



XII CONGRESSO
**SOCIEDADE
PORTUGUESA
DE ETOLOGIA**

PROGRAMA/*SCHEDULE*

RESUMOS/*ABSTRACTS*

9 E 10 **OUTUBRO**
ISPA AUDITÓRIO 1

ISPA.PT/SPE2015

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BEM VINDOS

Bem vindos à **SPE 2015, XII congresso da Sociedade Portuguesa de Etologia**, que irá decorrer no ISPA - Instituto Universitário (Auditório Armando de Castro).

A Sociedade Portuguesa de Etologia (SPE) foi fundada em 1987 e visa promover o estudo biológico do comportamento em Portugal. As atividades da sociedade incluem a publicação da revista científica *acta ethologica* pela Springer, a organização de reuniões científicas, a promoção de relações internacionais com sociedades congéneres e a divulgação da Etologia a nível do ensino secundário.

A SPE entende ser importante incentivar a apresentação de trabalhos por estudantes, pelo que atribui, em cada congresso, prémios para a melhor comunicação oral e melhor poster de estudantes. O Prémio Vítor Almada, criado em homenagem ao grande cientista e Professor Vítor Almada, irá ser atribuído à melhor comunicação oral e consiste no apoio financeiro à participação num congresso internacional de etologia. Este ano o prémio Vítor Almada visa apoiar a ida ao ECBB2016 (8th *European Conference on Behavioural Biology*), Viena, Austria, 12-15 Julho 2016.

Votos de um excelente congresso para todos!

WELCOME

Welcome to **SPE 2015, the XII congress of the Portuguese Ethological Society** that will take place at ISPA (Auditorium Armando de Castro).

*The Portuguese Ethological Society (SPE) was established in 1987 to promote the biological study of behaviour in Portugal. The society's activities include the publication of *acta ethologica* by Springer, the organization of scientific meetings, international relations with homologous societies and engaging in outreach ethology-teaching activities at secondary schools.*

SPE wants to encourage young researchers to present their work, and in each congress, will offer an award to the best student poster and oral presentations. The Vítor Almada award, created in honour of the great scientist and Professor Vítor Almada, will be presented to the best talk by a student and consists in a financial contribution for the student to participate in an international congress in ethology. This year, The Vítor Almada award intends to support the attendance to ECBB2016 (8th European Conference on Behavioural Biology), Vienna, Austria, 12-15 July 2016.

We wish everyone a great conference!

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PROGRAMA DA CONFERÊNCIA | CONFERENCE SCHEDULE



FRIDAY, 9th OCTOBER

8:30 Registration

9:00 Opening Remarks

9:30 **Invited talk**
Andy Radford
Impacts of anthropogenic noise on marine life: behavioural and fitness consequences for fish and invertebrates

10:20 **Diogo Antunes**
Dopamine is a modulator of social behaviour in a cooperatively breeding fish

10:40 **João Saraiva**
Strangers in a strange land: reproduction, social structure and endocrine profiles of the chanchito *Australoherus facetus*, an invasive cichlid in southern Portugal

11:00 Coffee Break

11:20 **Ana Faria**
A review on the impacts of CO₂-induced ocean acidification on larval behavior of a shoaling fish species

11:40 **Ana Lopes**
Behavioural lateralization of fish larvae altered under ocean acidification

12:00 **José Ricardo Paula**
Behavioural and physiological responses of cleaning mutualisms in the oceans of tomorrow

12:20 Lunch, ISPA Cafeteria

14:00 **Invited talk**
Susana Varela
The importance of mate-choice copying to sexual selection, speciation and hybridization

14:50 **Gisela Giardino**
Travel for sex: why to live far away from female?

15:10 **Gonçalo Faria**
Sex-biased dispersal, kin selection and the evolution of sexual conflict

15:30 Coffee Break

15:50 Poster Session – odd numbers

17:20 **Paulo Fonseca**
Multimodal and mismatching communication in the vocal cichlid fish *Metriacrima zebra*

17:40 **Inês Órfão**
Can the mating decisions of males be explained by the Marginal Value Theorem?

