



Report on
**UNEP/CMS Thesis Award on Migratory Species Conservation
2011**

sponsored by

Deutsche Lufthansa

Impressum

This report on the results of the “UNEP/CMS Thesis Award 2011” (winner elected 20th September 2011) in Bonn was compiled by Ann-Sybil Kuckuk (ZFMK, Bonn), Julia Karolina Lis (UNEP/CMS, Bonn) and Amalia Oganjanyan (UNEP/CMS, Bonn).

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The online-version of this document is available on the Convention’s web-page which can be found at <http://www.cms.int/>

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On the occasion of the
10th Conference of the Parties to the
Convention on Migratory Species (UNEP/CMS)
Lufthansa is offering
an award for the most outstanding PhD thesis on the biology of
migratory species of wild animals:

Thesis Award on Migratory Species Conservation

The award, amounting to

€ 10,000

is conferred every three years at the Conference of the Parties to the Convention in affiliation with Museum Koenig. The third Thesis Award will be presented at the 10th Conference of the Parties in 2011.

http://www.cms.int/thesis_award



PREFACE

On the occasion of the 25th Anniversary of the Convention on the Conservation of Migratory Species of Wild Animals (UNEP/CMS or Bonn Convention), Lufthansa donated an Award of €10,000 for the most outstanding PhD thesis on the biology of migratory species of wild animals . In 2011 the CMS Thesis Award took place for the third time.

All dissertations have already been accepted and evaluated by the specially selected Jury. Therefore, we can take it for granted that they are scientifically and methodologically sound. But the main focus of the evaluation of a scientifically solid dissertation should be the potential value of the study for CMS and the conservation of migratory animals.

The granting of the Award takes place every three years to coincide with the CMS Conference of the Parties (COP), which will next take place in Bergen, Norway 20-25 November 2011. The winner attends the COP, presents his/her work and explains his/her further plans. An outline of the importance for CMS should be clarified through a conservation statement.

For the UNEP/CMS Thesis Award 2011, 61 applicants from 25 countries submitted theses. Most of the abstracts received were interesting and valuable contributions to our knowledge of migratory species. The competition was fierce - many respectable young scientists decided to take part and submitted important work on understanding current and future problems of migrating species.

INTRODUCTION

UNEP/CMS Thesis Award on Migratory Species Conservation

For the promotion of scientific co-operation (basic research) and applied nature protection the Secretariat of the Bonn Convention on Migratory Species has established a prize for the best thesis in the field of migratory species. The reason is that scientific results from the basic research often flow into nature protection practice after a delay of many years. Particularly the international nature conservation sector, which is essential for the protection of migratory species, has benefited over the past years from new methods, such as satellite telemetry, DNA-fingerprinting and so forth. Migration routes can be mapped more exactly and the level of threat of individual populations can be measured better.

The Award should point out positive examples of co-operation between organizations and scientists internationally engaged in nature protection and help to intensify and improve collaboration. Work accepted includes finished doctoral theses with scientific results having direct effects on the protection of migratory animal species or results that can be implemented in nature conservation measures. An acknowledged educational institution must have accepted the work as a dissertation thesis. At the first selection phase a committee consisting of international experts shortlists the theses. As the further step specially elected Jury meets in Bonn and votes for the winner and laureates of the Thesis Award.

The applicant must register on an online database and provide an English translation of the title and an English summary as well as references to the candidate's articles reviewed by journals so far. Only after a pre-selection, the complete version of the doctoral thesis will be requested for further examination.

The Award ceremony takes place every three years on the occasion of the Conference of Parties of the Bonn Convention (COP) at various locations and this time at the 10th meeting of the CMS COP in Norway 2011. Lufthansa will donate the prize.

The awareness of the Thesis Award and the Conservation Statement of UNEP/CMS is increasing steadily inter alia through the raising amount of participants which followed the call for applications every three years. (Fig.1)

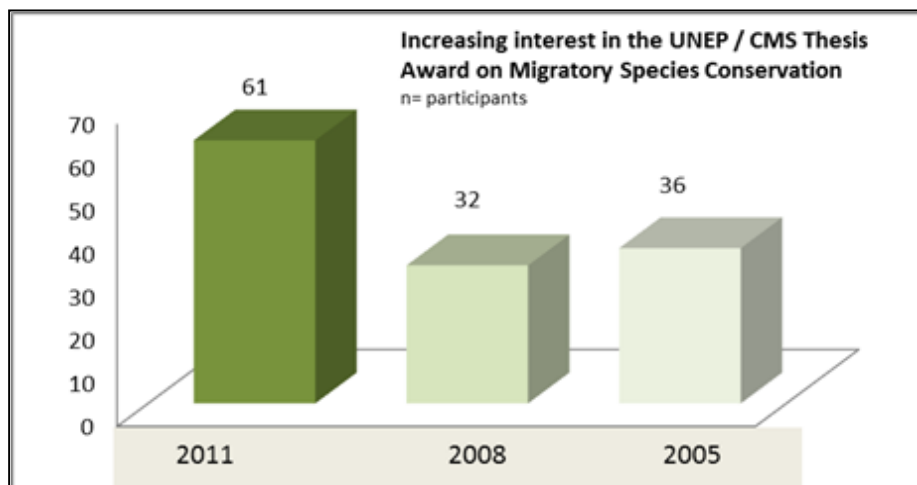


Fig.1

The selection process of the Thesis Award has required a great deal of effort on the part of the Thesis Award coordinators and the international experts, who reviewed the theses with appropriate subject knowledge. We are pleased with the very positive response to the call for applications this year, resulting in a total of 61 candidates from 25 countries on five continents.

The topics covered in the 61 theses varied greatly but the categories *bird* and *fish* were the most popular subjects for the 2011 application call.

THE WINNER OF THE THESIS AWARD 2011 LUCY KING

The jury selected as the winner Dr Lucy King for her work on **“The interaction between the African elephant (*Loxodonta africana africana*) and the African honeybee (*Apis mellifera scutellata*) and its potential application as an elephant deterrent”**.

With her thesis Dr King made a unique discovery that African elephants will avoid feeding on acacia trees that host beehives, either empty or occupied by African honey bees. The relevance to the vision and goals of UNEP/CMS to protect and improve the conservation status of migratory animals as well as sophisticated structure and methodology presented in the thesis were the main factor in the Jury’s choice.



Dr King lives in Kenya. In 2010 she received her Ph.D. in Zoology and Biology with her thesis from the Balliol College, University of Oxford, UK. At the moment she is employed at the Save the Elephants, Kenya, as DPhil Researcher and Chief Operations Officer where she is an integral part of STE’s research and conducts elephant behavioural and communication studies in Samburu National Reserve. Lucy King works with rural farmers from Turkana, Kikuyu and Samburu tribes who suffer from human-wildlife conflict issues, and she has developed a unique crop-raiding deterrent system using beehives to keep elephants out of farmers’ crops. She also manages fundraising proposals, financial management and research logistics to assist the overall charity’s research and fundraising goals

Lucy King has been employed by Quest Overseas Ltd as Managing Director & Africa Operations Director and Africa Operations Manager & Expedition Leader. Her goals there were the growth of a small project and expedition company and the establishing new African projects to take the ethos and conservation ideals established in 1996 in the South American projects over to sub Saharan Africa. Lucy King also worked with the Lubombo Conservancy TFCA Conservation Project, Swaziland; Community Development Project, Tanzania, and Water Relief Project, Kenya.

In affiliation with the Kenyan NGO Excellent Development, Lucy King organised two QO teams to raise money to build 6 sand dams in a drought-ridden region of Kenya, Machakos. All three projects are still running successfully.

She participated in several expeditions. In total Dr King visited has visited 53 countries on 6 continents.

PROTOCOL OF THE 3rd MEETING OF THE THESIS AWARD JURY**Participants of the meeting:****Experts**

1. Wolfgang Böhme, *ZFMK*, Former assistant Director, Former Direction Department Vertebrates.
2. Pierre Devillers, *Scientific Council CMS*, Vice-Chairman/ *Institut Royal des Sciences Naturelles de Belgique (IRSNB)*.
3. Borja Heredia, *Convention on Migratory Species (CMS)*, Scientific and Technical Officer.
4. René Marie Lafontaine, *Institut Royal des Sciences Naturelles de Belgique*.
5. Patricia Mergen, *Biodiversity Information and Cybertaxonomy Royal Museum for Central Africa*, Director.
6. Elizabeth Maruma Mrema, *CMS*, Executive Secretary.
7. Manfred Niekisch, *Frankfurt Zoological Garden*, Director.
8. Klaus Riede, *ZFMK*, Assistant of the Director, third-party funds projects.
9. Francisco Rilla Manta, *CMS*, Information and capacity building Officer.
10. Dennis Rödder, *ZFMK*, Direction Department Vertebrates, Curator Herpetology.
11. Fernando Spina, *CMS*, Scientific Councilor/ *Italian Ringing Center*, Director.
12. Ralf Sonntag, *International Fund for Animal Welfare (IFAW) Hamburg*, Director/ *ZFMK* (invited jury member).
13. Wolfgang Wägele, *ZFMK*, Director. **Also votes for Mr. Lutz Lämmerhold, Lufthansa.**
14. André Weller, *Zoologisches Forschungsmuseum Alexander Koenig (ZFMK)*, Research Assistant, Section of Ornithology/ *Brehm Fund for International Bird Conservation e.V.*

Coordinators and assistants

15. Veronika Lenarz, *CMS*, Public Information Assistant.
16. Ann-Sybil Kuckuk, *ZFMK*, coordinator.
17. Amalia Oganjanyan, *CMS*, intern.
18. Julia Karolina Lis, *CMS*, former intern.
19. Darinka Blies, *CMS*, intern.

AgendaTuesday, 20th September 2011Ornithological Library at the *Zoologisches Forschungsmuseum Alexander Koenig*, Museumsmeile
Adenauerallee 160, 53113 Bonn, Germany

Timeframe	Description	Presented by
11:00 – 11:20	Welcome from ZFMK	Prof. Dr. Wolfgang Wägele
	The Thesis Award; Role of CMS in Conservation	Elizabeth Mrema
	Introduction of the Jury, information of the members of the Jury and Information about the procedure	
11:20 – 11:50	Short introduction round from all jury members	All jury members
	Rules and criteria General Information	Klaus Riede
	Presentation of the Top 14 theses and presentation of the preliminary evaluations	
11:50 – 13:00	Presentation of the Top 14	Chair: Klaus Riede
	Summarizing the salient features of each dissertation	
	After each thesis a short discussion of the positive and negative aspects	
	Lunch	Museum Koenig (Bistro)
13:00 – 14:00	One-hour lunch break at Museum Koenig	
14:00 – 15:00	Discussion and Voting	Klaus Riede/Francisco Rilla
	Announcement of the winner	
15:00 – 16:00	The winner and the three CMS-Laureates	Klaus Riede
	Reading and signing of the declarations	
	Acknowledgements	Klaus Riede /Francisco Rilla
	End of Session	

Chair: Dr Klaus Riede

Beginning

Prof. Dr Wolfgang Wägele welcomed all participants of the Jury meeting and briefly introduced the Thesis Award and on the valuable role of the CMS. Prof. Dr. Wägele emphasized the importance of the sponsor Lufthansa, thanked Museum Koenig (ZFMK) for the friendly welcome and proud to participate in such a meaningful event.

Ms Elizabeth Mrema shortly presented the background of the Thesis Award. She reminded the jury of the uniqueness of CMS and pointed out that achievements presented in the theses could be a major contribution to the CMS work. Ms Mrema thanked the Museum Koenig, Prof. Dr Waegele and Dr Riede, as well as Lufthansa for their financial support and compared the objectives of the CMS with those of the airline company by describing the possibility of connection of sites through flyways and corridors. She also drew links to the COP 10 in Norway and to its slogan “Networking for Migratory Species”.

Dr Klaus Riede introduced the Jury members. He thanked all reviewers of the theses for their support and briefly noted on the difficulties and the importance of the selection process. Dr Riede highlighted the importance of the Thesis Award to make the work of the CMS and conservation of species more visible, and expressed a hope to keep the financial support of a sponsor.

Introduction of the Jury, information of the members of the Jury and Information about the procedure, rules and criteria for the decision-making.

All members of the jury shortly introduced themselves.

Rules and criteria:

- Dissertations should be useful to the CMS conservation goals
- In case of multi-authorships, the candidate's contribution should be clearly recognizable

General information:

- Mr. Lämmerhold was represented by Prof. Dr Wolfgang Wägele, so Prof. Dr Wolfgang Wägele had two votes.
- 61 candidates from 25 countries submitted their dissertation abstract online, which shows that the scientific community takes interest in the work of CMS
- Out of 61 candidates, 14 were shortlisted to be considered by the final Jury. All these candidates are allowed to use the nomination, for example as a reference in applications.

Presentation of the Top 14 theses and presentation of the preliminary evaluations

The Top 14 were introduced by Dr Klaus Riede in a brief PowerPoint Presentation, summarizing the salient features of each dissertation. Each thesis presentation was followed by a short discussion of its positive and negative aspects.

After the presentation of the last thesis a general discussion was held about all theses, which ended in the election of the winner and laureates.

