TIBE 2017 | BIO-LOGGING

June 28-30, 2017 @ CIBIO-InBIO, Vairão, Portugal

SCIENTIFIC & ORGANISING COMMITTEE
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TiBE 2017   CIBIO   InBIO

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Preface

Welcome to the 6th TiBE, Trends in Biodiversity and Evolution, an annual meeting organized by CIBIO-InBIO.

In 2017, TiBE Bio-logging aims to attract a wide range of researchers who use animal-attached electronic devices to study aquatic, terrestrial and aerial species, and their habitats. The term 'bio-logging' is generally interpreted has encompassing not only logger-based technologies but also state-of-the-art telemetry applications. TiBE will have as key note speakers (1) Professor David Sims whose research focuses on the movement ecology of marine predators, notably the sharks, skates and rays; (2) Yuuki Watanabe which studies the ecology and physiology of marine predators in the polar region; (3) Dina Dechmann's research focus on energetic constraints and ecological niche of animals, as well on the evolution of brain size; (4) Marco Martins, responsible for the development of NMR micro coils, MEMS sensors and magnetoresistive sensitive elementsand; and (5) Aldina Franco is interested in movement ecology and ecological responses to global change

TiBE in general, aims to bring together senior researchers, post-graduate and graduate students working with bio-logging tools to present and discuss relevant findings. Held in an informal but stimulating scientific atmosphere, these conferences provide an excellent opportunity for strong interaction and brainstorming between students and more experienced researchers.

We hope you have a nice time at Porto and enjoy the conference!

The organization committee of TIBE2017

Program

	Day 1 28/06/2017
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11:05	Coffee Break
11:35	**"SiMRiv, a new R package conceived to simulate movements in rivers and heterogeneous landscapes - uses and potentialities"** Lorenzo Quaglietta
11:55	**"MYTAG – Integrating natural and artificial tags to reconstruct fish migrations and ontogenetic niche shifts"** Filipe Martinho
12:15	**"ACCELTAG - Developing a 3-axis accelerometer acoustic transmitter for aquatic species"** Bernardo Quintella
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	Plenary talk: **"Tracking the Lives of Oceanic Sharks in a Changing World"** Prof. David Sims
15:00	**"Nocturnal activity and optimal searching: what do skates get up to, when they think we're not watching?"** Nick Humphries
15:20	**"Sub-lethal effects of pelagic longline interactions in juvenile loggerhead sea turtles (*Caretta caretta*)"** Frederic Vandeperre
15:40	Coffee Break
16:10	**"Evidence of site fidelity and partial migration in the flapper skate (Dipturus intermedia) in relation to an MPA"** James Thornburn
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	Day 2 29/06/2017
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09:45	Plenary talk: **"Into the deep: Tracking marine predators with modern electronic tags"** Ass. Prof. Yuuki Watanabe
10:45	**"A global synthesis reveals shelf and off shelf habitats shape marine megafauna movements"** Ana Sequeira
11:05	Coffee Break
11:35	**"Characterization and minimization of the stress response to trapping in free-ranging wolves (Canis lupus): insights from physiology and behavior"** Nuno Santos
11:55	**"Surface presence of Atlantic bluefin tuna in the Gulf of Lions, derived from electronic tagging data"** Robert Bauer
12:15	**"Vertical movement patterns of oceanic whitetip sharks"** Mariana Tolotti
12:35	Lunch
14:00	Travelling to Porto and Sightseeing
16:00	**Ramos Pinto wine cellars**
17:00	Travel to the harbour and Sightseeing
18:00	**6-bridges cruise**
19:00	Travel to the restaurant and sightseeing
20:30	**Conference dinner**

	Day 3 30/06/2017
09:30	**Conference opening**
	Session 4: Terrestrial animal tracking
09:45	Plenary talk: **"Causes and mechanisms underlying changes in the migratory behaviour of birds: insights from tracking studies"** Dr. Aldina Franco
10:45	**"Spatial behaviour of Iberian-imperial-eagle juveniles during the dependence period revealed by high resolution tracking devices"** Rita Ramos
11:05	Coffee Break
11:35	**"Survival and breeding success of captive bred Common Quail released on São Miguel (Azores)"** Tiago Rodrigues
11:55	**"Stopover ecology of a grassland bird"** Ana Teresa Marques
12:15	**"Migration of Teal Anas crecca wintering in Portugal. The use of Nasal saddles vs. PTTs vs. GPS/GSMs"** David Rodrigues
12:35	Lunch
	Session 5: Ecological niche and social behaviour
14:00	Plenary talk: **"Biologging on bats - when your study organism is small and nocturnal"** Dr. Dina Dechmann
15:00	Coffee Break
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16:10	Workshop: **"Bio-logging from concept to realization: steps, tips and pitfalls"** Fernando Lima & Rui Seabra
16:30	
16:50	
17:00	**Closing remarks**

Plenary speakers

Marco Martins
(International Iberian Nanotechnology Laboratory, Portugal)

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Marco Martins is an application engineer at the International Iberian Nanotechnology Laboratory. He is integrated in the Nano-ICs Group, being responsible for the test and characterization, system level integration and validation. NMR micro coils, MEMS sensors and magnetoresistive sensitive elements are some of the devices being evaluated for system integration and future integration. In the past, he developed the instrumentation for an Infra-Red Chamber sensor for chemical detection, a fiber optic Dip-coater for an oxygen sensor and a cell incubator temperature data logger for a research institute.

Session 1: Technology and electronics

Professor David Sims
(Marine Biological Association, UK)

Email: dws@mba.ac.uk

David Sims is an MBA Senior Research Fellow and Leader of the Sims Lab at the Marine Biological Association. His research focuses on the movement ecology of marine predators, notably the sharks, skates and rays. David has investigated the patterns, mechanisms, causes and consequences of predator movement. The consequences of predator movement for species conservation has been a particular interest stemming from his pioneering work for more than 20 years on the behavioural ecology of the plankton-feeding basking shark.

Session 2: Behaviour ecology
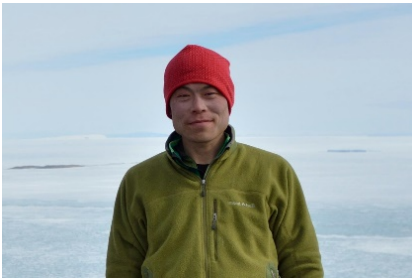
Yuuki Watanabe

(National Institute of Polar Research, Japan)

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Yuuki Watanabe is an associate professor at the National Institute of Polar Research in Japan. His main research interest is on the ecology and physiology of marine predators in the polar region. He has been focusing mainly in the foraging behaviour and energy budget of penguins and seals, the diving physiology of these animals, the biomechanical aspects that allow the animals to swim efficiently, and the impact of these animals on the marine ecosystem.

Session 3: Animal behaviour and physiology

Aldina Franco

(University of East Anglia, UK)

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Aldina Franco is a senior lecturer at the University of East Anglia, interested in movement ecology and ecological responses to global change. She has studied the effects of habitat loss and climate change on the distribution of northern butterfly species, at different spatial scales, and their movement in fragmented and heterogeneous landscapes. More recently, Aldina has studied the movement of white storks and quantified the importance of landfill resources for resident birds.