18:00 **Manuel Sapage**
An evaluation to the standard mate-choice copying experimental protocol

18:20 SPE Plenary Meeting

20:00 Social Dinner

SATURDAY, 10th OCTOBER

9:30 **Invited talk**
Gonçalo Cardoso
The evolution of diversity in birdsong

10:20 **Sara Cardoso**
Gene expression patterns associated with alternative reproductive tactics in the blennioid fish *Salarias pavo*

10:40 **Margarida Monteiro**
Optimization of the object recognition task protocol in C57BL/6 mice

11:00 Coffee Break

11:20 **Sofia Jerónimo**
Effects of group size on maternal allocation in a colonial cooperative breeding bird, the Sociable Weaver

11:40 **Liliana Almeida**
Consistent behavioural differences between two species of passerine birds may explain ecological adaptation

12:00 **Pedro Pereira**
A lunch to share – Interspecific competition in the feeding behaviour of birds

12:20 Lunch, ISPA Cafeteria

14:00 **Invited talk**
Denise Herzing
Dolphin communication and cognition: technology, tools, and time

14:50 **Arianna Cecchetti**
Effects of tour boats on the behaviour of short-beaked common dolphins in the Azores

15:10 **Patrícia Rachinas-Lopes**
Movements and acceleration as an approach to study behavior and daily routines of captive bottlenose dolphins (*Tursiops truncatus*)

15:30 Coffee Break

15:50 Poster Session – even numbers

17:20 **Flore Zélé**
The interplay between *Wolbachia* and haplotype-associated reproductive barriers among populations of *Tetranychus urticae*

17:40 **Diogo Godinho**
Is the within-plant distribution of herbivorous mites affected by differences in plant nutritious value or herbivore damage?

18:00 Video Session

18:20 Vítor Almada and Poster Awards

18:45 Closing Remarks

Impacts of anthropogenic noise on marine life: Behavioural and fitness consequences for fish and invertebrates

ANDREW N. RADFORD, *University of Bristol, UK*



Since the Industrial Revolution, human activities such as energy production, resource extraction, urban development and transportation have changed the soundscape of many terrestrial and aquatic ecosystems across the globe. In addition to increasing the amount of acoustic energy, these activities often generate sounds that are different from those arising from natural sources. Anthropogenic noise is therefore recognised as major component of environmental change, appearing in both national and international legis-

lation. While burgeoning research effort in the last decade has demonstrated that anthropogenic noise can detrimentally affect hearing thresholds, communication, movement patterns and foraging in non-human animals, it is often difficult to translate these effects into meaningful predictions about individual fitness and population-level consequences. For the last 5 years, we have conducted a programme of work investigating how various types of marine noise (e.g. shipping, pile-driving, seismic surveys) can affect the behaviour and fitness of a range of fish and marine invertebrate species. Utilising experiments with playbacks and real-world noise sources, in aquaria, mesocosms and natural conditions, we have found a variety of negative impacts (e.g. reduced anti-predator responses, reproductive output and survival). However, we have also uncovered evidence of intra-population variation in susceptibility, rapid recovery from short-term exposure and the development of tolerance if individuals are repeatedly exposed to a sound source. The implications of these findings for management, mitigation and policy decisions will be discussed.

The importance of mate-choice copying to sexual selection, speciation and hybridization

SUSANA A. M. VARELA, *cE3c* – Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências, Universidade de Lisboa, Portugal



A key question of sexual selection theory is how sexual organisms, mostly females, choose their mates. Researchers have been particularly interested in understanding the genetic mechanisms of mate choice and how they impact species evolution. What has been poorly understood, so far, is how non-genetic mechanisms of mate choice, such as Mate-Choice Copying (MCC), can also affect evolution. MCC occurs when an individual copies the mating choices of others by a process of social learning. Over the past 20 years, MCC has consistently been shown to affect mate choice in several species, by modifying genetically-based mating preferences. But how can it affect the evolution of male traits and female preferences? Because it can cause or increase skews in male mating success, it has the potential to induce a rapid change in the direction of sexual selection, potentially leading to divergence and eventually speciation. However, the role of MCC on speciation, when there is gene flow, has been questioned, because linkage disequilibrium cannot be established between the copied preference and the male trait, given that females copy from unrelated individuals in the population. On the other hand, MCC may actually play a key role in facilitating gene flow, thereby fostering hybridization. But the role of MCC on hybridization has been so far overlooked, though the conditions under which it might occur are much more likely, or less stringent, than those favouring speciation. Here, I will propose a conceptual framework to identify the exact conditions under which speciation or hybridization are expected.

