Safeguarding the Future of the Galapagos Penguin and Flightless Cormorant

A report for the Truell Charitable Foundation

Summary

To date, basic data has been collected which allows scientists conducting the project to keep a close eye on the population status of both the Galapagos Penguin and Flightless Cormorant. This data includes recording the number of birds captured (and hence tagged) and recaptured, their age, nesting activity and location. It is then fed into modelling software and the results produced form part of the historic annual census data.

It is important to keep a close eye on these two species because both are endemic, found in limited locations, exist in very small numbers and their status can be severely affected by a number of factors; El Nino, introduced species, disease, over fishing pressures and expanding tourism pressures. They are also very good indicators of the 'health' of their surrounding ecosystem and assist the Galapagos National Park (GNP) in making management decisions, not only for the birds but for the entire habitat in which they live.

In this report we include a short summary on the project to date, and a narrative on the rationale behind the project, which includes questions that we put to CDF following the last reporting period and information about the team who are carrying out the study.

A full analysis of data collected in 2012 is due to be presented to the GNP at the end of the year and a summary of this report will make up the body of the next report that we send to the Truell Charitable Foundation (TCF) in the new year. In the meantime we hope that the rationale and background section gives you further information on why the project is so important to the conservation for, not only to the future of the Galapagos Penguin and Flightless Cormorant, but also to their surrounding habitat.

Without the support from the TCF this vital work could not take place and we are extremely grateful for the Foundation's support.

Project update

The work plan for 2012 is mainly on schedule with two of the four planned field trips already taking place and all the necessary data being collected. The two tables below show some of the basic data that was collected during the March and June trips.

		Monitoring trip			
Penguin data		**Mar 2012**	**Jun 2012**	**Sep 2012**	**Dec 2012**
Mark-Recapture	Total No. Penguins captured	61	49		
	First time captured	26	22		
	Recaptured	35	27		
Age distribution	Adults	60			
	Juveniles	1			
Nesting	Total No. Nests	55			
	No. Active nests	4	0		
Location	Caleta Iguana	14	15		
	Pajas	18	15		
	Marielas	29	19		

Cormorant data		Mar 2012	Jun 2012	Sep 2012	Dec 2012
Mark-Recapture	Total no. Cormorants captured	48	38		
	First time captured	23	14		
	Recaptured	25	24		
Age distribution	Adults	42	36		
	Juveniles	6	2		
Nesting	Total No. Nests				
	No. Active nests	23	10		
Location	Carlos Valle	9	8		
	Playa Escondida	13	8		
	Albemarle	26	22		

Four oceanic loggers - instruments that record and store measurements of temperature, pressure, conductivity, tidal flow and other events over a period of time - have been installed in selected areas at a depth of 10 metres. Four more are still to be installed.

A delay has occurred in the delivery of the weather stations and these will now be installed during the September trip.

Scholarship student, Patricio, is now a well-established member of the team and has already collected samples where early results have shown that tapeworms, roundworms and amoebas are present.

A workshop also took place in May, which was facilitated by experts Dr Paul Doherty and Kate Huyvaert. Project and CDF staff were trained in the analysis of Mark-capture-recapture data, using a programme called MARK. This was extremely valuable training, which helped towards the long terms objectives of the project.

Finally collaboration with the two universities of St Louis - Missouri and Washington continues. Samples have been collected and sent to St Louis - Missouri for analysis and they are conducting studies on bird health, particularly on Avian Malaria (Plasmodrium sp) parasites among the Galapagos Penguin. Contact is being maintained with the University of Washington, who are conducting studies on reproductive success for Galapagos Penguins using 'condominiums' constructed in areas which are not impacted by invasive species. This group is expected to visit in 2012, but a date has not yet been confirmed (GCT was approached to support this work and unfortunately was unable to fund it; they may be waiting to secure funding before carrying out this work).

Rationale and background to the project

We asked the Charles Darwin Foundation a number of questions about this project and here are some of Gustavo's, the project leader's, answers:

Changes to the methodology

1) Why is the new methodology better than the one previously used? Does this make the years of historic data irrelevant?

Gustavo - The methodology used up to the year 2009 was based on a direct count by observing penguins or cormorants in the ten established coastal zones. The count took place between 6am and 6pm with one hour's break each day for ten days. A percentage was applied to this number to arrive at the final result. This work was very labour-intensive, and daily variations were common. Although this methodology enabled us to calculate population size and distribution, it did not help us to get data on survival and the factors affecting this.