Table of Top-14

ID	TITLE	AUTHOR	COUNTRY
47	Grassland Birds in Natural and Cultivated Grasslands in the Northern Campos of Uruguay: Diversity Patterns, Responses to Vegetation Structure and Nest Survival	Adrián B. Azpiroz	Uruguay
7	Spatial models and risk assessments to inform marine planning at ecosystem-scales: seagrasses and dugongs as a case study	Alana Grech	Australia
33	Population Genetic Structure of Sea Turtles in Macaronesia	Catalina Monzón Argüello	UK
46	Travels to feed and food to breed - The annual cycle of a migratory raptor, Montagu's harrier, in a modern world	Christiane Trierweiler	Netherlands
13	Movement patterns, habitat preferences, and fisheries biology of the common thresher shark (<i>Alopias vulpinus</i>) in the Southern California Bight	Daniel P. Cartamil	USA
57	The Pomeranian population of the Aquatic Warbler (<i>Acrocephalus paludicola</i>) - habitat selection and management	Franziska Tanneberger	Germany

31	Satellite Tracking Reveals Movement, Behavior, and Distribution of Endangered Leatherback Turtles (<i>Dermochelys coriacea</i>) in the Eastern Tropical and Southeastern Pacific: Implications for Conservation	George Lewis Shillinger	USA
4	Ecological Implications of Food and Predation Risk for Herbivores in the Serengeti	J. Grant C. Hopcraft	UK
51	Ecology and conservation of albatrosses and petrels at sea off Brazil	Leandro Bugoni	Brazil
8	Population structure and foraging ecology of southern right whales (<i>Eubalaena australis</i>): insights from isotopic and genetic analyses	Luciano O. Valenzuela	USA
61	The interaction between the African elephant (<i>Loxodonta africana africana</i>) and the African honeybee (<i>Apis mellifera scutellata</i>) and its potential application as an elephant deterrent.	Lucy E. King	Kenya
27	Vulnerability of sea turtles to climate change: a case study within the northern Great Barrier Reef green turtle population	Mariana Fuentes	Australia
48	The biology of Eleonora's Falcon: Migration routes and etho-ecology in its wintering area Madagascar	Marion Gschweng	Germany
39	Ecology, demography and conservation of a rare game species : the Red-crested Pochard <i>Netta rufina</i>	Pierre Defos du Rau	France

Adrián B. Azpiroz**E-Mail:** azpiroz@iibce.edu.uy**Phone Number:** (+ 598 2) 622 74 12**Institution:** Laboratorio de Genética de la Conservación, Instituto de Investigaciones Biológicas Clemente Estable**Street:** Av. Italia 3318**City:** Montevideo, 11600**Country:** Uruguay**Title:** Grassland Birds in Natural and Cultivated Grasslands in the Northern Campos of Uruguay: Diversity Patterns, Responses to Vegetation Structure and Nest Survival**Subject/ Field of Research:** Ecology, Biology and Avian Ecology**Date of Graduation:** August 2008**Educational Institute/ University:** University of Missouri-St. Louis, Missouri, USA**Short Statement:**

Grassland bird populations are declining widely as a consequence of habitat modification and this has generated substantial effort to determine how grassland species cope with changes in habitat features especially in agricultural landscapes. Grassland bird research has concentrated in North America and Europe where changes in bird community composition and widespread species declines have been documented. In the Neotropical Region, however, many aspects of grassland bird ecology remain virtually unexplored. Avian communities currently associated to habitats with different land-use patterns have not been fully characterized. The objective of this study was to examine the effects of habitat modification on the distribution, abundance, and reproductive success of Pampas' grassland birds. The study focused on birds that inhabit four grassland habitats which differed in terms of agricultural management in the Northern Campos of Uruguay. Bird assemblages in croplands, planted pasture and two natural grasslands under different grazing regimes were studied. First, distance sampling was used to characterize bird diversity patterns and population densities along the agricultural gradient. Second, nine vegetation structure variables were quantified and the response of birds species to these variables was assessed with multivariate analyses. Finally, systematic nest searching and monitoring activities were conducted during two breeding seasons and this information was used to estimate nest success patterns of both common and globally threatened species.

Overall, a total of 50 species were recorded; cultivated and natural grasslands were dominated by grassland generalist and specialist birds, respectively. Some threatened species (*Anthus nattereri*, *Sturnella defilippi*) were largely restricted to natural grasslands. In terms of vegetation structure, grass cover and vegetation height were the two variables to which birds responded most strongly. With respect to nest survival, models that included temporal trends (i.e., seasonal effects) and habitat type effects were the ones best supported by the data. Nest survival of grassland birds was relatively low, but within the range documented in other grassland ecosystems. Contrary to expectation, nest survival of threatened taxa did not differ from that of common congeners.



This study resulted in the first characterization of grassland bird communities inhabiting an agricultural landscape in the Northern Campos of Uruguay. Using modern sampling techniques and inferential procedures, information on bird diversity patterns and species-habitat relationships was combined with reproductive success data to provide a clear understanding of the effects of habitat alternation on grassland bird populations. The results from this study provide a useful baseline for the development of guidelines targeting bird conservation and land management in the grasslands of the Pampas region.

Conservation Statement:

Grasslands are found all over the world and have historically supplied key goods and services to humans. Because of their suitability for agriculture temperate grasslands in particular have experienced the highest habitat conversion rates amongst terrestrial ecosystems. These alterations have produced huge impacts on grassland-associated faunas. In the case of birds, population declines have been described as “a prominent wildlife conservation crisis of the 21st century”. Unlike their northern hemisphere counterparts, Neotropical grassland avifaunas have received very little attention until recently. This contrasts with the high number of Neotropical grassland birds that are currently classified as globally threatened. These include many long-distance migrants that winter in the Pampas biome of south-eastern South America. Concerned about the demise of these species, Southern Cone countries (Argentina, Bolivia, Brazil, Paraguay and Uruguay) have recently signed a MoU to promote grassland bird conservation in the region.

The application of effective conservation and management strategies is hindered by the lack of scientific data, especially with regards to the response of grassland birds to different land-use schemes. The main objective of my work was to characterize grassland-bird assemblages in terms of their response to agricultural practices. I combined data on diversity patterns, bird responses to vegetation and reproductive success. Resident and migratory birds were studied in several grassland sites varying from croplands to well-conserved native grasslands. For the first time in the Uruguayan Pampas I produced a clear picture of the effects of crop growing and cattle raising on native birds. My study identified those species that are more susceptible to changes driven by agriculture and provided insight about future trends in grassland bird populations if current patterns of agricultural intensification continue.

It is clear that many grassland specialists depend upon native grasslands and that cropland expansion will likely benefit a few common species while being detrimental to other common and threatened birds. Findings from my study have been applied to grassland management within a government-sponsored programme (“Responsible Production Project”) that promotes wildlife-friendly practices amongst farmers. In addition, my original thesis research provided the basis for an ongoing project that focuses on the ecology and conservation of grassland birds in northern Uruguay.

Some Publications:

- Azpiroz, A. B. 2001. Aves del Uruguay. Lista e introducción a su biología y conservación [Birds of Uruguay. List and introduction to their biology and conservation]. Aves Uruguay-GUPECA, Montevideo, Uruguay. 4
- Azpiroz, A. B. 1997. Aves del Uruguay. Lista, estatus y distribución [Birds of Uruguay. List, status and distribution]. PROBIDES. Rocha, Uruguay.
- Azpiroz, A. B. 2003. Diversidad y Conservación de las Aves del Uruguay [Diversity and Conservation of Uruguayan Birds]. Pp.: 67-69. In: Gómez de Silva, H. & Oliveras de Ita, A. (eds.). Conservación de Aves. Experiencias en México. CIPAMEX, México.
- Azpiroz, A. B. & J. G. Blake. 2009. Avian assemblages in altered and natural grasslands in the Northern Campos of Uruguay. *Condor* 111: 21-35.
- Alfaro M., A. Azpiroz, T. Rabau & M. Abreu. 2008. Distribution, relative abundance, and habitat use of four species of Neotropical shorebirds in Uruguay. *Ornitología Neotropical* 19 (Suppl): 461-472.
- Azpiroz, A. B. & J. L. Menéndez. 2008. Three new species and novel distributional data for birds in Uruguay. *B.B.O.C.* 128 (1): 38-56.
- Azpiroz, A. B., D. Ascanio, R. Restall, A. Soto, C. Bosque & A. Rodríguez-Ferraro. 2006. Status and distribution of the House Sparrow (*Passer domesticus*) in Venezuela. *Ornitología Neotropical* 17(3): 457-460.
- Azpiroz, A. B. & A. Rodríguez-Ferraro. 2006. Noteworthy observations of the birds of Falcón state, northwestern Venezuela. *Ornitología Neotropical* 17(3): 445-451.
- Azpiroz, A. B. & A. Rodríguez-Ferraro. 2006. Banded Red Knots *Calidris canutus* sighted in Venezuela and Uruguay. *Cotinga* 25: 82-83.
- Rodríguez-Ferraro, A. & A. B. Azpiroz. 2006. Notes on the breeding biology of the Maracaibo Tody-Flycatcher *Todyrostrum viridanum*. *Cotinga* 25: 18-20.
- Azpiroz, A. B. 2005. Conservation of Pampas Meadowlark (*Sturnella defilippii*) in Uruguay. *Cotinga* 23: 71-73.

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- Rodríguez-Ferraro, A. & Azpiroz, A. B. 2005. Notes on the natural history of the Andean Cock-of-the-rock (*Rupicola peruviana*) in western Venezuela. *Ornitología Neotropical* 16 (1): 105-108.
 - Rodríguez-Ferraro, A. & Azpiroz, A. B. 2004. Nidificación del Caracolero (*Haematopus palliatus*) en la península de Paraguaná, Venezuela. [American Oystercatcher nesting in the Paraguaná peninsula, Venezuela.] *Ornitología Neotropical* 15 (2): 269-270.
 - Azpiroz, A. B. 2003. Primeros registros del Capuchino de Collar (*Sporophila zelichi*) en Uruguay. [First records of the Collared Seedeater in Uruguay]. *Ornitología Neotropical* 14 (1): 117-119.
 - Azpiroz, A.B. 1999. Miná del Himalaya (*Gracula religiosa*) nidificando en Colonia del Sacramento, Uruguay [Himalayan Mina nesting in Colonia del Sacramento, Uruguay]. *Nuestras Aves* 40: 14.

Alana Grech**E-Mail:** alana.grech@jcu.edu.au**Professional Website:** <http://www.coralcoe.org.au>**Phone Number:** (+ 61 7) 4781 5222; cell: (+ 61 407) 705 088**Institution:** School of Earth and Environmental Sciences, James Cook University**Street:** Douglas Campus**City:** Townsville, Queensland 4811**Country:** Australia**Title:** Spatial models and risk assessments to inform marine planning at ecosystem-scales: seagrasses and dugong as a case study**Subject / Field Research:** Environmental Science, Spatial Science**Date of Graduation:** March 2010**Educational Institute/ University:** James Cook University, Australia**Short Statement:**

The Great Barrier Reef World Heritage Area (GBRWHA) of Queensland, Australia, is the world's largest World Heritage Area (approximately 348,000 km²) and one of the largest marine protected areas. The region supports a variety of species including globally significant populations of the dugong (*Dugong dugon*), a vulnerable (IUCN Red List 2008) and migratory marine mammal. Dugongs and their seagrass habitats are exposed to multiple anthropogenic threats along much of the 2,300 km coastline of the GBRWHA. Assessing the effectiveness of the current management arrangements for dugongs and informing the design of new management regimes is challenged by the difficulties associated with data collection and monitoring at the scale of the dugong's range in the GBRWHA (~ 53,000km²).

My thesis goal was to overcome the challenges associated with informing the management of dugongs and their habitats in the GBRWHA by using spatial models and risk assessments in geographical information systems (GIS). My thesis objectives were to: (1) develop spatial models (maps) of seagrasses and dugongs at the scale of the GBRWHA; and, (2) use these models to estimate the risk to dugongs and their seagrass habitats from multiple anthropogenic threats. This approach allowed me to compare and rank anthropogenic processes to identify the most severe threats to dugongs and their seagrass habitats, and to locate specific sites that require conservation action. I used ecological theory and expert knowledge to inform the design of a Bayesian belief network and to develop a predictive seagrass habitat model. The Bayesian belief network quantified the relationship (dependencies) between seagrass habitats and eight environmental drivers. The outputs of the modelling exercise were probabilistic GIS-surfaces of seagrass habitat suitability for the entire GBRWHA coast at a scale of 2 km * 2 km grid cells. The seagrass habitat model is published in Aquatic Conservation.

Quantitative information on the relative impact of anthropogenic threats to coastal seagrasses in the GBRWHA is incomplete or unavailable, and the cumulative impact of multiple threats on coastal seagrasses is difficult to measure and predict. In the light of this uncertainty, I used expert knowledge to evaluate the relative risk of coastal seagrass habitats to their threats. Vulnerability scores derived from expert opinion, spatial information on the distribution of threats and the probabilistic GIS-surfaces of seagrass habitat suitability were used to delineate areas of low, medium and high relative risk to coastal seagrass habitats. I found that whilst most seagrasses habitats in the remote Cape York region of the GBRWHA were at a low risk from multiple threats, almost two thirds of coastal seagrass habitats along the urban coast were at a high or medium risk from multiple threats. Reducing the risk to coastal seagrass habitats in the 13 sites I identified for conservation action would require: (1) improving the quality of terrestrial water that enters the GBRWHA; (2) mitigating the impacts of urban and port infrastructure development and dredging; and, (3) addressing the hazards of shipping accidents and recreational boat damage. The seagrass risk assessment is published in Marine Policy.

I derived a spatially explicit dugong population model from information on the abundance and distribution of dugongs collected by a 20 year time-series of aerial surveys. I interpolated the aerial survey data to the spatial

extent of the dugong's range in the GBRWHA using the geostatistical estimation method of universal kriging. The model estimated the relative density of dugongs across the GBRWHA at the scale of 2 km * 2 km grid cells (the scale recommended for use by managers of wildlife under Criterion B of the International Union for Conservation of Nature and Natural Resources Red List). I classified each grid cell as low, medium, or high conservation value on the basis of the relative density of dugongs estimated from the model and a frequency analysis. The dugong model is published in *Applied GIS* 3(2): 1-14. I used the same approach to model the spatial distribution of dugongs at the scale of the entire north-east coast of Australia (~136,000 km²), and published the results in *PLoS ONE*.

I compared the spatially explicit dugong population model with information on the distribution of commercial gill-netting activities to estimate the risk of dugong bycatch in the GBRWHA. I found that new management arrangements introduced in the GBRWHA in 2004 significantly reduced the risk of dugong bycatch by reducing the total area where commercial netting is allowed. Restructuring of the fishing industry further reduced the total area where netting is conducted. Netting is currently prohibited in 67% of high conservation value areas, a 56% improvement over the former management arrangements. I identified four sites where netting is still conducted in dugong migratory corridors. Conservation actions including area closures or modified fishing practices should be considered for these regions. The dugong bycatch risk assessment is published in *Aquatic Conservation*.