The evolution of diversity in birdsong

GONÇALO CARDOSO, *CIBIO/Universidade do Porto*



The evolutionary diversification of sexual signals is more challenging to explain than for most morphological and behavioural traits. While most phenotypic traits diverge due to competition among species and exploration of new ecological niches, sexual signals can diverge much more than required for species recognition, even when fulfilling the same functions in closely related and ecologically-similar species. Thus, sexual selection appears to continuously promote phenotypic divergence. Is this phenotypic evolution predictable, or do sexual signals diverge in disparate directions? In birdsong, metrics of signal complexity (e.g. repertoire size) do not correlate with species differences in sexual selection globally. This suggests that additional song traits are often sexually selected, perhaps even compromising song complexity. To explain the evolutionary diversification of birdsong, one needs to find whether sexually-selected song traits evolve together or constrain each other. Here I revisit behavioural research on different song traits, including some not traditionally thought of as communication signals, to show that several traits (some diametrically opposed: high- and low-frequency song, large and small syllable diversity) can communicate individual quality and, thus, be sexually selected. I then use this insight in comparative studies that describe constraints on, and selective correlates of, birdsong evolution. The emerging picture is that birdsong evolves under a network of trade-offs among song traits, which contribute to the diversity of phenotypes targeted by sexual selection in different species.

Dolphin Communication and Cognition: Technology, Tools, and Time

DENISE L. HERZING, *Wild Dolphin Project; Florida Atlantic University, USA*



In the last two decades the scientific study of dolphin vocalizations and behavior has greatly improved. Most of this advancement has come from digital and computer techniques applied to the area of delphinid research. Such tools include ultrasonic acquisition technology, neural networks, correlated video/sound systems, and advanced behavioral software techniques. We will explore some of these advances within the context of focused work with two species of delphinid in the Bahamas. Since 1985, a resident community of Atlantic spotted dolphin, *Stenella frontalis*, has been studied utilizing underwater video and sound recordings. Over 200 *Stenella frontalis*, and 200 bottlenose dolphin, *Tursiops truncatus*, inhabit this area and are sympatric. Various underwater video cameras with simultaneous hydrophone input are used. Correlations with behavior and sounds types include; 1) Contact and Reunion 2) Alarm and Distress; 3) Courtship, Herding and Discipline 4) Aggression, 5) Interspecies Interactions and 6) Foraging and Feeding. Specific behaviors (including gestures, vocalizations, body/head orientation) represent the potential media of information available to dolphins. Such media are real world, observable, and measurable signals through detailed behavioral analysis. Current pattern recognition programs and technological interfaces also hold promise for understanding dolphins.

CONFERÊNCIAS - RESUMOS | TALKS - ABSTRACTS

Dopamine is a modulator of social behaviour in a cooperatively breeding fish

DIOGO ANTUNES, *Behavioural Ecology, Institute of Ecology and Evolution, University of Bern; CiBIO, Universidade do Porto*; MARTA C. SOARES, *CiBIO, Universidade do Porto*; MICHAEL TABORSKY, *Behavioural Ecology, Institute of Ecology and Evolution, University of Bern*