Regression analysis used on data collected between the 1970's and 2009 identified which zones over time represented the greatest numbers of penguins and cormorants. This enabled us to reduce the number of zones to be monitored to four representative zones rather than the ten original ones. We can obtain the same results but at greater efficiency.

There remained many unanswered questions, especially about survival rates and associated factors. Long term monitoring based on the mark-recapture of individuals for a period of at least five years gives much more solid data on what is happening to these two species, it illuminates on a quarterly basis what is happening in the selected colonies over the long term, and it gives us answers that are relevant to the populations in general. For this reason we selected monitoring colonies for the greatest number of individuals counted in the historical census, ease of access, and to give a variation in their environment and oceanographic features.

With the new methodology we are aiming to:

- Continue to track population tendencies through counts in the four selected zones which can be compared with historic data
- Obtain long-term survival data over 3 and ideally 5 years, to understand population trends and the factors affecting them
- Understand better how penguins and cormorants respond to environmental and oceanographic factors
- Build a registry of diseases found among penguins and cormorants

Figure 1 below shows how the different methodologies produce similar results.

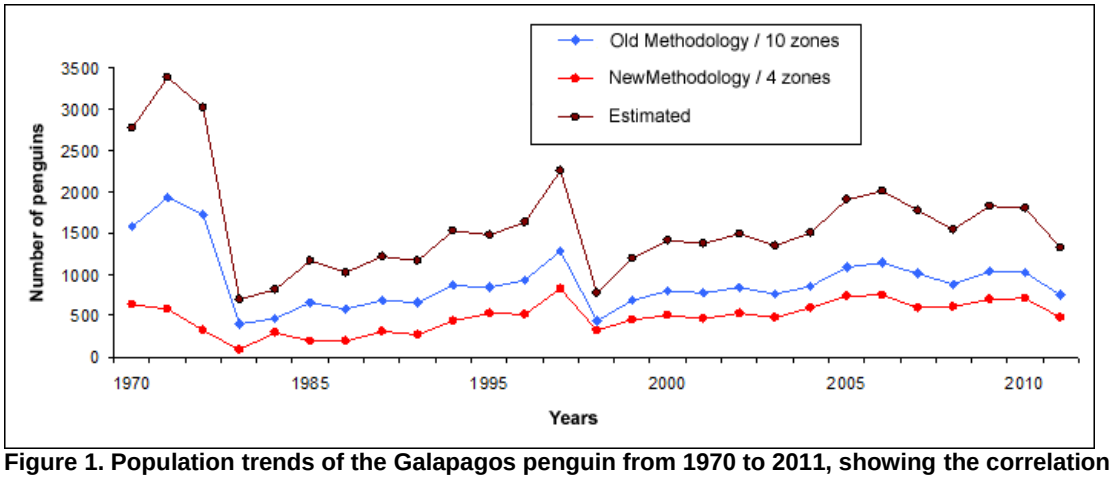

Figure 1. Population trends of the Galapagos penguin from 1970 to 2011, showing the correlation between the count in all zones which previously required more cost per unit/effort, and the four zones under the new methodology which obtains the same results with less effort.

2) Why has the project gone from two to four surveys a year? Is this now the long term plan, and how might the availability of funding affect this?

Gustavo - To fully investigate the matter of survival of the penguins and cormorants, it is necessary to intensify mark-recapture work in the first few years. This can be reduced after the third year, to three surveys annually: two exclusively for captures and one to continue gathering data on population trends and distribution.

If funding were not available, it would not be possible to carry out four trips per year, but there should at least be two trips annually: one for capture and one for population trends, but in this scenario the information would be incomplete as a mark-recapture programme to be effective needs to be maintained at a high level of activity for at least three years and ideally for five.

Working with the Galapagos National Park

3) What are the management decisions, made by the GNP, that are informed by this data?

Gustavo - Raw data is returned from field trips; these then need to be processed and analysed to get concrete information and recommendations which can be used to develop management action plans for the penguin and cormorant. Written reports are provided to the Galapagos National Park, and meetings are also organised where CDF and the GNP keep one another up to date on plans and work being carried out. In these meetings we also discuss whether any aspect of the project should be changed or augmented.

4) What is the feedback received from the Park?

Gustavo - This is a joint (GNP-CDF) project and the two organisations work together to plan and carry out the field trips. As a result of the knowledge gained from regular monitoring, the GNP is developing work programmes in relation to the introduced species which affect penguins and cormorants and the information is also fed into plans to define levels of protection in the zones.

The future and the need

5) What is the urgency of this funding and how has it helped to conserve these endemic, endangered species?