Session 4: Terrestrial animal tracking

Dina Dechmann
(Max Planck Institute for Ornithology, Germany)

Email: ddechmann@orn.mpg.de

Dina Dechmann is a staff scientist at the Max Planck Institute for Onithology and a research associate at the Smithsonian Tropical Research Institute. Her main research interests are energetic constraints and ecological niche of animals, as well the evolution of brain size. Dina is particularly interested in comparing knowledge gathered from geographical comparisons such as the tropics and the temperate zones, in order to test many current theories explaining the evolution of sociality and mating systems excluding confounding influences of seasons and seasonal behaviours such as migration and hibernation.

Session 5: Ecological niche and social behaviour

Abstracts

Session 1: Technology and electronics
(Wednesday, June 28, 2017)

09:45 - 10:45 | Plenary session

"Sensors and Electronics for data logging application"
Marco Martins[1,*]

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Design constrains and considerations constitute the main challenge for modern logging systems. From state of the art sensors, signal conditioning requirements, digital artifacts implementation and data compression are some of the topics that must be considered when designing a logging system.

Battery usage performance and energy harvesting emerging technologies are also addressed in the presentation mainly focusing specific "motion" applications.

A practical example implementation is also demonstrated in this presentation, identifying all the mechanical, electrical and production constrains and the impact/tradeoffs that are representative of today's available technologies.

10:45 - 11:05 | Oral presentation
"A small and rugged data logger for studying nearshore currents"
Bruno Loureiro[1,*]

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Nearshore currents are the dominant drivers of important processes controlling dispersal, recruitment, food supply and biochemical cycling among others. Nonetheless, studying these coastal currents is challenging due to the effect of wind, waves and the hazards imposed by the rocky shore. In this project, we developed a completely watertight 12cm spherical logger, equipped with GPS, able to register position and speed at 1Hz. These drifters had minimal fluctuation to avoid wind interference, and communication and charging was done wirelessly to avoid compromising the water tightness. This technology still has room for improvements. Other sensors such as accelerometers, or probes sensitive to temperature, dissolved oxygen, or pressure, can be used to study animal behaviour and environmental preferences.

11:35 - 11:55 | Oral presentation
"SiMRiv, a new R package conceived to simulate movements in rivers and heterogeneous landscapes - uses and potentialities"
Lorenzo Quaglietta[1,*], Miguel Porto[1]

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Most of the approaches for the study of animal movement imply the simulation of (pseudo-) random, individual-based, spatially-explicit trajectories, to be compared to observed trajectories to infer patterns. This is also required to test for site fidelity, which is a pre-requisite of home range estimation. So far, the lack of software allowing to simulate trajectories along linear habitats (e.g., rivers) hampered the realization of such studies in aquatic and semiaquatic species (e.g., fish, semiaquatic mammals, and Amazonian riverine people).

We recently developed a new, open source software for the simulation and statistical modeling of spatially-explicit individual trajectories using multi-state markov models, the R package SiMRiv. Although originally conceived to fill the mentioned gap, and thus to

simulate movements in rivers and heterogeneous landscapes, SiMRiv can be used for any species, and to test the effects of any landscape feature on its movement patterns.

We introduce the framework behind our methodology and the main functions and potentialities of SiMRiv, which, by allowing simulating movements of species independently on (or constrained by) their habitat, should help exploring questions relevant to fields as varied as animal behavior, landscape, spatial and movement ecology, disease and invasive species spread, population dynamics, and conservation biology.

11:55 - 12:15 | Oral presentation

"MYTAG – Integrating natural and artificial tags to reconstruct fish migrations and ontogenetic niche shifts"

Filipe Martinho[1,*], José Carlos Antunes[2], Henrique Cabral[4], Daniel Crespo[1], Hugo Ferreira[3], Marta Ferreira[2], Vanessa F. Fonseca[4], Vânia Freitas[2], Alfredo Martins[3], Miguel Pardal[1], Ana Lígia Primo[1], Sandra Ramos[2], Patrick Reis-Santos[4], Diogo Silva[2], Eduardo Silva[3], Susanne E. Tanner[4], Rita P. Vasconcelos[4], Ana Vaz[1]

[1]CFE - Centre for Functional Ecology, Department of Life Sciences, University of Coimbra, Portugal; [2]CIIMAR - Interdisciplinary Centre of Marine and Environmental Research of the University of Porto, Portugal; [3]INESC TEC - Robotics and Autonomous Systems, Instituto Superior de Engenharia do Porto, Portugal; [4]MARE - Marine and Environmental Sciences Centre, Faculdade de Ciências, Universidade de Lisboa, Portugal
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Reconstructing migration pathways throughout ontogenetic development of fishes is determinant for the development and implementation of accurate management and conservation plans. MYTAG project will develop and integrate the use of natural and artificial markers to study fish migrations at fine spatial and temporal scales, namely reproductive migrations, estuarine colonization and nursery habitat use.

We chose the European flounder (Platichthys flesus) as a model species, which migrates along the river-estuary-sea continuum throughout its life-history, with documented variability in these migrations over the distribution range. This project includes an ongoing strategically designed fieldwork approach in the Mondego and Douro estuaries (Portugal) for reconstructing life-history migrations using natural markers such as otolith microstructure and chemical composition for determining ontogenic migrations of early life stages along the river-estuary-sea gradient. In addition, artificial tags will be applied in fish: external tags will be implanted for a mark-and-recapture experience, and acoustic tags to be actively tracked by Autonomous Surface Vehicles for evaluating both intra-estuarine patterns of habitat use and migrations towards the coast for spawning. This innovative approach will allow a comprehensive understanding of the connectivity

between different life history stages and unravel the plasticity of life history strategies of marine fish.

11:15 - 12:35 | Oral presentation

"ACCELTAG - Developing a 3-axis accelerometer acoustic transmitter for aquatic species"

Bernardo Quintella[1,2,*], J.L. Costa[1,2], T.J. Pereira[1,3], A. Groeningsaeter[4], P.R. Almeida [1,3]

[1]MARE – Centro de Ciências do Mar e do Ambiente, Portugal; [2]Departamento de Biologia Animal, Faculdade de Ciências da Universidade de Lisboa, Portugal; [3]Departamento de Biologia, Escola de Ciências e Tecnologia, Universidade de Évora, Portugal; [4]Thelma Biotel, Sluppen, Trondheim, Norway
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A consortium composed by Thelma Biotel AS and MARE – Marine and Environmental Sciences Centre (former Institute of Oceanography) was created to develop and test an acoustic 3-axis accelerometer transmitter for aquatic species. This collaboration resulted in the project AccelTAG, financed by the EUROSTARS program of the European Union. Thelma Biotel was responsible for technical and hardware developments. MARE researchers assumed prototype testing in live fish specimens of Lusitanian toadfish, Halobatrachus didactylus, a benthic and fairly sedentary marine species common in southwestern Portuguese estuaries. The first phase took place in experimental tanks and consisted of externally implanting a prototype data logging tag in fish and compare logged data with observed typical toadfish behaviors (direct observations complemented by video recorded images), in order to obtain distinct accelerometer data patterns that could be assigned to those actions. Several "signatures" were successfully identified (e.g. burying, prey attack, swimming, activity sensor). The second phase was the development of algorithms and software capable of identifying those patterns during tag measurement process in order to only transmit relevant information, followed by laboratory tests with live fish. The third phase corresponded to the field experiment and was conducted in the Mira estuary, southwestern coast of Portugal, with the purpose of testing this new technology in free living toadfish.Thirty toadfish were captured, tagged with the AccelTAG and released in the Mira estuary, where an array of automatic acoustic receivers was deployed. The AccelTAG proved to be successful in identifying particular behaviours and to regularly transmit the processed data to the receivers array.