Abstract: Cooperation is an evolutionary enigma that has intrigued biologists ever since Darwin. However little is known about the physiological regulation of cooperative behaviour. Here we report on an experiment studying the role of dopamine in social behaviour of a cooperatively breeding fish species. Dopamine is involved in the modulation of animals' reward system and social decision network, suggesting that it might be involved in sociability. We studied *Neolamprologus pulcher*, a cooperative cichlid fish from Lake Tanganyika, East Africa. These fish live in families with a dominant pair and a variable number of subordinates helping the dominant breeders in territory maintenance and defense, showing altruistic behavior by engaging in alloparental care. We tested dopaminergic receptors D1 and D2, blocking or enhancing their activity with injections of agonists or antagonists (SKF-3893, SCH-23390, Quinpirole and Metoclopramide). Our data suggest that the two dopaminergic receptors have different regulatory roles for the social behavior of these fish. The D1 receptor is modulating the aggressive behavior, which increases when the receptor is enhanced and diminishes when it is blocked. The D2 receptor seems to modulate the affiliative behavior, particularly when the receptor is blocked. These data provide the first insight into the role of dopamine for the social behaviour of a cooperative fish species.

Strangers in a strange land: reproduction, social structure and endocrine profiles of the chanchito *Australoherus facetus*, an invasive cichlid in southern Portugal

FLÁVIA B. SILVA, PEDRO M. GUERREIRO, MARTA VARGAS, ADELINO V. CANÁRIO, JOÃO L. SARAIVA, *Centro de Ciências do Mar*

Abstract: Invasive species are a growing concern for habitats worldwide. Behavioural traits in exotic animals may be essential for successful invasions. Here we document the ethogram for reproductive and social behaviour of an invasive freshwater fish, the chanchito *Australoherus facetus*, a south-american cichlid that is present throughout southern Portugal. Chanchitos are highly social: during the summer, monogamous pairs establish and defend breeding territories, and a linear hierarchy ensues in the social group. Dominant males experience a rise in androgens through the process of hierarchy formation. Dominance is related to size but not sex, and even very small size differences can account for social ranking. Both members of the pair perform parental duties throughout early development, although males spend more time patrolling and females

spend more time caring for the young. Once the fry become free-swimming, the parents actively follow and protect the juveniles. Interestingly, the young can be adopted by a neighboring pair. Preliminary experiments on simulated territorial intrusions suggest that the pair is more aggressive towards conspecifics than other fish. This species presents an interesting array of behaviours that may confer an advantage over native fish in

Mediterranean-type streams. Furthermore, it can become a valuable model to study communication, individual discrimination and personality.

A review on the impacts of CO₂-induced ocean acidification on larval behavior of a shoaling fish species

ANA MARGARIDA FARIA, EMANUEL GONÇALVES, *MARE – Marine and Environmental Sciences Centre, ISPA-Instituto Universitário*

Abstract: Studies on coral reef fishes show that projected future CO₂ levels influence behavior and development of the early life stages, but the extent of this effect on temperate species is still uncertain. The present review discusses the effects of ocean acidification on a role of behavioural traits studied in larvae of a shoaling temperate fish species, sand-smelt *Atherina presbyter*. Behavioural lateralization, shoaling, swimming performance (measured as critical speed and routine speed), preference for a light-dark environment (scototaxis - which can represent "anxiety") and the capacity to recognize predator odours were investigated in larvae exposed to different levels of pCO₂. Results point to a disruption in lateralization, shoaling, predator recognition and increased anxiety of larvae reared in high pCO₂ levels, but swimming performance remains unaffected. Overall, our results suggest that larvae exposed to increasing CO₂ conditions might be in a greater risk compared to larvae reared in control conditions.

Behavioural lateralization of fish larvae altered under ocean acidification

ANA LOPES, *MARE – Marine and Environmental Sciences Centre, ISPA-Instituto Universitário*; PHILLIP MUNDAY, *ARC Centre of Excellence for Coral Reef Studies; College of Marine and Environmental Sciences, James Cook University*, MARTA PIMENTEL, RUI ROSA, *MARE – Marine and Environmental Sciences Centre, Laboratório Marítimo da Guia, Faculdade de Ciências da Universidade de Lisboa*; EMANUEL GONÇALVES, ANA MARGARIDA FARIA, *MARE – Marine and Environmental Sciences Centre, ISPA-Instituto Universitário*