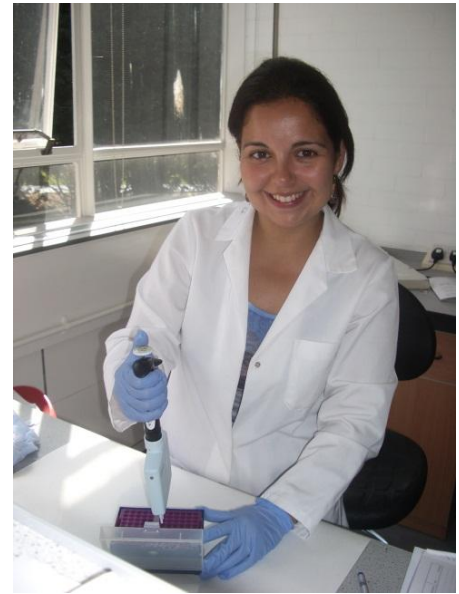
In addition to commercial gill-netting, dugongs are directly threatened by legal hunting and poaching, trawling, vessel traffic and poor water quality. I developed a rapid approach to assess the risk to dugongs from multiple anthropogenic threats in the GBRWHA, and evaluated options to ameliorate that risk. Expert opinion and a Delphic technique were used to identify and rank anthropogenic threats. I quantified and compared the spatial distribution of the threats with the spatially explicit model of dugong distribution and found that almost all areas of high and medium dugong conservation value in the GBRWHA are at low risk from the cumulative impact of multiple threats. Decreasing the risk to dugongs from anthropogenic threats in four sites that I identified for conservation action would require netting or Indigenous hunting to be banned in the remote Cape York region, and the impacts of vessel traffic, terrestrial runoff and commercial netting to be reduced in urban areas. The dugong risk assessment is published in *Conservation Biology*.

Conversation Statement:

Informing the management of migratory species is challenging because quantitative data are generally lacking at the appropriate spatial scale. Collecting empirical information on the distribution of migratory species and assessing the impact of multiple threats is expensive and logistically difficult. I developed an approach that was able to overcome these challenges by using spatial models and risk assessments in a geographical information system (GIS) to: (1) map the distribution of a migratory species and their habitats; and, (2) assess the risk of cumulative impacts across a large area. I was able to achieve this outcome in a data-deficient environment by combining qualitative assessments on the relative impact of multiple threats with predictive spatial models.

Political, social and economic costs and limited conservation resources make it unreasonable to protect migratory species by mitigating the impact of anthropogenic activities across their entire range. For conservation actions to be effective, it is essential to target resources to individual sites that can facilitate the achievement of conservation goals. The approach I developed provides managers with a method of achieving maximum return for minimal investment in data collection by identifying sites where management actions should be targeted at the scale of a migratory species. The approach is easy to replicate, and is particularly applicable to the management of migratory species in remote regions and developing countries where resources are limited.

The outputs of my thesis have influenced changes to the management of the Queensland inshore gill-net fishery and are used by the Australian and Queensland Governments to identify areas for further assessment as Marine Protected Areas. The maps have also been provided to Torres Strait and Aboriginal communities and private Queensland organisations to provide a context for dugong management at local scales and to inform Environmental Impact Assessments.

Catalina Monzón Argüello**E-Mail:** catyma21@hotmail.com, catalinama@iccm.rcanaria.es**Phone Number:** cell: (+ 34 605) 971 508**Institution:** ULPGC, Biology**Street:** Campus de Tafira, Ciencias del Mar**City:** Las Palmas de G.C., 35017**Country:** Spain**Title:** Population Genetic Structure of Sea Turtles in Macaronesia**Subject/ Field of Research:** Biology, Veterinary, Marine turtles Conservation Genetics**Date of Graduation:** May 2010**Educational Institute/ University:** University of Las Palmas de G.C. (Spain)**Short Statement:**

Sea turtle species are some of the most remarkable migratory vertebrates in the ocean. The seven species are globally endangered and characterized by complex population structure and connectivity. Then, identifying the specific links between foraging and nesting locations are vital information for effective population management. For my thesis, I employed genetic data to examine the origin, distribution, population structure and connectivity of sea turtles in a poorly explored region of the eastern Atlantic (Macaronesia) with a broader significance that extends to the whole ocean, trying to understand the genetic connectivity across the entire Atlantic Ocean.

Loggerhead sea turtle is the most common species in the Macaronesian region that occurs in all the archipelagos. The Cape Verde Islands harbour the second largest nesting population of loggerheads in the Atlantic Ocean which faces serious conservation threats. I analyzed mitochondrial DNA (mtDNA) control region sequences and twelve microsatellite markers in adult females nesting at three islands. Results indicated that Cape Verde constitutes a panmictic population significantly different from other Atlantic and Mediterranean rookeries. Therefore, it would be recommended that for practical conservation and management purposes, this must be treated as a distinct population. The Mixed Stock Analysis (MSA) revealed that turtles hatched in Cape Verde distribute in both Atlantic and Mediterranean feeding areas, and that their abundance at each feeding ground is not determined by geographic distance to the archipelago. Interestingly, a high and unambiguous percentage of Cape Verdean juveniles were discovered to be going to unknown areas. Results highlight the necessity of additional research and also inform practical conservation in identifying the key foraging areas that recruit juveniles from Cape Verde.

I examined also the distribution of oceanic juvenile loggerhead sea turtles that forage in the eastern Atlantic and western Mediterranean Sea to test a general hypothesis of non-random distribution during the oceanic stage. With this aim, 329 oceanic-feeding juveniles of four proximal areas were analysed using mtDNA sequence data and MSA, along with complementary surveys of regional nesting females. I found a clear latitudinal variation in the juvenile distribution in all studied areas. Southern rookeries, such as the Mexican population, preferred to go to southern latitudes to feed. Northern populations such as the south Florida population were more common feeding in Azores than in Madeira or Canary Islands. Rookeries of an intermediate latitude geographic position, like Dry Tortugas or Northwest Florida, distributed in similar frequencies in all studied areas. Two potential causes could explain the observed structure: (1) segregation throughout the Gulf Stream, under a drift passive dispersion, and/or (2) selection of specific feeding area for each rookery. I did not find a significant contribution of the Mediterranean nesting areas to the eastern Atlantic feeding grounds despite being geographically close. Furthermore, I found evidence of site fidelity of juveniles to their oceanic feeding areas and the size of turtles appeared to influence their distribution among the foraging grounds. Finally, there was no correlation between the percentage of individuals that go to a foraging area and the geographic distance that separates their natal rookeries to the different feeding grounds. Therefore, other factors, such as population sizes, segregation through oceanographic currents, and/or selection of specific feeding areas, may determine the population composition of a mixed stock.



Green sea turtle: I combined genetic and Lagrangian drifter data to investigate the connectivity between natal and foraging locations in the Atlantic, including the previously unsampled Cape Verde Islands, and focussing on the evidence for transatlantic transport. Results revealed clearly novel aspects of green turtle juveniles' migration, but also several features to consider when elaborating management and conservation plans. The key new finding was that small juvenile green turtles are capable of dispersing extensively, and can drop out of the pelagic phase on a transatlantic scale (the average distance between natal and foraging locations was 3048 km). The results also confirmed that there is indeed substantial transatlantic dispersal in both directions. Nevertheless, I also found support

for the 'closest-to-home' as larger-sized turtles appear to feed closer to their natal breeding grounds (the average distance was 1133 km), indicating that those that have been initially transported to far-flung foraging grounds may still be able to adjust their foraging preferences to be nearer to home as they grow larger. Additionally, Lagrangian drifter data demonstrated that transport by drift across the Atlantic within a few years is possible.

Hawksbill sea turtle: Despite the considerable population genetic and connectivity research on the hawksbill sea turtle and the species being critically endangered, the eastern Atlantic remains understudied. This chapter presented the first analysis of mitochondrial DNA sequences ($n=28$) of hawksbill juveniles in a foraging aggregation of western Africa (Cape Verde Islands). Results showed three new haplotypes un-reported in any nesting population to date, with one of them accounting for 68% of the samples. These three haplotypes were closely related to each other but highly divergent from all known Caribbean and Western Atlantic haplotypes. The dataset did not allow me to conduct a MSA since more than 86% of the individuals carried orphan haplotypes. Hence, the Cape Verde hawksbill foraging aggregation appears to be composed primarily of turtles from regional nesting colonies (i.e. eastern Atlantic), with some individuals derived from rookeries in the opposite margin of the ocean basin. The inability to ascertain the origin of putative eastern Atlantic stocks highlights the fact that the incomplete haplotype baseline of contribution nesting populations in the eastern Atlantic currently hampers progress of genetic studies, and consequently, a priority for evaluation on the conservation and management issues related to foraging aggregations in this region. Several conservation and research implications from this study are discussed in the chapter.

Conservation Statement:

Sea turtle species are a remarkable example of migratory species globally threatened. Listed on the appendix I, sea turtles have been recently favoured from the existence of CMS with a Memoranda of Understanding to conserve marine turtles of the Atlantic coast of Africa. This thesis contributes significantly to the knowledge of biology and ecology of sea turtles in western Africa. I studied the population genetic structure of loggerheads nesting in Cape Verde Islands, which is the major rookery in Africa and third worldwide for this species, but it is highly threatened. Results revealed the high reproductive isolation of this population and that its conservation is a priority for the species. Also, important conservation applications could be considered based on the connectivity results of Cape Verde and other foraging areas across the Atlantic and the Mediterranean Sea. Furthermore, I analysed juveniles of loggerhead, green and hawksbill sea turtles that inhabit the eastern Atlantic. I studied their origin, distribution and connectivity with other areas. New key aspects and/ or further support for previous suggested hypothesis about the biology of loggerhead and green sea turtles were revealed, including distribution in latitudinal accordance with their natal origin, fidelity to specific feeding areas, transatlantic passive transport and further support for the natal homing behaviour hypothesis. In the case of hawksbills, results showed that an important nesting colony in the region must be undiscovered for the community science, and consequently the urgent necessity of additional research. Finally, results of this thesis have had an impact on conservation policy/management, as have been considered during the elaboration of conservation reports, government papers and policies.

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In migrants, the annual cycle consists of four different seasons, notably breeding, autumn migration, wintering and spring migration. During different seasons, survival and reproduction of individuals are influenced, which is potentially reflected in population trends. Understanding the population trends of migratory animal species represents a challenge, because effects operate at widely separated places. Studying the annual cycle of long-distance migratory bird species is especially difficult since breeding and wintering areas can be located on different continents and autumn and spring migrations occur over thousands of kilometres. For a basic understanding of population dynamics and the development of effective conservation strategies, however, studies of the whole annual cycle are crucial: long-distance migratory bird species generally declined steeper in numbers during the last decades than short-distance and non-migratory bird species. Likely causes for the declines are consequently not only to be found in the breeding areas, but also along migration routes and on the wintering grounds.

The combination of sophisticated technology and traditional fieldwork enables biologists nowadays to study the whole annual cycle of long-distance migrants. This thesis is a study on the annual cycle of Montagu's harrier *Circus pygargus*, a medium-sized, slender-winged raptor that was originally a steppe bird. Montagu's harriers migrate annually between European breeding and African wintering areas south of the Sahara. It can therefore be used as model species for long-distance migratory raptors. Most of the natural breeding habitats in Europe are now cultivated or highly degraded, and harrier populations are since the last century most often breeding in farmland habitats. Because Montagu's harriers build their nests on the ground, breeding in farmland is hazardous. During the harvest, nests are often destroyed and even incubating females may be killed. In addition, intensification of agriculture leads to decreasing food availability. Although Montagu's harrier is not categorised as globally threatened, the species is included in several European national "Red Lists", being in need of special conservation actions.

This thesis comprises parts on (1) processes during the breeding season, (2) processes during migrations and (3) processes during the wintering season. In the last part (4), a complete picture of the annual cycle of Montagu's harriers is created.

In part 1, it is shown that NW-European farmland is attractive to Montagu's harriers when high numbers of small mammal prey, mostly voles, are available. Vole abundance positively influenced population growth rate and clutch size. High vole abundance alone, however, does not warrant nestling survival, which is also depending on nest protection from agricultural practices and forthcoming predation, and may depend on the abundance of alternative prey such as farmland birds, and weather conditions during the early nestling phase. To reveal how the harriers use the modern farmed landscape, we deployed miniature radio transmitters on birds in two Dutch farmland areas and tracked them by car using hand-held antennas. Results from these telemetry data showed that high habitat diversity was generally favoured within the home ranges, with lucerne, fallow habitats and cereals being most preferred habitats within the home ranges. For hunting, specifically intensive grasslands and natural grasslands were preferred. Birds with a high proportion of lucerne and fallow habitat types in a 1.6 km radius

around their nest site had relatively small home ranges and a relatively high breeding success, possibly because of energy and time savings of shorter hunting trips. Strategies to conserve breeding populations in intensive farmland should aim at offering more of these habitat types. Offering profitable hunting habitats can be realised by agri-environmental schemes (e.g. fallow field margins), being favourable hunting habitats themselves and potentially functioning as a year – round source habitat for potential prey animals colonising the surrounding landscape. Not only vegetation type but also vegetation management determines Montagu's harriers' hunting success. Mowing of grassy vegetation reduces cover for prey animals and makes them more readily available during several days. Phased and partial mowing, e.g. in the context of agri-environmental schemes, can thus be regarded as a tool to increase food availability for harriers during the breeding season each time on the short term. Besides, mowing can create heterogeneous habitats (foraging habitats and cover) for other farmland birds. Montagu's harrier, being on top of the food web, can function as a flagship and indicator species for the conservation of the underlying farmland small mammal and bird communities.