Session 2: Behaviour ecology
(Wednesday, June 28, 2017)

14:00 - 15:00 | Plenary session

"Tracking the Lives of Oceanic Sharks in a Changing World"
Professor David Sims [1,2,*]

[1]Marine Biological Association of the UK, The Laboratory, Citadel Hill, Plymouth PL1 2PB, UK; [2]Ocean and Earth Science, University of Southampton, National Oceanography Centre Southampton, UK
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The last few decades have seen incredible developments in bio-logging technology and the techniques for tracking and analyzing the physiology, movements, behaviour and ecology of free-ranging animals. Some of the most dramatic advances have been with studies on fully aquatic marine animals such as oceanic pelagic sharks. Key insights include discovery of migratory routes, foraging tactics, deep diving behaviour and habitat preferences, while outstanding questions include the 'rules' underlying movements, the drivers of aggregations and sexual segregation, the role of social interactions, the energy costs of different movements and the impact of climate change. A burgeoning issue for bio-logging is the need to determine how movements and behaviour interact with environmental gradients to determine spatial dynamics of conservation-priority species across whole population ranges. This advance will be crucial because there are widespread declines in threatened oceanic sharks due to overfishing, with catches remaining largely unregulated with poor monitoring and data reporting. In this plenary lecture I will describe the approach my research group has taken in studies spanning 20 years to understand where oceanic sharks go, what habitats they occupy and what they are doing whilst there, and how bio-logging approaches are beginning to reveal ocean-basin-scale population structure for quantifying the interactions with fishers needed to inform conservation and management initiatives.

15:00 - 15:20 | Oral presentation

"Nocturnal activity and optimal searching: what do skates get up to, when they think we're not watching?"

Nick Humphries[1,*], Sam Simpson[1, 2], David Sims[1, 2, 3]

[1] Marine Biological Association of the United Kingdom, The Laboratory, Citadel Hill, Plymouth PL1 2PB, UK; [2] Ocean and Earth Science, National Oceanography Centre Southampton, University of Southampton, Waterfront Campus, European Way, Southampton SO14 3ZH, UK; [3]Centre for Biological Sciences, Building 85, University of Southampton, Highfield Campus, Southampton SO17 1BJ, UK
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Until the advent of electronic tags the patterns of activity in free ranging benthic marine predators, such as skates, remained largely unknown, as a result of the difficulties of observing these animals in the wild. Consequently our understanding of how the behaviour of benthic predators changes over daily or seasonal timescales is poorly understood. As indeed are the details of what activities the animals are engaged in when they are active. However, the timing, pattern and nature of periods of activity (and rest) have important ecological consequences, as well as conservation implications related to catchability and, consequently, population assessments. Here, using depth time-series data from 89 skates from 4 species (Raja brachyura, R. clavata, R. microocellata and R. montagui) with a total of 12,000 days of data, we investigate fine scale activity patterns determined from vertical move step lengths. We find that activity in skates is more complex than expected with significant variation between both individuals and species. However, some clear trends and similarities emerge; in particular we present the first evidence of optimal foraging and searching in these benthic predators.

15:20 - 15:40 | Oral presentation

"Sub-lethal effects of pelagic longline interactions in juvenile loggerhead sea turtles (Caretta caretta)"

Frederic Vandeperre[1,*], Marco Santos[2], Hugo Parra[1], Helen R. Martins[1], Karen A. Bjorndal[3], Alan B. Bolten[3]

[1]IMAR – Instituto do Mar, Horta, Portugal; [2]DRAM – Direção Regional dos Assuntos do Mar, Horta, Portugal; [3]ACCSTR – Archie Carr Center for Sea Turtle Research, USA
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Incidental capture by surface longline gear is a well recognized issue for the conservation of endangered marine turtles. Sea turtles get hooked or entangled in the fishing line resulting in serious injuries and often in subsequent mortality. Loggerhead sea turtles (Caretta caretta) affected by this fisheries are mainly oceanic-stage juveniles belonging

to a relatively narrow size class (~40-70 cm FL), resulting in a bottleneck effect that is considered one of the main causes for their population decline in the last decades. While research effort has been largely focussing on estimating mortality rates associated with these interactions, at-haul back as well as post-release mortality rates, little attention has been given to eventual sub-lethal effects. Based on the analysis of satellite telemetry data of early sensors, the present study reveals important sub-lethal effects that can last up to at least 5 months after the interaction. The comparison of deep hooked and control individuals provides strong evidence of altered horizontal as well vertical behaviour. Since the fate of the turtles beyond the experiment and the long-term costs of compensatory mechanisms in sea turtles are unknown, this study underlines the necessity to further investigate the impact of sub-lethal effects on population dynamics.

16:10 - 16:30 | Oral presentation

"Evidence of site fidelity and partial migration in the flapper skate (*Dipturus intermedia*) in relation to an MPA"
James Thorburn[1,*], Dodd J[2], Neat F[1]

[1]Marine Scotland Science, Aberdeen, Scotland; [2]Scottish Natural Heritage, Scotland
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The Critically Endangered flapper skate (Dipturus intermedia) has been declared locally extinct in several areas of its former range over the last 100 years, placing accentuating the importance of managing the remaining population appropriately.

The Loch Sunart to the Sound of Jura Marine Protected Area (MPA) on the west coast of Scotland is designated to protect this species. To investigate movement of skate within the MPA and assess management measures, 34 acoustic receivers were installed for a 14-month period. Thirty-two skate of varying size and sex were double tagged with acoustic transmitters and data storage tags (DSTs) recording depth and temperature. Four DST records with over a year's worth of data were recovered. Tidal geolocation models showed tagged skate to make extensive movements in shelf waters before returning to the MPA. Acoustic data showed some individuals remained near the MPA for the duration of the project. Age and sex did not appear to be a factor determining movements. This data is suggestive of partial migration and strong site fidelity in the flapper skate that occupy the MPA, a behaviour that should be considered when reviewing management options for the species.