Abstract: Studies on coral reef fishes show that projected future CO₂ levels influence behavior and development of the early life stages, but the extent of this effect on temperate species is still uncertain. In this study we tested the effects that elevated CO₂ (~2000µatm) levels, which are expected to occur in

coastal upwelling regions in the future, have on behavioral lateralization (turning preference) of the temperate sand smelt *Atherina presbyter*. The hypothesis that behavioural changes are caused by interference of high CO₂ with GABA-A receptor function was tested by treating larvae with a receptor antagonist (gabazine). Lateralization was disrupted in fish reared at high CO₂, but gabazine reversed the loss of lateralization on larvae exposed to high CO₂, adding to the increase of evidence that a more acidified environment affects behaviour and is likely due to altered function of GABA-A receptors. Overall, our results suggest that pCO₂ levels likely to occur in coastal temperate ecosystems in the near-future will have an adverse effect on larval behaviour, which can potential compromise the survival of temperate fish early life stages.

Behavioural and physiological responses of cleaning mutualisms in the oceans of tomorrow

JOSÉ R. PAULA, MARIA R. PEGADO, TIAGO REPOLHO, *MARE – Marine and Environmental Sciences Centre, Laboratório Marítimo da Guia*; ALEXANDRA S. GRUTTE, *School of Biological Sciences, The University of Queensland*; RUI ROSA, *MARE – Marine and Environmental Sciences Centre, Laboratório Marítimo da Guia*

Abstract: Cleaning mutualisms are key ecological components in coral reef ecosystems and crucial drivers of marine biodiversity and abundance. These mutualisms are one of the most common interspecific interactions worldwide, which involves a cleaner organism that removes and eats ectoparasites from their so-called “clients” in complex and cognitive demanding cooperative interactions that can involve tactile stimulation and partner control. Nonetheless, until now, there is no knowledge on the potential effects of climate change on such mutualistic interactions. Here we investigated, for the first time, how cleaning mutualisms may respond to future chronic conditions of ocean acidification ($\Delta\text{pH}=0.4$) and warming ($+4^\circ\text{C}$). To accomplish that, we used two cleaner-client pairs from two geographically-different coral reef systems from the Indo-Pacific (*Labroides dimidiatus*), and from the Caribbean (*Elacatinus oceanops*). After 45 days of acclimation pairs of cleaners and clients were allowed to interact for one hour. We measured their behavioural responses as inspection, tactile stimulation, honesty and motivation and compared to both cleaner and client physiological state. As well as describing how this comprehensive set of behavioural responses to the conditions of the ocean of tomorrow, we discuss the related jeopardies for coral reefs health and functioning to project future impacts on this ecosystems.

Travel for sex: why to live far away from female?

GISELA GIARDINO, M. A. MANDIOLA, *Intituto de Investigaciones Marinas y Costeras, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata; Consejo Nacional de Investigaciones Científicas y Técnicas*; J. BASTIDA, *Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP)*; PABLO DENUNCIO, R. BASTIDA, D. RODRÍGUEZ, *Intituto de Investigaciones Marinas y Costeras, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata; Consejo Nacional de Investigaciones Científicas y Técnicas*

Abstract: Southern sea lions (*Otaria flavescens*; SSL) have a polygynous mating system and a prolonged social-sexual maturation period for males. Male haulouts are common in this species, with some very distant from central breeding rookeries, although the functions of these aggregations are not clearly understood. To estimate the potential connectivity between northern Argentina male colonies and breeding rookeries in Patagonia and Uruguay, we monitored the summer breeding activities and winter presence of 559 individually identified SSL males from haulouts in Mar del Plata and Quequén harbors. We also collected 185 faecal samples for diet analysis. Our results confirm that male groups are formed by sexually active sea lions that show a strong annual connection with distant (up to 700 km) breeding colonies. Circa 70% of the marked males made long distance round-trips (72 ± 26.7 days; $n=325$) from northern Argentina to Patagonia and Uruguay, indicating a high degree of winter site fidelity. Mating activity was confirmed for 53% of the sea lions re-sighted in breeding colonies, with ca 80% of them having central positions on the beach and holding harems of up to nine females. The chronology of this cycle is finely tuned with the onset of the breeding season which may result in comparative advantages such as anticipating female arrival or a prolonged participation in mating activities. Our results suggest a model of male haulouts spatially segregated from the central breeding areas, mainly related with feeding preferences, but with a summer recurrent flow of animals that contributes a significant proportion of the male population of northern Patagonia and Uruguay.