Gustavo - The penguin and cormorant monitoring is an ongoing project which is crucial to the long-term conservation of these endemic flightless birds. It will provide essential data to determine whether their populations are stable, increasing, or decreasing, and to diagnose the causes of population change. This will allow the GNP to take science-based management actions to protect these endemic seabird species and their habitats. The main populations of both species are in the far west of the Archipelago, and for this reason annual monitoring is carried out of both simultaneously.

Flightless birds such as the Galapagos Penguin and Flightless Cormorant are disadvantaged in that although they are perfectly adapted to their normal environments, they cannot easily escape from external threats. However, introduced species, disease, and over-fishing pressures, as well as the potential effects of the expanding tourism industry are increasingly threatening the long term conservation of these unique birds and their ecosystems. The Galapagos penguin faces a 30% probability of extinction in the next 100 years due to the effect of more frequent and stronger El Nino episodes. The recent detection of a Plasmodium sp. parasite, indicating the possibility of avian malaria in penguins, is also of concern. The probability of extinction increases even more when adult birds die from predation by exotic species such as feral cats which attack adult and juvenile penguins on Isabela island, or from entanglement in fishing nets.

Because these species are limited in their ability to move within the Archipelago they provide a very strong indicator of ecosystem health. Research has also shown that the Flightless Cormorant, like the Galapagos Penguin, is very vulnerable to changes in sea temperature and sea levels; from studying the impacts of El Nino/La Nina fluctuations, we know that when their preferred food (fish) seek cooler water they do not do well. Research on their movement patterns shows that they do not travel far from the nesting area to feed, and in the event of a rise in sea level caused by global warming, their nesting areas could be threatened by flooding.

To help current and future management of penguin and cormorant populations, we need to know how El Nino affects demographic parameters and how individuals are affected by local environmental variation and by other threats such as invasive species, fisheries and tourism activities. With these data, we can provide scientifically based advice to the GNP that will help them to manage these populations.

6) What will happen if funding is not received moving forward?

Gustavo - If funding were to be halted, the project would have to close and we would be unable to pursue the long term objectives of understanding population trends, disease, and vulnerability to climatic variation which are important for the conservation of these species. In a worst case scenario, emerging factors including disease and food shortages could be seriously affecting these

rare birds and we would have no early warning of it and thus no ability to respond until perhaps it was too late.

7) What are the future plans for the project – in the next 5, 10 years?

Gustavo - In the medium term we hope to able to acquire at least 3 and preferably 5 years of continuous data. New issues are likely to emerge during this period. One example is the presence of avian malaria among penguins; ten years ago there were no reported incidence of Plasmodium in the Islands, but now there are. Over ten years, the availability and variety of food in the Galapagos Marine Reserve can change, and this affects penguins and cormorants' reproductive and feeding behaviours as it does other sea birds.

Collaboration

8) What other work is taking place in Galapagos? Who else is working with these two species? How do you ensure that the penguins are not being captured too often by all the organisations working on different projects and how do you communicate with each other so that you all ensure that costs are being saved wherever possible and that work is not being duplicated?

Gustavo - The other projects working with penguin and cormorant species in Galapagos are: the GNP (population trends), Patty Parker of the University of Missouri – St. Louis (bird diseases), Dee Boersma of University of Washington (penguin artificial nesting sites) and Kate Huyvaert (MARK programme).

CDF researchers keep in contact with each of these via email or by meeting with them when they are in the Islands. Trips are organised and objectives discussed. The only groups that handle the birds addressed in this project are the CDF with support from the GNP, and Boersma when she is in the Islands assists this project with tagging of only previously non-tagged individuals. In the event of a recapture, this takes place quickly as there is no need to take measurements and samples.

We ensure that research objectives and studies do not overlap. In each case for example, Parker is focusing on the subject of the carriers of bird disease, while Huyvaert helps this project with statistical analysis.

We also have external collaborations which enhance this project. In January of 2012 CDF was represented at a meeting of the Important Bird Areas (IBAS) network organised by the National Audobon Society (Panama) and BirdLife International, where representatives discussed IBAS in Mesoamerica, in other words from the centre of the US to the north of Peru, which includes Galapagos. We presented a report on our work in the Galapagos IBAS zones, where the penguin and cormorant, among other species, are priorities. The topic of IBAS is important for the protection and conservation of marine birds as it provides significant support for conservation managers.

9) How do you ensure that the penguins are not receiving multiple tags from different organisations and that they are handled as little as possible?

Gustavo - The GNP is a collaborator in this project and is responsible for giving research permits to each study. They maintain an overview of all the work and the wellbeing of the birds is of paramount importance to them.