16:30 - 16:50 | Oral presentation

"Spatial and temporal dynamics of male lekking behaviour revealed by high resolution GPS tracking"

João P. Silva[1,2,3,*],Francisco Moreira[1,2], Jorge M. Palmeirim[3]

[1]REN Biodiversity Chair, CIBIO - InBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos - Rede de Investigação em Biodiversidade e Biologia Evolutiva , Universidade do Porto, Portugal; [2]Centre for Applied Ecology "Prof. Baeta Neves" - InBIO, Instituto Superior de Agronomia, Universidade de Lisboa, Portugal; [3]Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências da Universidade de Lisboa, Portugal
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Even though leks have been widely used by biologists as a model to study sexual selection, the understanding of how individuals use space, interact and socially progress over time is still lacking. Our work aims to provide new insights into lekking breeding dynamics using a high temporal and spatial resolution dataset derived from the GPS tracking of adult male little bustards Tetrax tetrax, collected over a four-year period. Results show the lekking system as being dynamic at both intra and inter-seasonal scales. Smaller ranges were consistent with territorial behaviour. Using Bayesian Latent Cluster Analysis, based on the movements of each individual, we were able to distinguish the breeding behaviour modes, territorial and floating, within the breeding season. Surprisingly only 27% of the males were found to be constantly territorial within the same year. The remaining birds showed predominant floating behaviour or shifted between the two behavioural modes, floating and territorial, possibly indicating male turnover. Between years birds were found highly philopatric with floating males reducing their ranges within the same area and becoming territorial, indicating a trend for rank progression with increasing adult age. The combination of territorial site fidelity and male rank ascent based on age can explain lek temporal persistence within stable habitats.

Session 3: Animal behaviour and physiology
(Thursday, June 29, 2017)

09:45 - 10:45 | Plenary session

"Into the deep: Tracking marine predators with modern electronic tags"
Yuuki Watanabe[1],[*]

[1]National Institute of Polar Research, Tokyo, Japan
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Understating how natural selection has shaped predator-prey relationships is of central importance in ecology. However, studying predation events under natural conditions is difficult, especially in marine ecosystems where direct observations are rarely possible. With the help of many collaborators, I have developed an animal-tracking package (including accelerometer and video camera) to record the hunting behaviour of marine predators. I attached the package to Adélie penguins (*Pygoscelis adeliae*) in Lützow-Holm Bay, Antarctica, and white sharks (*Carcharodon carcharias*) off Neptune Islands, Australia. Penguins frequently moved the heads during dives (as shown by the accelerometer), and head movements were confirmed (by the video camera) to represent krill capture events. White sharks occasionally exhibited burst swimming (as shown by the accelerometer), and burst swimming was confirmed (by the video camera) to represent seal chase events. These case studies demonstrated that accelerometers can record prey capture signals for long periods, and that video cameras can provide ground-truth despite their limited recording durations. The wide application of this method will allow a better understanding of hunting strategies and energetics of various marine predators.

10:45 - 11:05 | Oral presentation

"A global synthesis reveals shelf and off shelf habitats shape marine megafauna movements"

<u>Ana MM Sequeira</u>[1], J Rodriguez[2], V Eguíluz[2], J Fernandez[2], C Duarte[4], D Sims[5], R Harcourt[6], D Costa[7], M Hindell[8], M Meekan[3], L Ferreira[3], M Heupel[9], G Hays[10], M Thums[3]

[1]IOMRC and The University of Western Australia, School of Biological Sciences, Australia;[2]Instituto de Física Interdisciplinar y Sistemas Complejos (IFISC), CSIC - University of the Balearic Islands, Spain; [3]Australian Institute of Marine Sciences, UWA Oceans Institute (MO96), Australia; [4]King Abdullah University of Science and Technology, Red Sea Research Centre (RSRC), Kingdom of Saudi Arabia; [5]Ocean and Earth Science, National Oceanography Centre Southampton, University of Southampton, UK; [6]Macquarie University, Faculty of Science and Engineering, Sydney, Australia; [7]University of California, Institute of Marine Sciences, Long Marine Lab, USA; [8]University of Tasmania, Institute for Antarctic and Marine Studies, Australia; [9]Australian Institute of Marine Sciences, Townsville, Queensland, Australia; [10] School of Life and Environmental Sciences, Deakin University, Australia
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Movement is a fundamental behaviour of all animals, influenced by intrinsic factors including phylogeny, size, physiology and life history, but also constrained by extrinsic environmental factors. Yet, the relative importance of intrinsic versus extrinsic factors to movement is still unclear. To address this, we analysed movement trajectories of > 2300 individuals from 41 species spanning four classes of vertebrates. We found that differences in marine megafauna movement are primarily explained by an extrinsic factor: the habitat where the species move, and specifically, if the habitat is on- or off- the continental shelf. Species with strong affinity with habitats on the continental shelf exhibited much greater intraspecific variation in movement patterns, whereas open water species (moving mostly off the shelf) displayed more consistent patterns across all individuals. We suggest this result is due to the greater diversity of shelf habitats, highlighting the critical role of preferred habitat in the ecology and evolution of marine megafauna, with continental shelf species having potentially greater resilience to past and future environmental change.

11:35 - 11:55 | Oral presentation

"Characterization and minimization of the stress response to trapping in free-ranging wolves (*Canis lupus*): insights from physiology and behaviour"

Nuno Santos[1,*], Helena Rio Maior[1], Mónia Nakamura[1], Ricardo Brandão[2], Sara Roque[3,4], Francisco Álvares[1]

[1]CIBIO-InBIO – Centro de Investigação em Biodiversidade e Recursos Genéticos - Rede de Investigação em Biodiversidade e Biologia Evolutiva, Universidade do Porto, Portugal; [2]Associação ALDEIA - Centro de Ecologia, Recuperação e Vigilância de Animais Selvagens (CERVAS), Portugal; [3]Grupo Lobo - Faculdade de Ciências da Universidade de Lisboa, Portugal; [4]cE3c, Centro de Ecologia, Evolução e Alterações Ambientais, Faculdade de Ciências, Universidade de Lisboa, Portugal
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Wildlife capture is an essential management tool that nevertheless induces a reactive homeostasis response in the captured animals. Making use of wolves captured for ecological research as a model for wildlife acute stress, we characterize 25 reactive homeostasis mediators. Additionally we assess the effect on these mediators of reducing the duration of restraint on trap by using remote trap activation alarms. Free-ranging wolves trapped by leg-hold snares (n=15) showed higher stress leukogram, tissue injury and hematocrit; while lower glucose, ions and cardiac rate compared with captive wolves. They also showed higher leukocyte count and creatine kinase; but lower hematocrit, cardiac rate and rectal body temperature compared to wolves captured by darting from a helicopter. Daily distance travelled was significantly lower up to day 12 post-capture compared to the remainder of the telemetry follow-up and this effect was more noticeable on the nocturnal distance travelled. Reducing the duration of restraint on trap significantly lowered the stress leukogram and dehydration. Total daily distance travelled during the night by wolves captured with using trap-alarms was significantly lower only on up to day 4 post-capture compared to up to day 28 for wolves captured without trap-alarms. The capture method influences the reactive homeostasis response of free-ranging wolves. Technological solutions that reduce the duration of restraint on trap significantly dampen this influence. Wildlife trapping actions should strive to minimize the delay from capture to manipulation.