Sex-biased dispersal, kin selection and the evolution of sexual conflict

GONÇALO S. FARIA, SUSANA A. M. VARELA, *cE3c – Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências, Universidade de Lisboa*; ANDY GARDNER, *School of Biology, University of St Andrews*

Abstract: There is growing interest in resolving the curious disconnect between the fields of kin selection and sexual selection. One reason for this disconnection is that both empirical and theoretical researchers often assume that, when interacting sexually, individuals are not related to avoid inbreeding depression. However, this is not always true since many species have limited dispersion, meaning that no relatedness at all between mating partners may

actually be the exception rather than the rule. Although one theoretical study had already addressed this issue, some errors were present and, thereby, also the conclusions. With our work, we corrected those mistakes. Our goal was to understand the impact of sex-specific rates of dispersal upon the coevolution of male-harm and female-resistance behaviours. Therefore, our approach includes both kin selection and sexual selection, integrating both in the same theoretical background. We found that, in general, increasing male dispersal promotes the evolution of male harm and that increasing female dispersal inhibits the evolution of male harm. However, the opposite can also be true, depending upon parameter values and upon the balance between relatedness and competition. These results show that kin selection cannot be disregarded when we try to understand sexual selection.

Multimodal and mismatching communication in the vocal cichlid fish *Metriaclima zebra*

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Abstract: Agonistic contests are often mediated by multimodal communication but the way in which different signals interplay is poorly understood. Previous experiments with the vocal cichlid *Metriaclima zebra* showed that only visual signals trigger male aggression but when sounds are combined with visual information aggressiveness decreases. We tested how spectral size-related information of agonistic sounds modulates aggressive behaviour in a multimodal communication context. We visually exposed territorial *M. zebra* males to a size-matched male placed in a contiguous aquarium. Trials consisted in three 5-min periods: PRE (visual), PBK (acoustic + visual) and POST (visual). Acoustic treatment consisted in the playback of agonistic sounds of smaller (high-frequency) and larger (low-frequency) males. As a control we used white noise or silence. Only low-frequency sounds reduced aggression during PBK and POST periods. Our results suggest that fish evaluate the relative information provided by visual and acoustic signals during contests. When sound frequency indicates a larger opponent the acoustic channel overrides the visual one, but when it indicates a smaller opponent the visual channel seems to prevail as fish behaved as in visually matched contests. This study indicates that the acoustic and visual channels interplay during the evaluation of an opponent to avoid 'dangerous' conflicts.

Can the mating decisions of males be explained by the Marginal Value Theorem?

INÊS ÓRFÃO, *cE3c – Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências, Universidade de Lisboa; CESAM – Centre for Environmental and Marine Studies, Faculdade de Ciências, Universidade de Lisboa; ALFREDO OJANGUREN, Scottish Oceans Institute, School of Biology, University of St Andrews; LUÍS VICENTE, CFCUL – Centro de Filosofia das Ciências da Universidade de Lisboa, Faculdade de Ciências, Universidade de Lisboa; CESAM – Centre for Environmental and Marine Studies, Faculdade de Ciências, Universidade de Lisboa; VARELA S.A.M., cE3c – Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências, Universidade de Lisboa; ANNE E. MAGURRAN, Scottish Oceans Institute, School of Biology, University of St Andrews, St Andrews, Fife, United Kingdom*

Abstract: Research on optimal behaviour theory has traditionally focused on foraging behaviours. Marginal Value Theorem (MVT) suggests that the optimal foraging time within a patch is related with resource depletion over time and with time spent travelling between patches. Choices made during sexual selection provide an analogous situation. Females represent a resource to males that can deplete over time due to a decrease on female interest or on male sperm availability. Accordingly, optimal time that a male spends with a female (or a group of females) should rise when the time searching for females increases. To test our hypothesis that MVT explains male mating decisions, we conducted experiments with male guppies (*Poecilia reticulata*) tested in one of two treatments – isolation from females for a 20 hours period (to simulate longer intervals spent searching for females) and no isolation period. Males were individually observed with a group of three females, and time spent following females and frequency of sexual behaviours (courtship display and forced copulation attempts) recorded. Isolated males spent more time following the females and non-isolated males performed more courtship displays. Our results provide clear evidence that male mating decisions are related to time searching for females, in agreement with MVT.

