and make birds measurement, identify the habitat as well as song and behavior of *Acrocephalus brevipennis*.

My most memorable experience in this fieldwork were a tremendous learning experience to interact with people from such a wide range academic and cultural backgrounds.

I learned a lot about the practicalities and logistics of research, how to work with a variety of people from government workers, to local people to other scientists.

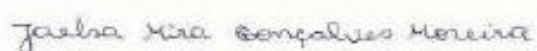
I am confident that both the professional and personal relationships formed over the past two months will reach far into the future and the shared collective experience in Cape Verde Warbler conservation is one that will not be easily forgotten.

Lastly, the life as a Helena's assistant were a journey, everyday one adventure. I really loved to work with her in this greatest project.

Thank you for your attention,

Best regards,

Praia, February 26, 2014



Support letter written by our former Cape Verdean field assistant Jaelsa Moreira for another funding application. Used here with her permission.

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