11:55 - 12: 05 | Oral presentation

"Surface presence of Atlantic bluefin tuna in the Gulf of Lions, derived from electronic tagging data"

Robert Klaus Bauer[1,*], Jean-Marc Fromentin[2], Tristan Rouyer[2], Manuela Capello[1]

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Recent regulatory measures have introduced extensive changes in the spatio-temporal patterns of the Atlantic bluefin tuna (ABFT) fisheries, significantly affecting the fisheries-dependent indices traditionally employed for its stock assessment in the Mediterranean Sea. To overcome this problem, the development of fisheries-independent abundance indices is needed. Scientific aerial surveys, targeting surfacing tuna schools, have proven to be useful method to achieve this task (e.g. in the Gulf of Lions). In comparison to traditional ship based surveys, they are easy to implement, efficient and come with a high spatial coverage, needed to monitor highly migratory species, such as tuna. However, the amount of non-surfacing schools remains unknown. Variations in the vertical behaviour of ABFT could therefore affect the reliability of thus derived abundance indices. To assess this source of uncertainty, we deployed 24 pop-up archival tags to investigate the vertical behaviour of ABFT in the Gulf of Lions during the aerial survey seasons of 2015 and 2016. Our analyses focused on changes in surface presence and absence periods, defined as continuous residence time (crt) and continuous absence time (cat), using survival curve analysis. Preliminary results indicate seasonal changes in ABFT surface presence, likely related to thermal stratification.

12:05 - 12: 35 | Oral presentation

"Vertical movement patterns of oceanic whitetip sharks"

Mariana Tolotti[1,2,*], Robert Bauer[1], Fabien Forget[1], Pascal Bach[1], Laurent Dagorn[1], Paulo Travassos[3]

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The aim of this study is to describe the fine-scale vertical movements of the oceanic whitetip shark (*Carcharhinus longimanus*), in order to go beyond the existing knowledge that this is an epipelagic species. Time series of depth data, obtained from 6 oceanic whitetips tagged with pop-up satellite archival tags, were analyzed in detail. Individuals

were tagged in the southwestern Atlantic Ocean (n=5) and in the western Indian Ocean (n=1) between 2011 and 2012. Deployment periods varied from 100 to 178 days. The tagged sharks spent most of their time in the mixed layer, displaying the typical behavior of an epipelagic species. However, analyses revealed complex vertical movement patterns, including marked diel changes and inverse behavior modes. Generalized additive models indicate that vertical movements were strongly correlated with variations in the depth of the mixed layer. A correlation between vertical movements and sea-surface temperature (SST) was also observed. When SST was above average, oceanic whitetip sharks increased their vertical amplitude, disregarding the reduction of the mixed layer. This pattern suggests that thermoregulation might occur for the species.

Session 4: Terrestrial animal tracking
(Friday, June 30, 2017)

09:45 - 10:45 | Plenary session

"Causes and mechanisms underlying changes in the migratory behaviour of birds: insights from tracking studies"
Aldina Franco[1,*]

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At higher latitudes, seasonality drives much of the environmental variation and thus migratory behaviour increases in frequency with latitude. Bird migratory behaviour is highly flexible; many species are classified as partial migrants (i.e. with both resident and migrant populations), and species such as irruptive migrants can switch between residency and migrancy in successive years. Migratory behaviour is likely to be advantageous whenever there is sufficient environmental variation to benefit individuals that move to exploit spatial variation in resource availability or quality. Changes to environmental conditions can thus alter the selection pressures operating on migratory behaviour, but the rate at which species can respond will depend upon the mechanisms through which migratory behaviour is initiated and maintained.

During c.20th, White stork (Ciconia ciconia) populations declined across Europe but increased since the 1980s. In South Iberia, the population increase has been linked to increased food availability; invasive crayfish in rice fields and organic material from landfill sites. These year-round food resources may have facilitated the Portuguese population to become partially migratory, with over half of the breeding population remaining in Portugal last winter. The effect of anthropogenic food sources on the resident individuals and on post-fledging movement was unknown. We found that resident White Storks used landfill more during the non-breeding (20.1% ± 2.3 of foraging GPS fixes) than during breeding period (14.9% ± 2.2). Attendance on landfills declined with increasing distance between nest and landfill in both seasons. During the non-breeding season a large proportion of GPS fixes occurred on the nest throughout the day (27% ± 3.0 of wakeups) in the majority of tagged storks. This study provides first confirmation of year-round nest use by resident White Storks. The proportion of GPS fixes on the nest was not influenced by the distance between nest and the landfill site.

Storks travelled up to 48 km to visit landfills during non-breeding and a maximum of 25 km during breeding, notably further than previous estimates. Storks nesting close to landfill sites used landfill more and had smaller foraging ranges in non-landfill habitat indicating higher reliance on landfill. The majority of non-landfill foraging occurred around the nest and long distance trips were made specifically to visit landfill.

White storks are social birds, they migrate in loose social groups rather than in family parties, and the juveniles from nests located close and far from landfill sites are possibly following non-naïve individuals to foraging areas and to landfill sites.

10:45 - 11:05 | Oral presentation

"Spatial behaviour of Iberian-imperial-eagle juveniles during the dependence period revealed by high resolution tracking devices"

Rita Ramos[1,*], João P. Silva[1,2,3], Carlos Carrapato[4], Paulo Marques[5], Jorge Palmeirim[1]

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In long-lived vertebrates, juveniles depend exclusively on their progenitors during the first stage of their life. This dependence stage can play a critical role on their development and fitness. The Iberian-imperial-eagle (*Aquila adalberti*) is a highly threatened long-lived raptor that only breeds in the Iberian Peninsula. With this work, we aimed to understand the spatial behaviour of juveniles during this dependence period, particularly looking at how home range varied over time and climatic factors influencing exploratory movements. Between 2014 and 2016, we tagged 10 juveniles using high resolution tracking devices. The birds were tagged in four different nests located in Southern Portugal. Juveniles showed a gradual increase of their home range with time, being highly dependent of the nest location during the dependence stage. For the majority of the juveniles, the direction of the exploratory flights were not random, and there was a clear tendency for the juveniles to fly NW from the nest, mainly against the predominant winds. Females travelled longer and to further distances than males. Still, juveniles from the same nest showed a similar exploratory flight patterns. These results may play an important role in assessing key conservation issues such as electrocution risk in the electric grid network.

11:35 - 11:55 | Oral presentation

"Survival and breeding success of captive bred Common Quail released on São Miguel (Azores)"

Tiago M Rodrigues[1,2,*], Marisa M Rodrigues[1], Manuel Leitão[2], David Gonçalves[1,2]

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The Azores Common Quail (*Coturnix coturnix conturbans*) is endemic to the Azores (36-39° N 25-31° W) and an important game bird in the archipelago. Since 2001, the regional hunting administration is releasing wild captive bred quail on São Miguel island to mitigate the possible negative impacts of hunting and agriculture practices. In 2008, 2009 and 2013, we tracked released quail (13 males and 28 females; age: 7 weeks) fitted with necklace radio-transmitters to evaluate their survival rate and breeding success. During an adaptation period of five days in captivity, body mass variation was not different (GLMM; $F_{1,236}$=1.93, p=0.166) between tagged (n=43) and untagged (n=197) quail. After release, there were no differences in survival between years and sexes (Cox Proportional Hazard; p>0.05 in both terms). The overall survival rate was 42.2%. Predation (50.0%) and agricultural practices (33.3%) were the main causes of mortality (n=12). Females can start nesting after two weeks in the field. The probability of nest survival (±SE) was 0.32 ± 0.03. Trampling by cattle (50.0%) and mowing (33.3%) were the main causes for nest failure (n=6). Despite the relatively high survival rate and the immediate contribution to local breeding, predation and agriculture practices, mainly the frequent mowing for dairy farming, may jeopardize the success of these actions, and require future attention.