In part 2, the life of Montagu's harriers during autumn- and spring migrations is investigated. Satellite transmitters were deployed on the birds as a backpack. Signals sent by these transmitters are received by satellites; localisations of the birds are sent to the researchers via the internet. These telemetry data show that northwest and northeast European Montagu's harriers used three important migratory pathways to their West-African wintering areas: either via Spain, Italy or Greece. Whereas migrants via Spain and Italy returned via similar routes to the breeding areas, migrants via Greece mostly returned in a loop via Italy. Combining insights from satellite tracking and recent migration counts, it is suggested that another important pathway must be located between the Caspian and Black Sea via Israel into West- or East-African wintering areas. Migratory connectivity between breeding and wintering populations is significant: the geographical locations of the different breeding areas are a mirror image of the locations of different wintering areas, and most individuals stick in subsequent years to certain migration routes, wintering- and breeding areas.

In part 3, we use satellite telemetry to provide insights into processes in West-African wintering areas. It was previously thought that Montagu's harriers were nomadic during the winter, following outbreaks of high food abundance such as migratory locust swarms. During this study, they were bound to a small number of winter home ranges that they visited in subsequent years. Fieldwork revealed that during the study period - years without migratory locust plagues -, Montagu's harriers needed to rely on non-migratory grasshoppers and alternative prey such as birds, small mammals and reptiles. Movements between the harriers' home ranges were correlated with a southward shift in vegetation greenness during the wintering (the Sahelian dry) season. The harriers followed a "green belt" of optimal vegetation greenness, which is apparently linked to grasshopper food availability. The use of chemical insecticides against crop-damaging grasshoppers may confront Montagu's harriers and other grasshopper-consumers in West-Africa with poisoned food sources. The increasingly widespread use of biological insecticides that are not harmful to birds opens potential future perspectives for the conservation of grasshopper-consuming (migratory) birds.

In part 4, we conclude from the presented data that the two most important components in Montagu's harriers' annual cycle can be summarised as "travels to feed" and "food to breed". Annual routines are characterised by movements on different scale levels ("travels to feed"): from small scale hunting trips (breeding areas) over medium scale movements between winter home ranges to large scale intercontinental during autumn and spring migrations. All movements are between areas abounding with different types of prey at different times of the year. Most important preys ("food to breed") are small mammals in the European farmland breeding habitats, directly influencing reproduction and population change. In the West-African natural and farmland wintering habitats, large insects play an important role, possibly influencing survival and reproductive success via effects on adult body condition and migration phenology, carrying over to the breeding season. In both breeding and wintering areas, modern landscapes are dominated by human influences. Agricultural intensification results in decreased food availability both in summer and winter as well as in nest destruction during the breeding season. A population modelling study shows that nest destruction must currently have the largest negative effect on population change within the annual cycle. Agricultural intensification can consequently be seen as the main threat to Montagu's harriers at this time. Effective conservation actions targeting this problem in the European breeding areas are nest protection and improvement of food availability by farmland extensification (e.g. agri-environmental schemes). Problems in the wintering areas are more difficult to tackle. Intensification of agriculture in West-Africa is a result of the growing human population. Montagu's harrier conservation strategies can make use of the fact that harriers often concentrate in small areas and are site-faithful. Effective conservation

actions may thus be targeted at these areas. In general, a motivation to strive for sustainable use of Sahelian farmland ecosystems is not only the benefit for biodiversity but also for human food security.

The aspects in the annual cycle of Montagu's harrier that is still least well understood are the processes during migration itself. Annual mortality is highest during migrations. Possible reasons are energetic bottlenecks during the crossings of barriers, e.g. the desert or the sea, but also illegal hunting. Suitability of stopover sites may be a prerequisite for successful migration. In future research, the relationship of ecological conditions during stopover and wintering with Montagu's harriers' fitness components will be investigated. The focus will be especially on a stopover site in eastern Morocco that was identified by satellite telemetry, being used in autumn and spring before respectively after the crossing of the Sahara desert.

Conservation Statement:

In threatened Palearctic-African migratory birds, knowledge on the breeding season is more profound than on the non-breeding season, although the latter represents most of their annual cycle. Here, I study for the first time individual raptors (Montagu's Harriers [MH]) year-round, including breeding, migration and wintering. MH is red-listed in many European countries; harvesting of fields is a hazard to its ground nests. Using radio-telemetry, we show that conservation of MH breeding in intensively farmed landscapes can be more effective than nest protection alone: The proportion of suitable hunting habitats should be increased by agri-environmental schemes.

We deployed satellite-transmitters on MH across Europe (from the Netherlands to Belarus) and revealed the most important migration routes and stopover sites. Especially knowledge on stopover sites is very scarce in raptors. We discovered a stopover site in East-Morocco of crucial importance for 80% of Northwest-European breeding MH. This site may also be relevant for other migratory bird species. In a follow-up project, I currently study MH stopover timing, prey and habitat selection and hazards in that site. // Through combining satellite-tracking with field work in Africa, we show that MH winter in the Sahel and track predictable gradients of non-migratory grasshoppers as preys there, opposed to the hypothesis that they track migratory locust outbreaks. Telemetry revealed furthermore that MH use several hotspot wintering areas within the Sahel and that individuals were faithful to breeding areas, migration routes and wintering areas. The high migratory connectivity between breeding and wintering populations should make conservation actions in hotspot areas effective. Adequate actions are conservation of natural and agricultural habitats and exclusion of harmful insecticides. // My thesis shows the effectiveness of our approach to study the whole annual cycle of threatened migratory species and identify adequate conservation actions, using fieldwork and telemetry across populations and continents.

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Title: Movement patterns, habitat preferences, and fisheries biology of the common thresher shark (*Alopias vulpinus*) in the Southern California Bight

Subject / Field of Research: Marine Biology

Date of Graduation: October 2009

Educational Institute/ University: Scripps Institution of Oceanography – La Jolla, University of California, CA

Short Statement:

The common thresher shark (*Alopias vulpinus*) is a pelagic species that constitutes the largest commercial shark fishery in California waters. Despite its commercial value, little is known of thresher shark biology, nor is there adequate data on which to base fishery management decisions. This dissertation entails four studies dealing with the biology and fisheries interactions of common thresher shark in the Southern California Bight (SCB). Chapter 1 examines the movement patterns of adult and subadult thresher sharks using acoustic telemetry. These larger threshers preferentially inhabit waters offshore of the continental shelf, inhabit shallow waters nocturnally, and may make extensive vertical excursions by day that are suggestive of foraging.

In Chapter 2, movement patterns of larger threshers are further examined over extended time periods through the use of archival tagging. Archival data show that in addition to exhibiting diel periodicity in movement patterns, threshers undergo distinct modes of daytime depth distribution for extended periods that are interpreted as relating to regional differences in abundance of surface oriented prey and prey in deeper water. Chapter 3 investigates the habitat utilized by juvenile threshers and shows that they preferentially inhabit waters over the SCB continental shelf as a nursery area. Chapter 4 describes the artisanal fishery for threshers and other elasmobranchs along the Pacific coast of Baja California Norte, Mexico. It was found that 44 artisanal fishing camps are located in the region, of which at least 26 target elasmobranchs. In addition, the detailed species, size, and sex composition of elasmobranchs captured at the Laguna Manuela fishing camp is reported. Finally, Chapter 5 provides a synoptic view of the contributions made by this dissertation towards the current status of knowledge regarding thresher shark life history, ecology, and fisheries biology.



Conservation Statement:

The common thresher shark, *Alopias vulpinus*, is a highly migratory shark species. In the eastern North Pacific, it has a genetically distinct population which ranges from Baja California, Mexico to British Columbia, Canada. Throughout this range, it is commercially harvested, and population levels appear to have declined drastically as a result of overfishing in recent decades. Despite its commercial and ecological importance, little is known about the biology of this species. My thesis research used archival and acoustic tracking technology to examine the movement patterns and habitat requirements of the thresher shark, and to relate these to management and conservation objectives. For example, this research showed that adult thresher sharks have a diel vertical distribution pattern, characterized by deep daytime diving activity and a shallow nighttime distribution above the thermocline. Using these data, I showed how altering the set depths of commercial fishing gear could reduce catch rates of threshers in the California drift gillnet fishery. This thesis also describes for the first time the nursery habitat used by a highly migratory

shark species. By devising regulations to minimize commercial fishing in these sensitive nursery habitats, fishery managers can preserve juvenile populations, which are in essence the ‘future of the fishery’.

The last chapter of the thesis focused on documenting the catch of thresher sharks in the traditional shark fisheries of rural Baja California, Mexico. It was found that the magnitude of thresher shark catch was high, and composed almost entirely of juveniles. This information is currently being used by the U.S. National Marine Fisheries Service to update stock assessments for eastern Pacific threshers. These results highlight the need for international cooperation in research, management and conservation efforts to achieve sustainability of highly migratory species such as the common thresher shark.

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The Aquatic Warbler (*Acrocephalus paludicola*) is the only globally threatened passerine bird species in continental Europe. Around 1900, it was one of the most common birds in European fen mires. The world population collapsed in the course of the 20th century due to habitat loss caused by wetland drainage and agricultural intensification. Currently, the world population is approx. 12 500 singing males, of which the current core population (approx. 90%) breeds in Belarus, Eastern Poland and Northern Ukraine. The small and geographically isolated population in Pomerania (Northeast Germany/Northwest Poland; 80 singing males in recent years) represents the last remnants of a formerly large western Central European population and is threatened with extinction. Its conservation has high priority (reflected e.g. in the CMS Memorandum of Understanding of 2003).

The main objective of this study was to provide the scientific basis for the conservation and restoration of Aquatic Warbler habitats in Pomerania. In contrast to the well-studied core population, the poor knowledge of habitat requirements in Pomerania hampered conservation and restoration activities until recently. As it was assumed that the habitat deterioration in Pomerania is caused by vegetation succession, key vegetation and site condition parameters of habitat selection, currently best habitat conditions, and compatible land use techniques maintaining or creating such conditions were investigated.

Throughout the breeding seasons 2004-2006 all sites currently used by the bird in Pomerania as well as several recently abandoned and potential sites were studied. Data on vegetation structure (e.g. vegetation and litter height, vegetation density), soil and nutrient conditions, invertebrate composition and biomass, land use, and habitat heterogeneity were analysed with regard to the occurrence of singing males. In addition, female nesting site selection and foraging behaviour and the nestling diet (using a surrogate species) has been studied.

From the detailed analysis of all current breeding sites, it emerged that the less productive coastal breeding sites are characterised by dominant *Phragmites australis* stands with a well-developed herb layer (e.g. Rozwarowo Marshes, the stronghold of the species in Pomerania), and that the sites in lower Oder valley are more productive and dominated by *Carex acuta*, *Phalaris arundinacea*, or meadow grasses (e.g. Lower Oder Valley National Park, the last breeding site in Germany). As in the core population sites, optimal conditions during late May/early June include a vegetation height of less than 70 cm, a cover of the lower herb layer of approx. 20% and of the upper herb layer of less than 60%, i.e. rather sparse vegetation. In contrast to the core population sites, where the water height is up to 20 cm and a thick litter layer is needed for building nests above it, in Pomerania the water height is only 0-1 cm and the thickness of the litter layer less than 10 cm. This is probably connected to the larger invertebrate biomass on moist sites with a small litter layer. Again in contrast to the core population sites, habitat heterogeneity is high and specific foraging habitats with a vegetation height gradient (edges between used and not used areas, ditches) and with moister conditions (ditches, depressions) are preferred by females provisioning their nestlings. The distance between foraging habitats with sufficient food supply and nesting sites cause (probably unfavourably) long foraging flights, but still allows successful breeding.

A refined analysis of nesting site conditions and breeding success as well as of population development and exchange between breeding sites is recommended. Trophic conditions in current and potential Aquatic Warbler habitats strongly influence the management needed to maintain or restore suitable conditions in Pomerania. Early summer land use is needed in the more productive sites to prevent habitat deterioration by succession to higher and denser vegetation. As this also poses a serious threat to broods, it is recommended to create a mosaic of early and late used patches by alternating land use. Such a mosaic also offers edges as preferred foraging habitats. In the less productive sites, winter mowing can maintain suitable habitat conditions. Small stripes should be left uncut to increase prey availability and to provide nest-building material. Further eutrophication needs to be prevented, and habitat restoration is probably best supported by summer mowing. Such land use on mires and rewetted peatlands belongs to a variety of wet, environmentally harmless forms of peatland agriculture and forestry (so-called paludiculture) that offer climate, biodiversity, and socio-economic benefits.

Conservation Statement:

Franziska Tanneberger studied landscape ecology and nature conservation. In spite of her young age she has made outstanding contributions to the study and protection of near-natural mires and associated biodiversity in Germany, Poland and West Siberia (Tanneberger et al. 2003, Wassen et al. 2005). As a student, Franziska worked on mires of the Polessie wetlands supporting the global core population of Aquatic Warbler, continental Europe's only globally threatened passerine bird species. She excelled under extremely difficult field conditions in Shegarka, a large mire in Western Siberia gathering data that fed into the proposal to designate Vasyuganskoe/West-Siberian mires as a World Heritage Site.



In her PhD thesis (Tanneberger 2008), Franziska developed recovery strategies for the Aquatic Warbler and delivered sound management advice to authorities and bird conservation NGOs in Poland and Germany. An EU LIFE Nature project (2005-2011) in Poland and Germany is currently implementing Aquatic Warbler habitat management advice that emerged from Franziska's research in order to find an optimum between economic and ecological needs in peatland management. Major achievements comprise the large-scale (>2000 ha) implementation of mowing in Biebrza National Park (Poland) in combination with biomass pellet production, the adaptation of commercial reed cutting for thatch production to the needs of the target species, and the successful vegetation management in

Peene Valley (Germany) where already numerous threatened Lapwings and Redshanks returned to a former Aquatic Warbler breeding site. In the latter area, Franziska persuaded local stakeholders to try new ways of managing floodplain mires by the re-introduction of mowing for energy production. The results of her PhD have not only been presented in four peer-reviewed international papers and numerous other publications, but also form key input to the Aquatic Warbler Conservation Handbook, which is currently being co-edited by Franziska and L. Lachmann (RSPB/OTOP BirdLife Poland). They also allowed her to prepare the Aquatic Warbler Species Action Plan for Germany (Tanneberger et al. 2010).