An Evaluation to the Standard Mate-Choice Copying Experimental Protocol

MANUEL SAPAGE, *cE3c – Centre for Ecology, Evolution and Environmental Changes; CESAM – Centre for Environmental and Marine Studies, Faculdade de Ciências, Universidade de Lisboa; SUSANA A. M. VARELA, cE3c – Centre for Ecology, Evolution and Environmental Changes; LUÍS VICENTE, CFCUL – Centro de Filosofia das Ciências da Universidade de Lisboa, Faculdade de Ciências, Universidade de Lisboa; CESAM – Centre for Environmental and Marine Studies, Faculdade de Ciências, Universidade de Lisboa; INGO SCHLUPP, Department of Biology, University of Oklahoma*

Abstract: Mate-choice copying (MCC) occurs when animals change their mate-choice decisions after having observed and learned the mate-choice of others. This phenomenon is widespread in nature, occurring in birds, fish, mammals, and even insects. Interestingly, the experimental protocol for testing MCC in such a diverse group of species has been similar. The basic protocol consists

of three sequential steps: (1) assessing the initial choice of a focal individual; (2) presenting the focal individual with social information regarding mate choice and (3) assessing the postdemonstration choice. However, this protocol assumes that the postdemonstration choice is not influenced by the initial one, although this assumption has never been tested. This is relevant, because during the first choice, the focal individual has the opportunity to build up a personal preference for one of the mates, which might be difficult to change. In this study, we used female guppies to test this hypothesis. Our main prediction was that females would tend to copy more often the mate-choices of others if they do not have a chance to compare the males prior to the demonstration step, thus making the effect of MCC more prominent than previously thought. The data are currently being analysed.

Gene expression patterns associated with alternative reproductive tactics in the blenniid fish *Salaria pavo*

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Abstract: In species with discrete variation in reproductive behaviour, different life-history trajectories are observed that can either be fixed (e.g. genetic polymorphism), or plastic and therefore responsive to environmental factors (e.g. time of birth, resource availability) that will ultimately influence developmental processes. Males in the peacock blenny *Salaria pavo* can follow two developmental pathways, grow directly into dominant nest-holder males or mimic the females' morphology and courtship displays in order to approach the nests of larger males to sneak fertilizations. These alternative reproductive tactics are sequential as sneakers later develop into nest-holder males, going through a phase in which they are reproductively inactive (i.e. transitional males). In this work we explored at the neurogenomic level how gene expression profiles differed between male morphs (i.e. nest-holder, sneaker and transitional males) and females. For this, RNA was isolated from whole brain tissue for each one of the four phenotypes, sequenced using Illumina HiSeq and de novo assembled. Pairwise comparisons were made in order to identify the up and down-regulated genes, revealing that expression of the plastic male tactic was accompanied by broader and divergent gene expression when compared to either females or nest-holder-males, both more similar between themselves.

Optimization of the object recognition task protocol in C57BL/6 mice

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Abstract: The object recognition task assesses recognition memory in rodents. Although it is widely used in neurobehavioral research, there are many variations regarding the protocol and the results are not consistent. The aim of this study was to determine the protocol that allows the mice strain C57BL/6 to keep the mnemonic representation of the familiar object. Fifteen male mice were tested in three inter-trial intervals: 1, 6, and 24 hours. Familiar object was placed inside each cage 3 days before testing. The results showed that mice were not able to remember the familiar object, independently of the inter-trial interval, when 10 minutes of the choice trial were analyzed. However, during the first 20 seconds of object exploration in the choice trial, animals were able to remember the familiar object when the inter-trial interval was 1h but not when it was 6 or 24h. This suggests that animals remembered the familiar object when the interval between trials was relatively short, and that 10 minutes of testing is too long as the new object novelty seems to dissipate as the animal explores. The presence of the familiar object inside the cages did not potentiate its recognition 6 and 24 h after sample trial.