11:55 - 12:05 | Oral presentation

"Stopover ecology of a grassland bird"

Ana T. Marques[1,2,3,*], Hany Alonso[4], Ricardo A. Correia[5,6,7], Francisco Moreira[2,3], Jorge M. Palmeirim[1], João P. Silva[1,2,3]

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The Little bustard (*Tetrax tetrax*) is a medium sized grassland bird that has been recently described as a partial migrant in the Iberian Peninsula. High resolution tracking data has shown that all migratory movements occur exclusively during night time, using stop-over areas between breeding and post-breeding areas. This behaviour remains to be described.

In this study, we aim to characterize stop-over areas during the migratory journey and understand the factors influencing their occurrence, such as habitat type and human infrastructures.

The migratory movements of 21 individuals were studied with satellite tracking devices. The areas used as stop-overs were identified and mapped with dynamic Brownian bridge models. Habitat selection was modelled contrasting birds' presences and absences.

All tracked birds performed seasonal movements (mean distance travelled: 62.7 km, range: 10.0-303.5 km), having 1 to 3 stop-over sites in each migratory movement (2.6 ± 1.4 in post-breeding and 2.2 ± 1.1 in return movements). Most stop-over areas were used for short-term periods (80% lasted less than 24 hours), while other stop-overs lasted for longer periods (3% lasted between 72 and up to 168 hours). Birds positively selected areas in open-habitats (non-irrigated and irrigated lands) and avoided the main roads.

12:05 - 12:35 | Oral presentation

"Migration of Teal *Anas crecca* wintering in Portugal. The use of Nasal saddles vs. PTTs vs. GPS/GSMs"

David Rodrigues[1,2,*], Maria Ester Figueiredo[2], Fernando Luís Arede[1,3], Luís Pascoal da Silva[1], Loïc Podvin[4], António Fabião[2]

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The Teal is the most abundant duck species during winter and is exclusively a wintering migratory species in Portugal. More than 4400 teal were captured and ringed in Portugal since 1993. From those, more than 3700 were nasal saddled (www.pt-ducks.com). The recoveries, recaptures and resights of these, modelled through GIS, allowed the definition of migratory routes from breeding grounds to Portuguese wintering sites. Most teal used the East Atlantic migratory route, with breeding grounds from Iceland to Siberia. The use of 5 PTTs since February 2017 already produced new information, some unexpected, and will allow better future GIS modelling. The advantages and limitations of the use of PTT versus GPS/GSM on this specie will be discussed, since next winter will be used also GPS/GSM.

Session 5: Ecological niche and social behaviour
(Friday, June 30, 2017)

14:00 - 15:00 | Plenary session

"Biologging on bats - when your study organism is small and nocturnal."
Dina Dechmann[1,*]

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Working with small animals creates special challenges when it comes to tracking and this has traditionally been a great inhibitor for research on free-ranging small animals. As an extreme case, most bats are small, cryptic and nocturnal and only the recent developments and miniaturizations in tracking technologies have allowed the boost this taxon a boost of scientific research. Here I give an overview over project from the last decade, where we have used miniaturized tracking technology on bats - movement studies from roost observations and group telemetry of socially foraging bats, to long-distance migration and the recording of flight altitude; and physiological studies from heart rate to body temperature in free-ranging tropical bats across the globe. Tracking devices are only tools, but the science they give us access to in the second-largest, but poorly known order of bats are ground-breaking.

Poster Session
(Wednesday, June 28, 2017)

P1. "Investigating microenvironment to improve the survivability of production and laboratory animals"

Gabriela Munhoz Morello[1,*], I. Anna S. Olsson[1], Donald Lay[2], Luiz Henrique Antunes Rodrigues[3], Brian Richert[4], Jeremy Neville Marchant-Forde[2]

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Monitoring animals´ microenvironments can improve understanding of animal health and welfare parameters. Here we report research into previously unexplained variation in pre-wean mortality in swine and laboratory mice. Two swine (60-crate) farrowing rooms had their crate temperature and light levels individual and continuously monitored (May-2013 to June-2014), with the use of data-loggers in a commercial swine facility, Indiana, USA. Differences in temperature and light among crates were up to 9.6oC and 3847.3Lx, respectively, at the same instant of measurement, despite the room's automatic climate and artificial lighting controls. Crate temperatures above 28oC and light levels above 40Lx led to increased incidence of sows crushing at least three of their piglets. A similar investigation is being conducted with C57BL/6 mice at the I3S, Porto, Portugal. Breeding trios have their cages continuously monitored (May-2017 to February-2018) for temperature, light, and handling intensities with the use of data-loggers and accelerometers. Data collected prior to the study showed that differences in light intensity were up to 161.5Lx and 29.0Lx among static and Individually Ventilated (IVC) cages of the same rack, at the same instant of measurement. Light, temperature and handling data will be evaluated as possible factors explaining the variation in pre-wean pup mortality.

P2. "Proximity loggers' performance under controlled field conditions

Roxana Triguero-Ocaña[1,*], Jose Ángel Barasona[2], Patricia Barroso[1], Joaquín Vicente[1], Pelayo Acevedo[1]

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The use of proximity loggers has become very popular in the last years in biological sciences, including prey-predator studies and spatial epidemiology. Many factors were described as constraints of their performance. Thus, measures of the possible error

affecting device calibration and data reception should be empirically quantified for a correct interpretation of the obtained data. Under experimental field conditions, we used proximity collars to i) calibrate the measure of proximity among contacting devices, and ii) estimate their reception success. The effect of factors related with the presence of tall vegetation, height from the ground and distance between devices were assessed and accounted for calibration purposes. Our results suggest that the absence of vegetation, lower distances among loggers and higher height from the ground improve significantly reception success, as have been separately recorded in previous approaches. Moreover, we found significant interactions among studied factors regarding to calibration and device reception success. These results are relevant not only for raising the factors constraining devices' performance, but also they allow us to make critical interpretation of the resulting contact rates and subsequent network analyses.