With her scientific and practical work, Franziska has stimulated and facilitated both the conservation of Aquatic Warbler breeding habitats and peatland rewetting for biodiversity and climate protection. Thus, her works forms key input to the CMS Memorandum of Understanding for the protection of Aquatic Warblers and opens new perspectives for habitat management. Conservation projects that are based on her achievements and in which she is currently working or contributing to include a BfN funded project on Aquatic Warbler conservation in Lower Oder Valley, Germany (2008-2013), a BMU funded project on peatland rewetting in Belarus for climate and biodiversity benefits (2008-2011), a BMBF funded project on paludiculture (wet land use of peatlands) in NE Germany (2010-2013), and two LIFE+ project in Poland and Lithuania on Aquatic Warblers and biomass use (2010-2013).

George Lewis Shillinger**E-Mail Address:** georges@stanford.edu**Phone Number:** (+ 1 831) 655 6200; cell: (+ 1 202) 549 0987**Institution:** Center for Ocean Solutions of Stanford University, 1) Department of Biology, and Program Director, Marine Spatial Planning**Street:** 1) Hopkins Marine Station 120 Oceanview Blvd.**City:** 1) Pacific Grove, CA 93950**Country:** USA**Title:** Satellite Tracking Reveals Movement, Behavior, and Distribution of Endangered Leatherback Turtles (*Dermochelys coriacea*) in the Eastern Tropical and Southeastern Pacific: Implications for Conservation**Subject/ Field of Research:** Marine Biology, Biological Sciences, Ecology and Evolutionary Biology**Date of Graduation:** December 2009**Educational Institute/ University:** Stanford University Stanford, California**Short Statement:**

Effective transboundary conservation of highly migratory marine animals requires international management cooperation as well as clear scientific information about habitat use by these species. Populations of leatherback turtles (*Dermochelys coriacea*) in the eastern Pacific have declined by >90% during the past two decades, primarily due to unsustainable egg harvest and fisheries bycatch mortality. While research and conservation efforts on nesting beaches are ongoing, relatively little is known about this population of leatherbacks' oceanic habitat use and migration pathways.

This thesis examines satellite tracking data collected from forty-six female leatherback turtles, electronically tagged during three field seasons at Playa Grande, Costa Rica, the largest extant nesting colony in the eastern Pacific. The turtles were tracked for 12,035 total tracking days with a mean track duration of 263 days, a distance of 8,070 km, and a mean travel speed of 37.7 km d⁻¹. This thesis describes the movements and behaviors of internesting turtles, assesses the predictable effect of ocean currents on a leatherback migratory corridor, characterizes the long-distance leatherback movements in the Eastern Pacific, and examines the influence of mesoscale oceanographic features upon the movements and behaviors of post-nesting turtles.

A total of 1135 days of internesting movements were recorded across three tracking years. High-use internesting habitats were identified for leatherbacks within the Exclusive Economic Zones of Costa Rica and Nicaragua. The core 25% utilization distribution (UD) during the internesting period remained predominantly centered within the marine protected area, Parque Nacional Marino Las Baulas (PNMB). The turtles generally dispersed in a northward or southward direction over the shallow continental shelf framing Costa Rica's Nicoya Peninsula. However, there was considerable interannual variation in the shape and area of the larger UD polygons, driven by variability in the thermal environment. The maximum swimming speeds and distance traveled from the nesting beach occurred during 2007. Significantly deeper and longer dive durations to cooler temperatures also occurred in this year, which may have been in response to warming from the south driven by a strong Costa Rica Coastal Current. Our findings validated the importance of PNMB as a critical habitat for internesting leatherbacks, but also suggested that a latitudinal expansion of the Park is warranted.

After completing nesting, the turtles headed southward, traversing the dynamic equatorial currents with rapid, directed movements. In contrast to the highly varied dispersal patterns seen in many other sea turtle populations, leatherbacks from Playa Grande traveled within a persistent migration corridor from Costa Rica, past the equator, and into the South Pacific Gyre, a vast, low-energy, low-productivity region. Analysis of turtle vertical behavior suggested that turtles maximized swimming efficiency with short, shallow dives during migration through an area of strong zonal currents followed by deeper, longer dives that may indicate searching for prey in the South Pacific Gyre. The southern terminus of the turtles' range (35-37°S) was characterized by high mesoscale activity that may act as a physical mechanism to aggregate their prey, gelatinous zooplankton, but it may also act as a thermal limit to their distribution.

The findings from this thesis elucidate potential areas for mitigating fisheries bycatch interactions, thus directly informing ongoing marine spatial planning efforts and existing multinational conservation frameworks. This information will provide an impetus for focusing future conservation efforts within the leatherback interesting region, migration corridor, and dispersal zone that these analyses have identified in the southeastern Pacific Ocean.

We utilized my thesis data to develop the first-ever Great Turtle Race (GTR: http://www.topp.org/features/great_turtle_race_history, <http://animals.nationalgeographic.com/animals/>, http://www.conservation.org/great_turtle_race/Pages/race_history.aspx) featuring the eleven leatherbacks satellite-tagged at Playa Grande during 2007. The GTR was inspired by and created from our analyses of the concerted post-nesting migration trajectories of the satellite-tagged turtles during 2004 and 2006. We transformed the persistent postnesting leatherback migration corridor into a virtual racecourse, and worked with a team of data managers, web designers, and communications and marketing experts to create the GTR website.

The website was designed to communicate the importance of leatherback conservation to the broadest possible audience (with an emphasis on schoolchildren and their parents). Within the website, we developed content about leatherback biology and conservation, marine ecology, oceanography, and satellite tracking technology. We created and featured school curriculum content, showcased community based conservation efforts at the Playa Grande nesting beach, and highlighted human impacts (i.e. fisheries) on leatherback turtles and other highly migratory species.

During a two-week period, the GTR website generated over 3.5M page views, 700,000 unique users, and 65,000 subscribers, and hundreds of mentions in multinational media (television, radio, and print). The GTR raised over \$450,000 for leatherback conservation and research, and was successfully replicated during 2008 in a trans-Pacific "Race to the Dateline," involving turtles tagged in Indonesia and Monterey, and during 2009, in a "Canada to Caribbean" race featuring tracks from eleven leatherbacks tagged on their North Atlantic foraging grounds in Nova Scotia. The concept has subsequently been applied to several other populations of sea turtles and to other pelagic species (i.e. the Great Marlin Race: www.greatmarlinrace.org).

Conservation Statement:

The population of critically endangered leatherback turtles (*Dermochelys coriacea*) nesting at Playa Grande, Costa Rica, the highest density nesting colony in the Eastern Pacific (EP), is so imperiled that its immediate future is in doubt. Despite intensive ongoing turtle conservation and protection efforts within critical nesting habitats, including curtailment of egg harvest and relocation of at-risk clutches, annual counts of nesting adult females at Playa Grande continue to decline. Similar trends have been observed at other EP leatherback nesting colonies, supporting the premise that additional pressures beyond the nesting beach (during migration or foraging periods) are impacting the survival of EP leatherbacks.



During a five-year period from 2004 – 2008, we developed the largest satellite tracking data set ever collected on EP leatherbacks. This data enabled us to: 1) describe the distribution and movements of interesting and postnesting adult female leatherbacks; 2) examine the influence of oceanographic conditions on leatherback movements and dispersal; 3) confirm and elucidate a migration corridor from the nesting beach past the Galápagos Islands; and, 4) describe for the first time, horizontal and vertical movements of leatherback turtles beyond 10°S into putative foraging habitats within the South Pacific Gyre. We identified critical areas for directed leatherback conservation efforts in the eastern Pacific and proposed management measures to protect leatherbacks within areas where they are most at-risk from interactions with fisheries.

We are now contributing these findings to a Pacific-wide collaborative research effort (involving biologists and fisheries managers) to develop new strategies for reducing the impact of fisheries on leatherbacks. Our aim is to integrate our respective leatherback tracking datasets (Eastern and Western Pacific) with fisheries datasets (e.g. effort, catch, and bycatch data); to model turtle habitat use; to predict areas where fisheries-turtle interactions are most likely to occur; and to develop strategies to mitigate these impacts.

J. Grant C. Hopcraft**E-Mail:** granthopcraft@fzs.org, jgchopcraft@gmail.com**Professional site:**<http://www.rug.nl/biologie/onderzoek/onderzoekgroepen/cocon/people/hopcraft/index>**Street:** 1 / 01 Laurel Place**City:** Glasgow, G11 7RE**Country:** UK**Title:** Ecological Implications of Food and Predation Risk for Herbivores in the Serengeti**Subject/ Field of Research:** Ecology**Date of Graduation:** 2010**Educational Institute/ University:** University of Groningen**Short Statement:**

A major concern for conservationists is that the current location of national parks might not contain the required niches of many rare, endangered or economically important species in the future because of global climate change. This thesis explores the factors that determine the distribution and migration patterns of African grazing herbivores. The results indicate that the distribution of small savanna grazers (like gazelles) is determined primarily by the risk of natural predation and the availability of high quality food, while the distribution of large grazers (like buffalo) is determined primarily by the quantity of forage. Furthermore, the results show that, while wildebeest migrations in the Serengeti are tuned to find the best available food, zebra migrations are tuned to avoid predators.

Therefore, not only does predation and nutrition shape the distribution and movement of herbivores, but the relative affect varies with the body-size of the grazer. The most novel finding is that these top-down controls in ecosystems, such as predator regulation, and bottom-up controls, such as food regulation, are both determined by common underlying environmental gradients such as rainfall and soil fertility and cannot be thought of as independent processes, as has been done until now.

If the rainfall patterns in sub-Saharan Africa change due to shifts in global climate, this will alter both the rates of predation and the quality of food for savanna herbivores. Thus climate change will probably lead to major shifts in the migration patterns of different savanna species. Furthermore, if animals are prevented from moving between habitats because human development is isolating protected areas this could lead to large-scale population declines. These negative impacts would be exacerbated by continued habitat fragmentation, such as the proposed national highway through Serengeti, and should be avoided in favour of developing contiguous areas of protection, particularly across rainfall gradients.

**Conservation Statement:**

Large-scale animal migrations have profound implications for key ecosystem processes such as nutrient cycling, competition and predation between species, as well as socio-economic spin-offs for societies whose livelihoods are contingent on them. However, migrations are collapsing globally, which raises concerns about the persistence of these landscape-scale biological processes. This thesis investigates the distribution and movement patterns of African savanna grazers. The wildebeest and zebra migrations in Serengeti are a major source of bush-meat for local people living around the park. In addition, the Serengeti attracts over 150,000 international visitors/ year who come to see the mass migration of over 1.5 million wildebeest and zebra. Tourism alone generates over \$740 million / year for Tanzania. The results of this thesis illustrate that wildebeest migrate so as to access the highest quality food available, whereas zebra migrate with wildebeest to decrease their exposure to predation, which is a largely unexplored driver of migrations.

Despite this, the single largest variable that determines the movement of both species is proximity to human disturbance. Wildebeest and zebra avoid areas with high disturbance and this is important for conservation for two reasons: (1) migrants might be forced to change their traditional routes because of shifts in global climate but human disturbance might block them from moving, which could lead to catastrophic declines in the future. (2) There are plans to build a national highway across the Serengeti, which would bisect the migration and fragment an otherwise contiguous ecosystem. If the highway continues, we should expect the movement patterns of both zebra and wildebeest to change in direct response to human conflicts, and this could have large implications for the stability of the Serengeti ecosystem which could lead to declines in tourism revenue. This thesis makes significant contributions to understanding these risks and outlines possible mitigation strategies.

Some Publications:

- Hopcraft, J.G.C., van der Westhuizen, H., Lewis, C., van der Westhuizen, E., Sayer, E., Laurenson, K., Borner, M., & Sinclair, A.R.E. (in press). Ensuring the long-term conservation of ecosystems: The role of cataloguing and disseminating information. In: *Making conservation work - experiences and lessons learned from around the world*. Springer.
- Hopcraft, J.G.C., T. M. Anderson, S. Perez Vila, E. Mayemba, and H. Olf. (in press). Body size and the division of niche space: Food and predation differentially shape the distribution of Serengeti grazers. *Journal of Animal Ecology*.
- Hopcraft, J.G.C., Sinclair, A.R.E., Holdo, R.M., Mwangomo, E., Mduma, S.A.R., Thirgood, S., Borner, M., Fryxell, J.M., & Olf, H. (submitted). Why are wildebeest the most abundant herbivore in the Serengeti? In: *Serengeti IV* (eds A.R.E. Sinclair, K. Metzger, S.A.R. Mduma & J.M. Fryxell). University of Chicago Press, Chicago.
- Hopcraft, J.G.C., H. Olf, and A.R.E Sinclair (2010). Herbivores, resources and risks: alternating regulation along primary environmental gradients in savannas. *Trends in Ecology & Evolution* 25(2): 119-128.
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- Anderson, T.M., J.G.C. Hopcraft, S. Eby, M.E. Ritchie, J.B. Grace, and H. Olf (2010). Landscape-scale analyses suggest both nutrient and anti-predator advantages to Serengeti herbivore hotspots. *Ecology*.
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- Harris, G., S. Thirgood, J.G.C. Hopcraft, J.P.G.M. Cromsigt and J. Berger. Global decline in aggregated migrations of large terrestrial mammals. *Endangered Species Research* 7:55-76
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- Olf H., and J.G.C. Hopcraft (2008). The resource basis for human-wildlife interaction. In: *Serengeti III: Human Impacts on Ecosystem Dynamics*. Eds.



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In this study I investigated Procellariiformes (albatrosses, petrels and shearwaters) at sea in the southwestern Atlantic Ocean. Fourteen species and 301 individuals were sampled non-destructively using a cast net method described here. A method is described for ageing Atlantic Yellow-nosed (*Thalassarche chlororhynchos*) and Black-browed (*T. melanophris*) Albatrosses based on bill colour and moult. Procellariiformes appear to have two distinct moulting strategies: petrels and shearwaters have complete annual moult, start to moult during the breeding period, and replace several primaries and tail feathers at one time, whereas albatrosses undergo long moulting cycles, replace less feathers at once, and suspend the wing moult during breeding periods.