Meet the team


Survey team December 2011


Survey team March 2012


Survey team June 2012

Director: Volker Koch, PhD

Volker joined CDF as Director of Marine and Coastal Sciences in March 2011 and has managerial oversight of the Penguin and Cormorant Project. He was part of the field team in September 2011.

Investigator: Dr Gustavo Aníbal Jiménez-Uzcátegui, DVM



Gustavo is the leader of this project and has worked with the Galapagos Penguin and Cormorant survey since 2005, when he worked side by side with Dr Hernan Vargas, who received support from GCT while developing his PhD thesis at Oxford University. He was a Guide in Pasochoa Reserve, Ecuador for 7 years, and worked in the Guayllabamba Zoo and in Veterinarian Clinics. In 2000, he graduated as DVM (Doctor of Veterinary Medicine) from the Agrarian University of Ecuador (Guayaquil, Ecuador), followed by a specialist Diploma in Wildlife Veterinary Medicine from the University of Tolima (Santiago de Cali – Colombia) in 2004.

In Galapagos, he began work in 2001 as a CDF volunteer, working on Avian Pox in Santa Cruz, bird mortality in the lagoons of the Isabela island, and a health study of Galapagos Giant Tortoises on Santa Cruz island. Since then he has contributed towards and led a number of scientific investigations with a particular emphasis on sea birds and avian disease. Gustavo spends his time working on the Penguin and Cormorant project, the Albatross project and as Curator of the Vertebrate Collection at the Charles Darwin Research Station, and works as Wildlife Veterinarian with different species and as CDF Ornithologist. He also provides veterinary support to the GNP's Captive Breeding programmes.

Gustavo lives in Puerto Ayora, Santa Cruz island, and has a three year old son with his wife Corina Gallardo.

Gustavo says: “The Galapagos Penguin and Flightless Cormorant populations have recovered little by little from the effects of the last severe El Nino event in 1998. In the penguin’s case, it is very clear that they have not yet fully recovered when we compare current data with the data collected in the seventies, when the population was more than twice its present size. And while the number of cormorants has been increasing rapidly, with a record high in 2006, in recent years the population figures have been falling and rising regularly. Although we do not yet have a complete and clear analysis, we can say that these are stable populations, but this means that given the threats that they face, joint action plans with the GNP can help these species to survive in the longer term are required. For this reason we have deepened the scope of this project, to enable us to make the best management plans possible.”

Assistant Researcher: Alizon Llerena

Alizon has a degree in Biological Sciences from the Technical University of Ambato, and graduated in 1996. She first came to Galapagos in 1997 to volunteer in the then Vertebrates and Terrestrial Monitoring area of CDF. Since then she has worked with the endemic fauna of the Islands, mainly with reptiles. In 2010 she coordinated the bi-institutional (GNP/CDF) Marine Turtle monitoring project on behalf of the CDF, and from 2011 she has coordinated the terrestrial reptile projects. She has also assisted with ornithological research, and in the first six months of 2011 carried out monitoring of the penguin population which has established in Puerto Villamil, on Isabela island.

Alizon has a five year old son, who shares her love of nature and conservation.

Alizon says: “I understand the importance of studying the Galapagos Penguins and Flightless Cormorants, as they are two unique charismatic species and are extremely vulnerable. Their ecological stability in the Islands depends greatly on marine environmental conditions, as well as on the conservation of their terrestrial environment. I see my role as protecting and conserving all species found in the Galapagos Islands.”

Scholarship student: Patricio Carrera

Patricio is from Quito, and is a student of Veterinary Medicine and Zoology of the Central University of Ecuador. From a very early age, he felt an affinity with animals and nature. He did his primary and secondary studies in the La Salle educational unit and the Eloy Alfaro Military School in Quito. He has spent short periods in veterinary clinics and his dream is to actively support the conservation of wildlife in his country.

Patricio says: ”In my three monitoring trips as a thesis student, I have observed that the Galapagos Penguin has a stable population, but it faces daily threats such as pollution from tourism boats when organic waste and oil is thrown overboard, being caught in fishing nets, and predation by feral cats. The Flightless Cormorant seems to have gone down in numbers between December and March, and it also faces threats from tourism and predation. For this reason, tourism controls and the removal of predatory introduced animals are important.”

We hope that this gives the Truell Charitable Foundation a good insight into this long-term project that they have funded. In our next report, in the new year, we look forward to sharing more technical data and the recommendations that are due to be presented to the GNP with you.

Once again we are extremely grateful to TCF for its continued support of this work. Thank you very much indeed.

Abigail Rowley
Events and Fundraising Manager
20 July 2012

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