P3. "MARBEC (MARine Biodiversity, Exploitation and Conservation), more than 30 years of experience in marine biologging"

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Biologging has become an important tool for investigating the behaviour of animals within the context of their physical environment. As leading pioneers in marine biologging, our scientists at MARine Biodiversity, Exploitation and Conservation (MARBEC), a joint research unit by IRD, IFREMER, CNRS, and the Université de Montpellier, in France, developed numerous applications over the past 30 years, that significantly improved our understanding of the behavioural ecology of marine mammals, sea birds, sea turtles and diverse marine fish species. The objective of this poster is to give a short overview about current biologging projects at MARBEC that include among others:

(1) habitat use of dorades in coastal lagoons of the Northwestern Mediterranean Sea (project: SB-Tag)

(2) vertical behaviour of Atlantic bluefin tuna with implications to stock-abundance assessment (project: BLUEMED)

(3) devlopment of physiological state bio-loggers (project: POPSTAR)

(4) spatial ecology of tropical seabirds (project: TOPINEME & MAFALDA)

(5) post-release mortality rates of bycatch species of commercial long liners (project: SELPAL)

(6) bull-shark habitat use (project: ECORECO)

P4. "Demonstrating habitat selection in sympatric Rajidae (skate) species using acoustic telemetry"

Samantha J. Simpson[1,2,*], Nicolas E. Humphries[1], David W. Sims[1,2,3]

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Habitat selection is defined as space use that is non-random due to voluntary movements in response to multiple factors over varying spatial scales. Species living in sympatric assemblages with similar niches are in direct competition for resources and there is increasing evidence that habitat selection allows sympatric assemblages to coexist. Previous studies of Rajidae distribution have suggested broadly sympatric coastal habitat preferences for all species. Common methods to measure distribution, such as fishing surveys, have provided broad scale patterns of distribution, but fine scale movements are often missed. A greater understanding of elasmobranch habitat selection is vital for effective management and conservation, because habitat selection can affect patterns of distribution and therefore commercial catch rates of different species. This is especially important for elasmobranchs, which are vulnerable to overfishing due to their slow growth, late age at maturity and relatively low fecundity. Using acoustic telemetry and network analysis we present research that aims to answer the following questions: Are these 4 sympatric Rajid species moving randomly through a relatively small coastal zone, or do they occupy certain areas preferentially and are different species selecting the same habitat?

P5. "Foraging tactics of marine predators across heterogeneous ocean environments"

Nuno Queiroz[1,2], Catarina Vila-Pouca[3], Ana Couto[1,4,*], Emily J. Southall[2], Gonzalo Mucientes[1], Nicolas E. Humphries[2], David W. Sims[2,5,6]

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Advances in satellite tracking and archival technologies now allow marine animal movements and behaviour to be recorded at much finer temporal scales, providing a more detailed ecological understanding that can potentially be applicable to conservation and management strategies. Here we analysed high-resolution dive depth profiles of two pelagic shark species with contrasting feeding strategies to investigate movement patterns in relation to environmental heterogeneity. Seven macropredatory blue (*Prionace glauca*) and six plankton-feeding basking (*Cetorhinus maximus*) sharks were tagged with pop-off satellite-linked archival tags in the North Atlantic Ocean to examine habitat use and investigate the function of dives. We grouped dives of both species into five major categories based on the two-dimensional dive profile shape. Each dive-shape class presented similar frequency and characteristics among the two species with U- and V-shaped dives predominating. We tested the spatial occurrence of different U- and V-shape dive parameters in response to environmental field gradients and found that mean depth and mean depth range decreased with increasing levels of primary productivity (chlorophyll 'a'), whereas ascent velocities displayed a positive correlation. The results suggest that a planktivore and a macropredator responded behaviourally in similar ways to environmental heterogeneity. This indicates fine-scale dive profiles of shark species with different feeding strategies can be used to identify key marine habitats, such as foraging areas where sharks aggregate and which may represent target areas for conservation.

P6. "Link between foraging behaviour and thermal fronts – using first-passage time analysis and composite front mapping with two shark species in north Atlantic"

Inês Pereira[1,2,*], Ana Couto[1,3], Peter Miller[4], B. Loveday [4], David Sims[5], Nuno Queiroz[1]

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Foraging strategies of marine predators have evolved to respond to patchy prey distribution in a vast, heterogeneous and dynamic environment. These strategies allow predators to locate biological hotspots, where the probability of prey encounters is higher, and adjust their searching effort according to the surrounding environment. Due to their unique oceanography characteristics, oceanic fronts (horizontal gradients in water

properties, such as temperature, salinity, density, among other) are highly productive environments and consequently, foraging hotspots for many marine species. However, despite fronts' importance as foraging locations, their ecological value for top predators is not yet fully understood.

Thus, using fine-scale composite front maps and tracking data from individuals tagged in the north Atlantic over 9 years (2006-2015), we aim to understand the influence of frontal activity on blue and mako sharks foraging behaviour. Specifically, we will investigate the relation between sharks' first-passage time (FPT) as measure of individuals' search effort, and front metrics (intensity, proximity and frequency) using generalized additive mixed models (GAMMs).

This study will provide novel information on the spatial and temporal distribution of two top predators, providing the basis for the development and establishment of adequate management and conservation strategies.

P7. "Thermocline influence on vertical behaviour of pelagic sharks in Atlantic Ocean"

Ivo Costa[1,*], Ana Couto[1,2], Nuno Cruz[3], Nicolas E. Humphries[4], David W. Sims[4,5], Nuno Queiroz[1]

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Even though rapid declines in some large pelagic predators are occurring on a worldwide scale due to overfishing, there is a concern for particular target and by-catch species, such as sharks. Pelagic predators move over large areas and display particular behaviours under distinct environmental conditions. Physical structures in the open ocean, such thermal fronts and the thermocline, are known to constrain movements of marine predators by aggregating prey that cannot tolerate high temperature variations. Hence, these regions likely represent areas of forage accumulation. Sharks are also assumed to move through an environment in a manner that optimizes their chances of encountering prey. Lévy flights are a special class of random walk that may represent an optimal solution to the biological search problem in complex landscapes where preys are sparsely and randomly distributed. However, the adaptive significance of this strategy in response to specific environmental features in the ocean is unclear. This study aimed to determinate how

changes in thermocline (intensity, location) influence the movements and foraging behaviour of pelagic sharks. Results showed that all tracked sharks displayed Lévy-like vertical movements and that increases in the Levy exponent were related with increases in thermocline strength. Furthermore, the turning points distance to the thermocline also decreased with increasing thermocline intensity. Thus, we may consider thermocline as an important foraging area of increased prey availability.

P8. "Trans-Atlantic movements of mako sharks (*Isurus oxyrinchus*) and susceptibility to longline fishing"

João Ferreira[1,2,*], Marisa Vedor [1,3], Ana Couto[1,3], David Sims[4,5], Nuno Queiroz[1]

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Understanding ecological patterns, evolutionary limitations and functioning of the ecosystem is critical to prevent extinctions, loss of biodiversity and damage to ecosystem services.

Worldwide fish populations have been declining the past decades due to overfishing, constituting a major conservation threat. Lack of monitoring and catch data reporting makes difficult to assess these declines for species such as mako sharks, with a vast geographic distribution. We tracked movements of nineteen mako sharks, tagged between 2008 and 2014 in two distinct areas of the North Atlantic Ocean (mid-Atlantic: Azores; North-western Atlantic: NLCZ) using pop-off satellite-linked archival tags (PSAT) and Argos satellite platform transmitter terminals (PTTs) (SPOT and Kiwisat 202). Records of horizontal and vertical movements enabled the identification of core activity areas and diel vertical movements/behaviour. These behaviours have been analysed complementarily with Global Positioning System (GPS) tracking of the entire Spanish and Portuguese longline-vessel fishing fleets to identify areas of high overlap between mako sharks and longliners.