Primary moult starting at P2 rather than P1 was demonstrated to be a common feature in this taxon, with important implications for studies of stable isotopes, trace elements and pollutants in feathers. Overlap between moulting and breeding is demonstrated to be common with tail and contour feathers, but limited in wing, which suggests that flight constraint in long distance foragers rather than nutritional and energetic limitations is the ultimate factor determining primary moult timing. Based on molecular sexing and linear measurements, sexual size dimorphism was shown to vary according to species, with females in general smaller than males, more pronounced in bill measurements than in other traits, and more conspicuous in Giant Petrels (*Macronectes* spp.) and Diomedea albatrosses. Closely related species pairs of *Thalassarche* albatrosses and *Procellaria* petrels had differing levels of sexual dimorphism.

The pelagic seabird community sampled comprises birds from different ages and breeding status according to species. Skewed Adult Sex Ratio (ASR) has been proposed as a common pattern in birds, frequently biased towards males and with larger biases in globally threatened species. In albatrosses and petrels, differential mortality of one gender in fisheries is suggested to be caused by sexual size dimorphism giving males a competitive advantage, which allows more access of the larger sex to discards and baits, or to at sea segregation of sexes. These hypotheses were tested by sampling birds at sea and reviewing ASR of birds incidentally captured in fisheries. Skewed ASR is common in albatrosses and petrels from the community attending vessels, but there was no correlation between skewed ASR and conservation status, both in terms of population size or global level of threat, or between ASR and sexual size dimorphism. Thus, sexual dimorphism in size does not explain skewed ASR in the community sampled or in incidental captures in fisheries reported in the review. Differential at sea distributions of males and females appear to explain better the patterns found in the community sampled at sea, as well as skewed ASR in seabird fatalities.

Kernel density analysis of satellite tracked Spectacled Petrels (*Procellaria conspicillata*) in 2006 and 2007 demonstrated intense use of waters in the Brazilian Exclusive Economic Zone, from 26 to 31° S, mainly over the continental shelf break and offshore waters. The marine habitats used by Spectacled Petrel and described by bathymetry, SST and productivity are remarkably different from those of the sister species White-chinned Petrel (*Procellaria aequinoctialis*), which occurs in the area during the winter, but remains over the continental shelf, on Sub-Antarctic and oligotrophic waters. A close association between birds and pelagic longline fishery was demonstrated through comparison of the main kernel areas used by Spectacled Petrels and the pelagic longline fleet. Stable isotopes of nitrogen ($\delta^{15}\text{N}$) and carbon ($\delta^{13}\text{C}$) in blood preserved in different ways and

simultaneously growing feathers were analysed in Spectacled Petrel. Mean $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values in growing feathers were higher than in blood, suggesting tissue-specific fractionation.

Different methods of preserving tissues such as blood may bias stable isotope values. Air drying is proposed as a practical and unbiased method for blood preservation in field situations where freezing is not a practical option, and a mathematical approach is suggested to permit comparison between studies using different preservation methods or tissues. By analysing stable isotopes in blood of all species of Procellariiformes sampled it is demonstrated that availability of discard, mainly the preferred shark liver, which is shared among species with contrasting body masses and feeding techniques, is the ultimate cause of overlapping in trophic levels.

Carbon isotopic signature overlapped among the species and was typical of subtropical and offshore region. Early migrant individuals from Antarctica and sub-Antarctic (e.g. Cape Petrel *Daption capense*, White-chinned Petrel, Wilson's Storm-petrel *Oceanites oceanicus*) and species still rearing chicks when sampled (Wandering Albatross *Diomedea exulans*) had clear carbon isotopic signatures from the austral region.

All southern latitude species underwent a clear shift in carbon and nitrogen isotope signatures, increasing in trophic level after arriving in the SW Atlantic. Cory's Shearwater (*Calonectris diomedea*), the only species not attending vessels, has low nitrogen values resulting from a diet of flyingfish and squids naturally occurring in the area. While some abundant and widespread petrels and shearwaters, particularly those small in size, benefit from discards from pelagic longline vessels, the balance between benefits and the incidental mortality in hooks is negative for albatrosses and some petrels. Information on bycatch rates of seabirds in the Brazilian domestic pelagic longline fishery from 2001 to 2007 in the Exclusive Economic Zone and adjacent international waters of the southwestern Atlantic Ocean is presented, and bycatch rates for the area are reviewed. Overall, seabird capture rate for the Brazilian pelagic longline fleet was 0.229 birds/1000 hooks, varying from 0 to 0.542 birds/1000 according to season. Capture rates were higher between June and November (cold season) and affected mainly the Black-browed Albatross (55% of birds captured), the White-chinned Petrel, the Spectacled Petrel and the Atlantic Yellow-nosed Albatross.



Overall, seabird capture rate for the Brazilian pelagic longline fleet was 0.229 birds/1000 hooks, varying from 0 to 0.542 birds/1000 according to season. Capture rates were higher between June and November (cold season) and affected mainly the Black-browed Albatross (55% of birds captured), the White-chinned Petrel, the Spectacled Petrel and the Atlantic Yellow-nosed Albatross.

Capture rates previously reported in the SW Atlantic varied from 0 to 5.03 birds/1000 hooks, with those based on logbooks or fishermen interviews tending to underestimate capture rates, whereas those based on small numbers of hooks or short time periods tend to greatly overestimate rates in both pelagic and demersal longline fisheries. A range of poorly-known hook-and-line commercial fisheries carried out by the Itaipava fleet, southeastern Brazil, composed by 497 vessels, was described with seven fisheries defined. Capture rates were higher for the surface longline for Dolphinfin (0.15 birds/1000 hooks and 1.08 turtles/1000 hooks), slow trolling for Bigeye Tuna (0.41 birds/day) and handlining targeting Yellowfin Tuna (0.61 birds/day). Bycatch of 47 seabirds, mainly the endangered Spectacled Petrel, Atlantic Yellow-nosed, and Black-browed Albatrosses, and 45 turtles of four species were recorded. Longline and other hook-and-line fisheries are the major threat for albatrosses and petrels from different origins when foraging in the SW Atlantic Ocean, and require urgent conservation measures.

Conservation Statement:

The thesis addressed basic and applied research on albatrosses and petrels, migratory seabirds globally threatened by extinction, contributing on the ecology and conservation in several ways: methodologically, by demonstrating how to capture and sample seabirds non-destructively at sea, encouraging further research elsewhere on this neglected period (Ch. 2); ageing albatrosses (Ch. 3); improving stable isotope analysis (Ch. 4 and Appendix 1); providing data on general biology (Ch. 5&6); and natural mortality factors (Appendix 2); applied conservation, by revising bycatch in the South-western Atlantic Ocean in the globally well known pelagic longline (Ch. 9) and providing insights on small-scale fisheries, not recognized previously as threat for seabirds and seaturtles (Ch. 10); investigating overlap of longliners and satellite tracked Spectacled Petrels distribution (Ch. 8); demographic impacts of fishery mortality on males and females (Ch. 11); how benefits from food discards, and costs from

incidental mortality, are balanced and vary according to species (Ch. 7); conservation of Trindade Petrels in breeding grounds (Appendix 1&3, and papers) by determining at sea distribution using geolocators, feeding ecology, breeding biology and recent expansion towards Indian Ocean mediated by introduced mammals and deforestation investigated through molecular methods. Overall, the study used an innovative approach to study seabirds at sea, which allowed addressing distinct issues not investigated at colonies. It wandered from basic studies on biometry, moult and censuses, to technological ones based on molecular biology, remote sensing, tracking devices and stable isotopes determined by mass spectrometry, most not previously used in Brazil. New data and insights were widely disseminated in international forums, providing evidences on how fisheries disrupt migration increasing mortality in fisheries or providing food discards. All these have important implications, and applications, in the research and mitigation of fishery impacts, recognized as a major factor impairing the long-term survival of albatrosses and petrels.

Luciano O. Valenzuela**E-Mail Address:** valenzuela@biology.utah.edu**Phone Number:** (+ 1 801) 587 3405**Institution:** Department of Biology University of Utah**Street:** 257 South 1400 East**City:** Salt Lake City, UT 84112**Country:** USA**Title:** Population structure and foraging ecology of southern right whales (*Eubalaena australis*): insights from isotopic and genetic analyses**Subject/ Field of Research:** Population ecology, foraging ecology, population genetics, Migration**Date of Graduation:** July 2008**Educational Institute:** Department of Biology, University of Utah**Short Statement:**

Ocean warming will undoubtedly affect the migratory patterns of many marine species, but specific changes can be predicted only where behavioral mechanisms guiding migration are understood. Southern right whales (*Eubalaena australis*) show maternally inherited site fidelity to near-shore winter nursery grounds, but exactly where they feed in summer remains mysterious. Southern right whales are recovering from exploitation during the past two centuries, but their population numbers remain low at approximately 20% of pre exploitation estimates. However, their reproduction is influenced by reduction of food abundance linked to increased sea surface temperatures following El Niño events.

Here, I present the work conducted for my doctoral dissertation, which is aimed at increasing our understanding of the population structure, the foraging ecology and the migratory strategies of southern right whales.

In this dissertation I show that genetic and isotopic signatures, analyzed together, indicate that maternal lineages are structured over an isotopic range, and that the isotope ratios from adult females are more similar than expected among individuals sharing the same mitochondrial haplotype. This pattern suggests a strong maternally directed site fidelity to summer feeding grounds. Such fidelity would be expected to limit the exploration of new feeding opportunities and might explain why this population shows increased rates of reproductive failure in years following sea surface temperature anomalies in the western South Atlantic. By comparing isotope ratios from skin samples with published and unpublished values of potential prey and other predators I have also discovered that southern right whales appear to have at least three different foraging strategies probably associated with different migratory patterns.

Additionally, I found significant genetic differentiation between live and dead animals, with an overrepresentation of dead calves within one of the two major phylogenetic clades known for this species. This overrepresentation is likely the outcome of a recent influx of migrants from populations where this clade is more abundant.

Finally, I present a study aimed at comparing mother and calf isotope ratios. I discovered interannual variability in the magnitude of nitrogen and carbon fractionation, which was interpreted as potential differences in the nutritional stress of the mother-calf pairs across years.

Conservation Statement:

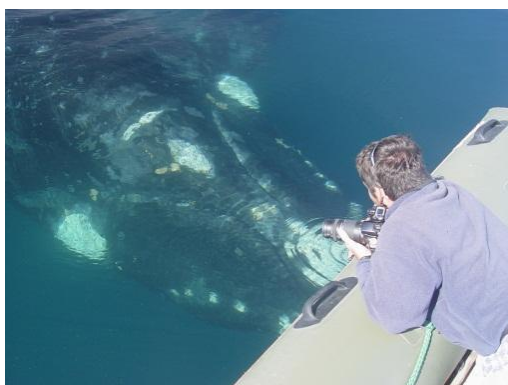
Southern right whales make long summer foraging migrations to replenish the blubber reserves that they will need to survive their winter fasting period. Success is critical for adult females who may be gestating and then nursing a fast-growing calf during the last weeks and months of the fast. Prior to my dissertation research, very little was known about the range of feeding destinations used by the population that calves at Península Valdés, Argentina, and it was not known whether individuals or families show site fidelity to those destinations from one year to the next. We used a combination of stable isotopes and mitochondrial genetics to investigate the foraging

strategies of these whales, which have been studied for 40 years in a program of intensive repeat photo-identification.

We found that the Península Valdés whales use feeding areas distributed over a very wide geographic range and apparently have different migratory strategies that are transmitted “culturally” within matriline (i.e., from mothers to offspring). We also found that the isotopic differences between mothers and calves (both for carbon and nitrogen) are nearly zero, so a mother’s migratory strategy can be assessed from tissues of her calf.

Like other southern right-whale populations, the Península Valdés whales have increased at rates of 6-7% for many years. However, more than 300 whales (mostly young calves) have died at the Península since 2007, suggesting that the population and its ecosystem may be less healthy and robust than previously thought. We are now assessing the isotopic profiles and mitochondrial genetic lineages of many dead calves to find out whether the recent extraordinary mortalities are concentrated among whales that forage in particular locations. This work may provide insight into how changing conditions in the southern ocean ecosystem affect right whales, and by extension, many other species as well.

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- Luciano O. Valenzuela July 2011 Valenzuela LO P.3

Lucy E. King**E-Mail address:** lucy@savetheelephants.org**Phone Number:** cell: (+254 720) 275 561**Institution:** Save the Elephants**City:** Nairobi 00200, P.O.Box 54667**Country:** Kenya**Title:** The interaction between the African elephant (*Loxodonta africana africana*) and the African honeybee (*Apis mellifera scutellata*) and its potential application as an elephant deterrent.**Subject/ Field of Research:** Zoology and Biology**Date of Graduation:** 2010**Educational Institute/ University:** Balliol College, University of Oxford, UK**Short Statement:**

The conceptual origin of this DPhil thesis was based on one foundation publication by Vollrath and Douglas-Hamilton (2002a) “African bees to control African elephants”. The authors made a unique discovery that African elephants will avoid feeding on acacia trees that host beehives, either empty or occupied by African honey bees. The concept that elephants might hold a long term memory about bees that could be so negative as to evolve avoidance behaviour towards an otherwise favourite food source, was deeply intriguing and warranted further study. Two key research questions are asked in this thesis and are reflected in the title (i) what happens when elephants and honey bees interact and (ii) how can we adapt this behaviour into a potential deterrent system for crop-raiding elephants. Hence, this is really a thesis of two halves blending both disciplines of natural and social sciences.

The first three data chapters explore in detail the behavioural response of elephant families to digital playbacks of bee sounds. This technique has been used successfully by other established elephant research teams including acoustic studies on African savannah elephants conducted by scientists with the Amboseli Trust for Elephants and Cornell University studying African forest elephants. Here, I work with an unfenced savannah elephant population studied by Save the Elephants in Samburu and Buffalo Springs National Reserves, northern Kenya. I show that not only do elephants run from the sound of bees but that they emit a unique low frequency alarm call when doing so, which in turn alarms (or warns) others in the area to retreat.