Mako sharks space-use suggested that they spend much time in areas of intensive pelagic longline fishing, and in shallow depths, highly overlapping with the hook deployment depths. Females appear to be more susceptible to fisheries by spending more time in low depths at night where and when they are more likely to be caught.

This study provides useful knowledge by combining fish and vessel telemetry for a more sustainable fisheries management.

P9. "Movement in progress – following red fox movements through northern German landscapes"

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In recent years sensors that are able to measure movement at high spatially and temporal resolution have evolved considerably, providing researchers with novel insights about the behavior and ecology of species. In this study, we aim to gain deeper insights into the spatio – temporal use of territory for red foxes (*Vulpes vulpes*) in Northern Germany. Studying red foxes as important predator and a species with interesting territorial behavior is of high interest from a landscape perspective. We specifically focus on recording long term data to understand the full picture of movement and behavior of our target species throughout the year. Starting 2016, we equipped six red foxes (*Vulpes vulpes*) with devices using GPS and accelerometers in two areas along the coastline of the Northern and Baltic Sea. First preliminary results show that multiple drivers such as phenology, cover within the landscape and interaction with neighboring foxes may influence movement patterns throughout the year, but further research needed.

To understand the role of red foxes within the study areas we plan to identify the environmental drivers for fox movement in the two study areas. Furthermore studying energy expenditure and quantify fine scale behavior from a landscape perspective is of high interest.

P10. "Understanding movement for mitigating the impacts of roads on giant anteater"

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The Brazil's Cerrado support the largest remaining populations of Giant anteaters. However, today this biome is being heavily fragmented by an ever-increasing road network, and Giant anteaters are one of the most frequently road-killed species.

To address this threat, data on why, when, and how anteaters interact with roadways is urgently needed. We have recently initiated a four-year research project aiming to assess the impact of roads on Giant anteater populations in the Brazilian Cerrado in order to understand how roads in the Cerrado are affecting anteater population persistence. Specifically, we will assess the effect of roads on animal movement behavior, population structure and health condition. Research findings will then be used to develop landscape and road management guidelines to mitigate the impact of road mortality on anteater populations.

A total of 8 individuals have already been fitted with GPS loggers (our target is to track at least 15). Also, for the past three months we have been performing roadkill surveys in ca 1,300 km of highway, which have confirmed a high roadkill rate for this species (97 individuals).

By the time of the meeting, we expect to have more data on more individuals, and will present the preliminary analysis of their movement behavior, relating it with the road and landscape features, roadkill data and animal abundance in road vicinity areas.

P11. "Estimating wild boar (*Sus scrofa*) travel speed and day range: is telemetry the more precise option?"

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Day range and travel speed are important ecological variables that are usually measured by telemetry assuming straight-line distances between intermittent relocations of tagged animals. However, recent studies showed that telemetry can notably underestimate these parameters, mainly due to high tortuosity in animal paths. Here, we estimated travel speed (average speed of travel while active) and day range (average speed over the day) of 5 wild boars tagged with GPS-GSM radio-collars recording 12 fixes h-1 (alternative monitoring strategies were also simulated, e.g. 2 h-1). Simultaneously, the population was sampled with camera-traps to estimate travel speed (length of a passage/time). From cameras, day range was estimated as the product of average travel speed and activity level (proportion of day that the population spent active, also obtained from the cameras).

According to previous studies, our results suggest that estimations from telemetry can underestimate the day range. The frequency of fixes and day range were exponentially related, with the greater increments at the highest frequencies. Finally, after applying a tortuosity-related correction factor to the telemetry-based estimates, no significant differences were found in day range estimates obtained from cameras and telemetry. These results support the use of camera-trapping to estimate movement rates of wildlife populations.

P12. "Is Citizen Science an efficient tool for the identification of camera trapping pictures?"

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Citizen science has been widely used in different areas of ecology and conservation, where researchers have used trained and non-trained volunteers to monitor wildlife since the XVIII century.

The development of new technologies applied to conservation have allowed researchers to access information that were not available before. Camera-trapping, for instance, have brought long datasets which become more and more time-consuming to analyze.

Gorongosa WildCam is a citizen science project hosted by Zooniverse where volunteers identify the animals present in pictures from camera trapping in Gorongosa National Park, Mozambique. 39386 pictures were identified by volunteers registered in the web platform and also by one expert, with the aim of understanding the accuracy of volunteers' identification.

Among the identifications were registered 2229 false positives and 738 false negatives. Sympatric and less known species are the ones with more misidentifications, being recurrent the confusion between species as bushbuck, reedbuck and duiker.

In conclusion, the use of citizen science is an efficient and relative fast method to identify large amounts of pictures, however researcher have to be aware of the risk of a high error index. Eventually it will be mitigated in study areas with higher density of popular species, such are lions, zebra, elephant and so on, and the avoidance of pictures taken during the night.

P12. "Tracking social structure within bird flocks"

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Tracking social associations through time is important to understand animal societies, mate choice and various other aspects of the behaviour and ecology of gregarious animals. However, it is very difficult to track gregarious animals year-round, especially in highly mobile and non-territorial species. Here we summarize the approach that our long-term study (3 years) is taking to describe changes in the social networks of common waxbills (*Estrilda astrild*), a highly gregarious and non-territorial finch. We study waxbills in semi-natural conditions, in a very large outdoor enclosure ($78m^2$) with abundant vegetation. This way, waxbill flocks can behave with typical fission-fusion dynamics in this large area, and we can monitor the associations among individuals in great detail. Each bird is tagged with a unique passive integrated transponder (PIT) that is read automatically by the magnetic fields of PIT antennae. We have an array of 44 PIT antennae attached to perches and feeders, and also a set of antennae to detect entrances to a dormitory area. This system continuously monitors joint movements among birds, allowing us to describe proximity-based social networks and their changes through time, including the important transitions that occur from the non-breeding to the breeding seasons.

Workshop Session

(Friday, June 30, 2017)

"Bio-logging from concept to realization: steps, tips and pitfalls"

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Bio-logging is becoming an increasingly crucial part of biological research, providing evermore detailed data about the environment and the organisms living therein. Still, there usually is a significant mismatch between those who need it and those who have the skills to do it. In this workshop we will guide participants through the challenging process of designing, building, implementing and improving a custom-made bio-logging solution. Drawing from more than 10 years of intense experience in the use of bio-logging in the harsh intertidal environment, we will focus on the least-talked aspects of the process, including overcoming design flaws, choosing appropriate materials and strategic cost-effectiveness decisions. Contrary to first impression, lack of attention to these details can easily derail a bio-logging project. We hope the exchange of experience and ideas within this workshop will empower participants to successfully kick off their own bio-logging applications.

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