Although these multi-layered behavioural discoveries were groundbreaking, I go on to reveal that bee sounds alone will not be enough to deter elephants for long as they do start to habituate to the playback sounds when no negative conditioning from live bees occurs. Turning to the application of this knowledge, I spend three chapters describing in detail the development and evolution of a unique beehive fence designed specifically for use by poor rural farmers who suffer from frequent crop depredations and damage by elephants.

I rely on several rapid rural appraisal techniques to evaluate the impact of the beehive fence on efficiency and effectiveness as well as the perception of the farmers and the potential income and livelihood prospects. The adoption success of the beehive fence system in three rural communities leads to a discussion about the wider application of beehive fences on both a regional and global scale. I end with a list of recommendations for the conditions within which I predict the beehive fences will be effective.

Conservation Statement:

The African elephant is perhaps the most iconic migratory land mammal on the continent. Catastrophic poaching in the 1970's and 80's saw their populations plummet to a mere fraction of pre 1970's numbers. An effective international ivory trade ban implemented by CITES in 1989 has resulted in rising numbers, particularly in East and Southern Africa, but these elephants are expanding into a world now densely settled by people. Rising incidents of human-elephant conflict are occurring where elephants are exploring old migratory routes and either being blocked by new developments or breaking into farmland plots to take advantage of nutritional agricultural produce. Injuries, deaths and stress are felt by both elephants and man.

Where electric fences are neither appropriate or affordable, research efforts are focusing on elephant deterrent systems that can be managed and implemented by the farmers themselves. Our research has been exploring the use of African honeybees as a natural deterrent for crop-raiding elephants that also enables farmers to benefit from honey and bee products. We have made several unique discoveries: (i) Elephants avoid feeding on acacia trees hosting beehives (Vollrath & Douglas-Hamilton, 2002), (ii) elephants will run away from the sounds of disturbed honeybees (King et al., 2007), (iii) our unique beehive fences are effective against crop-raiding elephants (King et al., 2009) and (iv) elephants have a unique low frequency rumble which helps them communicate about the threat of bees to each other (King et al., 2010).

Critical to this thesis is the discovery that beehive fences are able to keep elephants out of crops therefore enabling migrating families to pass peacefully around farming areas on their migratory routes to seasonal foraging grounds. The beehives provide protection against elephants, provide honey, wax, and pollen products and help with pollination enhancing growth of indigenous vegetation and agricultural productivity.

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Sea turtles are vulnerable to aspects of climate change because they have life history, physiological attributes and behaviour that make them extremely sensitive to environmental changes. Arguably, the more detectable impacts of climate change to sea turtles will occur during their terrestrial reproductive phase (egg laying, egg incubation and hatchling success phase) since there are clear, and relatively straightforward, effects of increased temperature, sea level rise and cyclonic activity on sea turtle nesting sites and reproductive output. Indeed, there has been a recent increase in research activity focusing on the potential impacts and implications of climate change to sea turtles' terrestrial reproductive phase.

While first identified as an issue in the mid 1980s recent studies have begun to investigate and predict how specific climatic processes will affect sea turtle's nesting habitats and reproductive output. However, the studies conducted to date are limited temporally, because (1) they predict how a single climatic process will affect sea turtles, yet processes are likely to occur simultaneously and cause cumulative effects, and (2) they typically focus only on one nesting ground used by a particular turtle population and this approach does not provide a full understanding of how a population (management unit) will be affected. Consequently, there is a need for a structured approach to investigate how multiple climatic processes may affect the full range of nesting grounds used by a turtle population.

The issue of cumulative impacts was addressed by using a systematic and comprehensive methodology to assess how multiple climatic processes will affect the northern Great Barrier Reef (nGBR) green turtle population (the largest green turtle population in the world) under a conservative and an extreme scenario of climate change for both 2030 and 2070. For this, I first identified how key processes: (1) change in sediment traits, (2) increased temperature, (3) sea level rise, and (4) cyclonic activity will affect key nesting grounds (n= 7) that represent the nesting habitat for 99% of the nGBR green turtle population. I then, used expert opinion to gather information on the relative impact of each process on sea turtle nesting grounds. This information was then incorporated into a climate change vulnerability assessment framework.

The sediment from each nesting ground was very different, which indicates that nesting grounds will respond differently to predicted climate change, potentially causing changes in nesting and hatchling emergence success, and reducing optimal nesting habitat. Investigations of the impacts of increased temperature on the nGBR green turtle population predicts a feminization of annual hatchling output into the population by 2030 and temperatures above the upper thermal threshold at some nesting grounds by 2070.

Importantly, Raine Island, western Milman Island and Sandbank 7 will still produce male hatchlings by 2070 even under the most extreme scenario of climate change. This is crucial for future management as managers may choose to protect important male-producing regions to balance future population viability. Further impacts to the nGBR green turtle population will occur from sea level rise (SLR). Up to 34% of available nesting area across all

the selected nesting grounds may be inundated as a result of predicted levels of SLR. Low sandbanks will be the most vulnerable to SLR and nesting grounds that are morphologically more stable, such as Dowar and Raine Islands, will be less vulnerable. More positively, impacts from cyclones to the nGBR green turtle population will be very low. The latest regional climate models predicted a tendency for a reduction in the impacts that the nGBR green turtle population will experience from cyclones.

The predicted impacts from each of the climatic processes were incorporated into a vulnerability assessment framework. The vulnerability assessment indicated that in the short term (by 2030), sea level rise will cause the most impact on the nesting grounds used by the nGBR green turtle population. However, in the longer term, by 2070 sand temperatures will reach levels above the upper transient range and the upper thermal threshold and cause relatively more impact on the nGBR green turtle population. Thus, in the long term, a reduction of impacts from sea level rise may not be sufficient, as nesting grounds will start to experience high vulnerability values from increased temperature. Therefore, a stronger focus on mitigating the threats from increased temperature will be necessary for long term management of the nGBR green turtle population.

Some of the potential options to mitigate the impacts of increased temperature include changing the thermal gradient at beaches, nest relocation, and artificial incubation. The best management options will be site specific and dependent on a series of factors, including feasibility, risk (interaction and impact on other species and ecosystems), cost, constraints to implementation (both cultural and social), and probability of success in relation to selected sites. Thus, a “toolbox” with various strategies will be needed to address the impacts of increased temperature across the nesting sites used by the nGBR green turtle population.



Conservation Statement:

Climate change is one of the most significant threats to global ecosystems and biodiversity. Migratory species are especially at risk from climate change as they require separate breeding, wintering, and migration habitat. My thesis used a vulnerability assessment framework to evaluate how multiple climatic processes will affect the terrestrial reproductive phase of the largest green turtle population in the world, the northern Great Barrier Reef green turtle population. The framework used was the first to assess systematically how sea turtle nesting grounds will be affected by multiple climatic processes and provided information on 1) how each nesting ground used by this population will be impacted by predicted increases in temperature, sea level rise and cyclonic activity, 2) which of the climatic processes will cause the most impact on each of the nesting ground used by this population, 3) which of the nesting grounds used by this population is most vulnerable to climate change and 4) how the vulnerability of various nesting grounds used by this population will change as the impacts of different climatic process are mitigated.

The results highlighted the need to consider the impacts of climate change on sea turtles and to increase sea turtles resilience to enhance their adaptive capacity to climate change. Further emerging management strategies were identified to conserve sea turtles as the climate changes. This provided key information for managers to direct and focus management and conservation actions to protect turtle populations in the future. Indeed, as I worked closely with different management agencies during my PhD I delivered my results in a manner that could be incorporated into their management practices. Consequently the current Australian Minister of Climate Change has publicly acknowledged the value of this thesis and indicated it increased the capacity for management of sea turtles in the face of climate change.

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Every year, millions of birds fly thousands of kilometers across continents to overwinter in climatically favourable habitats. Because human impact and climate change have led to profound alterations of our environment (BERTHOLD 2003), migratory birds which rely on a variety of habitats for breeding, migration and wintering grounds are increasingly threatened. Conservation measures for migratory species are mainly undertaken in the Northern Hemisphere at well-known reproduction sites, but little or no protection is provided during migration and in their wintering areas. This is often because the countries with most of those wintering areas are developing countries and their financial resources are therefore limited. The scant resources typically focus on endemics and this means that migrants or highly vagrant species remain mostly unstudied.

During the past few decades, ringing and radar observation have led to a better general understanding of the long-distance movements of several migratory species. However, details of individual migration routes and movements of migrants in their wintering areas have remained largely unknown or have been limited to anecdotal observations (SANDERSON et al. 2006). With the development of lightweight satellite transmitters in the 1980s a new era of migration studies began (BERTHOLD 2001). This permitted the successful tagging of large bird species such as the bald eagle (*Haliaeetus leucocephalus*), the trumpeter swan (*Cygnus buccinator*), the whistling swan (*C. columbianus*) and the Antarctic giant petrel (*Macronectes giganteus*; STRIKWERDA et al. 1986) as well as marine and terrestrial mammals (GILLESPIE 2001, AKESSON et al. 2003, KENNEDY et al. 1998). In 1990, satellite telemetry was successfully introduced in Europe. In addition to larger birds such as Bewick's swan (*Cygnus bewickii*) and the griffon vulture (*Gyps fulvus*), the white stork (*Ciconia ciconia*), the Montagu's harrier (*Circus pygargus*) and birds as small as the prairie falcon (*Falco mexicanus*) were fitted with satellite transmitters (STEENHOF 2005, LIMINANA et al. 2007, BERTHOLD 2001).

With the invention of this method, migration strategies and navigation mechanisms (ALERSTAM 2006, GILLESPIE 2001, THORUP et al. 2006, GSCHWENG et al. 2008) as well as so far unknown migration routes, important stopover sites and new wintering areas were discovered (HAKE et al. 2001, ALERSTAM 2006, GSCHWENG et al. 2008, STRANDBERG et al. 2006, MEYBURG & MEYBURG 1999). Furthermore, satellite tracking provides continuous spatial data across large scales with a high temporal resolution - a fact that enables the tracking of highly vagrant species which move within inaccessible and/or remote wintering areas (MUTSUYUKI 2000, LATTA & FAABORG 2008).

In contrast to most resident or short-distance migrants, long-distance migratory birds are exposed to a variety of threats. These include difficult environmental conditions during migration such as heat, drought, wind or bad weather, as well as physiological challenges, e.g. the crossing of high mountain chains or large water bodies, thus further complicating the already difficult navigational challenges that the migrants face. Besides certain natural environmental issues, these birds also encounter human-made threats during their long journeys of several thousands of kilometres, which are mostly environmental pollution, e.g., contaminated drinking water, heavy metals or pesticide in the environment or accumulated in their food (CHADWICK & BROCKSEN 1969, SIERRA et al. 1987, HELANDER et al. 2002). Furthermore, habitat alterations such as forest fragmentation or deforestation (HARPER et al. 2007, MYERS et al. 2000), industrialisation and the associated loss of valuable

habitat for stopover during migration as well as for wintering might influence the migrants' overall constitution. On the one hand, long-distance migratory species escape hostile environmental conditions such as low temperatures and resource shortage during winter in the Northern Hemisphere. On the other hand, to reach their far-off wintering areas in the Southern Hemisphere they face a multitude of threats that seriously affect their survival rates.

Because of the threats long-distance migratory birds have to face during their absence at the breeding sites, risk assessment studies are urgently needed to define the habitat quality of areas that are crucial for the survival of migratory animals such as stopover sites or wintering grounds. Whereas sampling of low-resolution data is adequate for determining migration routes, high-resolution data are required to execute risk assessments based on detailed habitat analysis. The latter can be provided by GPS or satellite transmitters, which deliver high location accuracy. Accuracy is increasingly becoming an important issue with regard to the detailed analysis of ARGOS tracking data, as only high-resolution data enable, for example, calculation of migration speed or small-scale movements (HAYS et al. 2001).

During my fieldwork in Sardinia in 2003, 2004 and 2005 as well as during my five months' fieldwork in Madagascar, I tracked the rare Eleonora's falcon, a colonial breeder on Mediterranean and Atlantic islands off the Moroccan coast. In the first and second year of my fieldwork in Sardinia, I tagged six adult and four juvenile Eleonora's falcons with light-weight solar powered transmitters (Microwave Telemetry Inc.). In the third year (2005), I fitted three more juveniles with transmitters. The fieldwork in Madagascar comprised a survey of the species by personal observation, as well as data collection by ornithologists, local NGOs and guides in national parks.

Observations in Madagascar were challenging due to the difficult climatic conditions in the wet season, as well as inaccessible forest areas (DUFILS 2003). A large number of broken roads and bridges, as well as destructive cyclones, such as Gafilo in 2004, the most intense cyclone that has ever formed in the southwest Indian Ocean (killing 363 people and leaving more than 200,000 homeless), hindered travelling and limited access to regions where I expected Eleonora's falcon to be present. Despite the difficulties, I obtained a first comprehensive data set of Eleonora's falcons on their wintering ground. Furthermore, most of the satellite transmitters produced valuable data, and one bird could be even tracked during two autumn and one spring migration.

Given the small world population of the species, which is part of several action plans, such as the European Action Plan for Eleonora's falcon, the Bonn Convention, the Berne Convention as well as the EU Bird Directive, in which this bird is listed in class I (highly endangered; SCHÄFFER & NIPKOW 2003), the declining population trend, as well as major gaps in our understanding of the species ecology have led me to investigate several aspects of the biology of this rare raptor. I studied current migration routes and compared them with data on historical migration routes (VAUGHAN 1961, WALTER 1979b, BERTHOLD 2001, STRESEMANN 1954), modelled and analysed the habitat suitability of its wintering ground in Madagascar and assessed the possible contamination loads of the falcon's eggs.

Eleonora's falcon breeds in large colonies of up to 630 pairs (Morocco) and is, together with the smaller sooty falcon (*Falco concolor*), the only raptor species known to delay its breeding period into late summer, feeding its young with migrating passerines at the peak of autumn migration (WALTER 1979b). It is a long-distance migratory bird that makes journeys of several thousand kilometres to its wintering grounds in Madagascar, where 90% of the world population is estimated to overwinter (GSCHWENG et al. 2008). In contrast to white storks where juvenile birds usually join groups of experienced adults and are likely to learn navigational skills as well as distinct landmarks on their way to their wintering areas (CHERNETSOV et al. 2004), transmitter data suggest that juvenile Eleonora's travel on their own (GSCHWENG et al. 2008). This leads to the question of what navigational skills are applied by the naive birds that enable them to find their exclusive wintering areas in Madagascar (ERNI et al. 2003, CHERNETSOV et al. 2004, CHERNETSOV et al. 2008), and what orientation mechanisms, e.g. orientation by the magnetic field of the earth (COCHRAN et al. 2004, CHERNETSOV 2008, MOURITSEN et al. 2003, THORUP et al. 2006), stellar cues, vision (MOURITSEN et al. 2004), or so far unknown mechanisms come into play in order to enable the naive birds to find their way and, for instance, to compensate for wind drift (THORUP 2003, AGOSTINI et al. 2005) while navigating over large bodies of water.

Together with the description of the migration routes, these questions form the first chapter of my thesis. With this study of the migration route of Eleonora's falcon, I found that in contrast to the historical migration route

described by Stresemann (STRESEMANN 1954) the species migrate on highly individual routes all across the African continent and that juvenile falcons make a stopover of 14 days in West Africa where they display a “Zugknick” (an abrupt change of course), an observation that supports the theory of vector navigation (BERTHOLD 1996). Satellite data made it possible to discover the hitherto unknown summering sites of two juvenile falcons in combination with the detection of a completely new wintering area in the Democratic Republic of the Congo.

In the second chapter, I conducted a comprehensive analysis of the wintering habitat of Eleonora’s falcon and modelled its habitat suitability via MaxEnt (statistical species distribution modelling). To investigate the potential distribution of the species, satellite data of seven Eleonora’s falcons were analysed during the wet season in Madagascar from 2003 to 2006. A first half-year model shows all regions which are predicted as suitable for the species, and a further set of six monthly models displays the habitat shift throughout the wet season in different months (November to April) according to varying ecological variables. The results show that the falcons are specialists regarding their habitat choice and do not occur throughout the island but are limited mainly to humid mountainous regions mostly located in the north and on the Central High Plateau. All sites were characterised by a particular climatic profile. These findings will form an indispensable basis for proposing concrete conservation measures, which have long been called for in the European Action Plan for Eleonora’s falcon (EU Action Plan; RISTOW 1999).

In the third chapter, I focus on threats that the species encounters due to the continuing application of pesticides and other contaminants in Africa that could influence the reproductive success of a long-distance migratory bird (PEVELING et al. 2003, PRINZINGER 1980). One dominant factor that influences the body condition and hormonal status of a wide range of vertebrates and especially migratory bird species is the accumulation of a high pesticide load along different stages of the birds’ migration routes and on their wintering grounds. Regular and intensive treatments with dangerous insecticides that have been banned in Europe are still conducted due to plagues of locusts that regularly occur in African countries (FAO 2004) including the application of DDT from 1997-2000 in Madagascar (PEVELING et al. 2003). One example is the intensive treatment of hopper bands of the endemic Malagasy migratory locust (*Locusta migratoria capito*) with DDT (PEVELING 2001). The results of the analyses are published in the international journal *ISRN Zoology* (GSCHWENG et al. 2011 in press).

With the assistance of Sardinian fieldworkers I collected dead eggs in a Sardinian colony in 2004 and 2005 and investigated the possible accumulation of pesticide and heavy metal load in Eleonora’s falcons’ eggs during the journey of this bird across more than 20 African countries (GSCHWENG et al. 2008). In 62% of the eggs examined, we found dead embryos and further analysed the samples on organ chlorines as well as on polychlorinated biphenyls and heavy metals. Our results show an overall similar contaminant load compared to other bird species recently investigated (GERVAIS & CATLIN 2004, Fernandez-Garcia et al. 2008, BIANCHI et al. 2003) but the individual toxic substances might not be sufficient to explain such a high percentage of dead embryos, so we discuss the possibility of a cocktail effect that might have led to our findings.

To investigate the different aspects of Eleonora’s falcon ecology I combined a wide range of methods, e.g., satellite telemetry, statistical modelling, censuses, personal observation as well as the contaminant analysis of eggs. With the data at hand, it is now possible to fill in the gaps in understanding the ecology of an endangered raptor outside its breeding territories. This finally forms the basis for conservation efforts and for determining the actual conservation status of this rare falcon species.

Conservation Statement:

My thesis provides new insights into the migration routes of Eleonora’s falcons and the location of areas used by non-breeding individuals. The high inter- and intra-individual variability of migration routes, the variety of important stopover sites as well as the apparent discovery of a new wintering area in the Democratic Republic of the Congo and the location of hitherto unknown summering areas show the complicated nature of conserving migrants and the vulnerability of Eleonora’s falcon.

Although Eleonora’s falcon is a geographically widespread species with regard to its breeding areas, its range is spatially restricted during winter in Madagascar. Given the alarming destruction of many habitat types in Madagascar, in particular humid evergreen forests that are especially rich in endemic species, data on migration and winter movements are crucial for the development of applied conservation management plans. To ensure

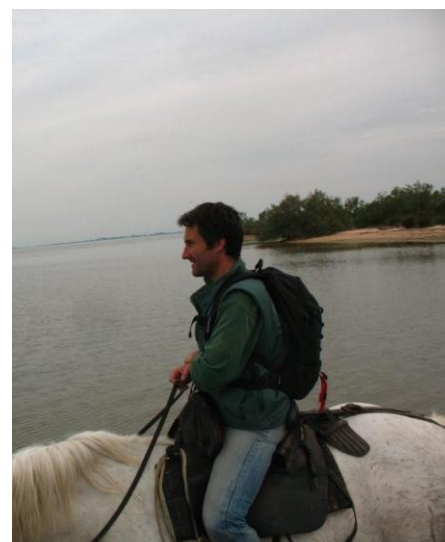
effective protection of endangered migratory species as requested by the CMS, detailed information on habitat use and requirements of those species is urgently needed. My thesis aimed at assembling a comprehensive database on the distribution and ecological needs of Eleonora's falcon that would inform a detailed management plan to enhance its protection.

The method to use satellite data for dynamic ecological niche modeling which we designed on behalf of my thesis could be applied by other satellite tracking studies of migratory species, too. Thus, our method enables analyzing satellite data beyond the mere description of migration routes, leading to an enormous surplus of ecological information on migratory species.

The results of my thesis also underscore the importance of further surveys of Eleonora's falcon on the breeding grounds. Regular censuses and pesticide analyses of unhatched eggs have shown that long term monitoring is important because contamination is not a local but a continental issue for migrating birds.

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Pierre Defos du Rau**E-Mail:** lddr13@hotmail.fr, pierre.defosdurau@oncfs.gouv.fr**Phone Number:** (+33 466) 816 505; cell: (+ 33 625) 032 211**Institution:** ONCFS, migratory birds unit**Street:** Tour du Valat, Le Sambuc**City:** Arles, 13200**Country:** France**Title:** Ecology, demography and conservation of a rare game species: the Red-crested Pochard *Netta rufina***Subject/ Field of Research:** Ecology, Population dynamics, genetics**Date of Graduation:** June 2007**Educational Institute/ University:** Toulouse University (France)**Short Statement:**

Red-crested Pochard *Netta rufina* is one of the rarest migrant duck species in Europe. However, it is exploited in France, Spain, Portugal and Romania. But exploitation level and population size remain not known enough to guarantee sustainability of its exploitation.

Aims of this work were

- to identify breeding habitat requirements in order to produce recommendation for wetland managers. However, some of these recommendation were identifiable only when taking into account detection imperfection occurring in field surveys.

- to evaluate sustainability of hunting exploitation of the species and assess possible risks for the European population. Genetic analyses based on samples collected over the whole distribution area showed that the Central European and Western Mediterranean population is a single independent management unit. Estimation of main demographic parameters of the species allowed to build a matrix model which was then used for perturbation analyses and simulations under various conditions of climate change and harvest rate. Hunting exploitation of the Western European population does not seem to negatively affect its viability; however, several vital rate estimates used in this matrix model, like survival and harvest rates, must be improved in order to remove uncertainty in future management choices in the species exploitation and conservation.

Conservation Statement:

Red-crested Pochard *Netta rufina* is one of the rarest migratory breeding duck in Europe. However, it is hunted in France, Spain, Portugal and Romania. But exploitation level and population size were not known enough to guarantee sustainability of its exploitation. This knowledge gap was therefore of serious concern since the species was one of the rarest game species in France and possibly Western Europe. I then gathered and analysed all sparse datasets existing on the species and complemented these old datasets with habitat surveys and genetic analyses. I used this set of analyses to build a management strategy in order to assess hunting sustainability and promote better breeding habitat management.

I surveyed habitat requirements for the first time in three different breeding strongholds (deltas of Ebro, Rhône and Danube) so as to provide wetlands managers with habitat management recommendations. Added values of these habitat surveys were:

- a) its large European scale, providing first-time results on the species' macroecology and increasing reliability of habitat management recommendations all over the European breeding range:
- b) integrated correction for detection imperfections in both habitat and macroecology analyses based on the most recent CMR methodologies and enabling to draw counter-intuitive conclusions otherwise not reachable through conventional surveys uncorrected for detection imperfections.

The population stock exploited by West-European hunters was identified through genetic analyses as encompassing Central Europe and Western Mediterranean. This stock proved rather small, as estimated by Wetlands International, thus strengthening the need for a sound management strategy. I therefore developed PVA analyses using demographic parameters most of them were estimated for the first time for Red-crested Pochard. A matrix model was used for perturbation analyses and simulations under various conditions of harvest and climate change, which demonstrated that past hunting regulations proved efficient to improve the species' conservation status, which now seems secure.



Some Publications:

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- Defos du Rau, P. & Crochet, P.A. 1994 Présence et reproduction de la Tarente *Tarentola mauritanica* à Toulouse (Haute-Garonne, France). *Bulletin de la Société Herpétologique de France* 69-70 : 66-67
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The winner Lucy King



The jury selected as the winner Dr Lucy King for her work on “The interaction between the African elephant (*Loxodonta africana africana*) and the African honeybee (*Apis mellifera scutellata*) and its potential application as an elephant deterrent”.

With her thesis Dr King made a unique discovery that African elephants will avoid feeding on acacia trees that host beehives, either empty or occupied by African honey bees. The relevance to the vision and goals of UNEP/CMS to protect and improve the conservation status of migratory animals as well as sophisticated structure and methodology presented in the thesis were the main factor in the Jury’s choice.

Dr King lives in Kenya. In 2010 she received her Ph.D. in Zoology and Biology with her thesis from the Balliol College, University of Oxford, UK. At the moment she is employed at the Save the Elephants, Kenya, as DPhil Researcher and Chief Operations Officer where she is an integral part of STE’s research and conducts elephant behavioural and communication studies in Samburu National Reserve. Lucy King works with rural farmers from Turkana, Kikuyu and Samburu tribes who suffer from human-wildlife conflict issues, and she has developed a unique crop-raiding deterrent system using beehives to keep elephants out of farmers’ crops. She also manages fundraising proposals, financial management and research logistics to assist the overall charity’s research and fundraising goals

Dr Lucy King has been employed by Quest Overseas Ltd as Managing Director & Africa Operations Director and Africa Operations Manager & Expedition Leader. Her goals there were the growth of a small project and expedition company and the establishing new African projects to take the ethos and conservation ideals established in 1996 in the South American projects over to sub Saharan Africa. Dr Lucy King also worked with the Lubombo Conservancy TFCA Conservation Project, Swaziland; Community Development Project, Tanzania, and Water Relief Project, Kenya.

In affiliation with the Kenyan NGO Excellent Development, Lucy King organised two QO teams to raise money to build 6 sand dams in a drought-ridden region of Kenya, Machakos. All three projects are still running successfully.

She participated in several expeditions. In total Dr King visited has visited 53 countries on 6 continents.

Laureates

In addition, the Jury selected the following three authors as CMS Laureates, because of the outstanding quality of their theses and their significance for CMS conservation efforts and species plans:

The 1st Laureate: Dr Franziska Tanneberger with "The Pomeranian population of the Aquatic Warbler (*Acrocephalus paludicola*) - habitat selection and management"

The 2nd Laureate: Dr Grant C. Hopcraft with "Ecological Implications of Food and Predation Risk for Herbivores in the Serengeti".

The 3rd Laureate: Dr Christiane Trierweiler with "Travels to feed and food to breed - The annual cycle of a migratory raptor, Montagu’s harrier, in a modern world".

Reading and signing of the declarations: Dr Klaus Riede

All jury members signed the declaration for the winner and the laureates.

Francisco Rilla reported on the next steps regarding the winner of the Thesis Award. The winner, Dr. Lucy King will be introduced and honored during the Tenth Conference of the Parties of the CMS in Bergen, Norway, 20-25 November 2011. Dr. Lucy King will be invited to come to Bergen for the official ceremony. She will also summarize briefly her thesis and provide it for the all participants of the COP 10.

The 1st, 2nd, 3rd laureates will be announced on the web-page and will also receive certificates. The links to the all theses also will be available on the web-page of the CMS in the future.

Members of the Jury



From left to right: Pierre Devillers, Ralf Sonntag, Klaus Riede, Francisco Rilla, Wolfgang Böhme, Patricia Mergen, Manfred Niekisch, Elizabeth Mrema, Dennis Rödder, André Weller, Wolfgang Wägele, Fernando Spina, Borja Heredia, René Marie Lafontaine

Résumé:

CMS is pleased that the donor fully endorses the work of CMS and its objectives now being promoted by the Award confirmed, So the organizers of the Thesis Award hoped for Lufthansa's support for the future.

It was proposed to concentrate not only on the winner but also to emphasize achievements of the three laureates. In addition,, it was suggested that all the Top-14 participants of the Thesis Award 2011 would provide short statements about the applicability of the results of their studies for CMS.

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We also want to thank the *Forschungsmuseum Koenig*, Bonn/Germany (<http://www.museumkoenig.de>) for the support during the meeting of the Final Jury on 20th September 2011.

Our special thanks go to all reviewers, who all wholeheartedly agree to participate in verifying all the applications received:

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