Effects of group size on maternal allocation in a colonial cooperative breeding bird, the Sociable Weaver

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Abstract: Maternal allocation in eggs is an epigenetic mechanism through which females can adjust the environment experienced by the developing offspring in order to maximise offspring or maternal fitness. Cooperative breeding species, where individuals called “helpers” assist breeders by providing care to their offspring, are interesting models to study female allocation. Indeed, females may adjust their reproductive investment according to the expected breeding condition represented by the presence of helpers. In several cooperatively breeding species, mothers have been found to reduce egg size with group size as helpers may compensate by bringing additional food to the brood. In one of these species, the Sociable weaver *Philetairus socius*, first laid eggs had lower hormonal contents when nests were assisted by helpers, but no effect in yolk

mass and in the investment of costly contents, such as carotenoids. However, this pattern may not hold for the whole clutch as the costs of egg production are expected to be the highest during yolk production of later laid eggs and as hormonal contents are known to vary with laying order. This study will analyse the yolk contents of complete clutches in relation to the group size to confirm the pattern found in the first egg.

Consistent behavioural differences between two species of passerine birds may explain ecological adaptation

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Abstract: Consistent differences in behaviour, both across time and contexts, are expressed in humans and animals, and these are designated behavioural syndromes or personality. The behaviours can be arranged along several axes, such as shyness/boldness, aggression, exploration/avoidance and activity. Differences in all these axes have been documented in several taxa. We wanted to assess if there were behavioural syndromes within and between two species of insectivorous birds: the robin, *Erithacus rubecula*, and the blackcap, *Sylvia atricapilla*. We performed personality assays on exploratory behaviour, reaction to novel objects and aggressiveness. We only found a few repeatable behaviours in blackcap. However, the two species differed significantly in almost all behaviours: robins were bolder in the novel object test and more aggressive in the mirror test, in opposition to blackcaps that were more exploratory in the open-field test. Despite the lack of behavioural syndromes, these differences in species' behaviour could be the result of ecological challenges that they face in their environment.

A lunch to share – Interspecific competition in the feeding behaviour of birds

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Abstract: Interspecific competition in birds has been studied mainly in a breeding context (e.g. singing interactions or nesting-site competition), and less

often have researchers analysed aggressive behaviour related with interspecific feeding competition. We evaluated interspecific competition in an owner-intruder context during foraging activity and assessed the existence of interspecific aggressive behaviour between two passerines: the blackcap *Sylvia atricapilla* and the robin *Erithacus rubecula*. We tested three alternative hypotheses: (1) species dominance, (2) "owner always wins" or (3) resource holding power hypotheses, which propose that (A) one species dominates or that winners are either (B) the most motivated or (C) have higher competitive ability. The field tests were developed inside a tent containing food and three artificial trees. Each competition test had two parts (10 min. each): 1 - one individual was tested alone; 2 - the intruder was introduced and observations followed. Food intake and foraging height were the parameters analysed to compare the intruder effect. The number of threat displays and attacks were used to evaluate the existence of interspecific aggression. Preliminary results point to the rejection of hypotheses 1 and 2. We consider further variables to discuss the results which are based in territorial behaviour and dominance of food-resources.

Effects of tour boats on the behaviour of short-beaked common dolphins in the Azores

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Abstract: Whale watching activities have been reported to pose a potential threat to cetaceans by affecting their energy balance via changes in activity state, diving profile and vocalization rate. The short-beaked common dolphin (*Delphinus delphis*) is the species most frequently sighted in the Azores and constitutes an important component of the whale watching industry in this region. Common dolphin behavioural data were collected from land off the southern coast of São Miguel using a group focal-follow methodology. Markov chains were applied to analyse control and interaction sequences, and behavioural transition probabilities were compared between both scenarios. In the presence of tour boats, dolphins significantly reduced the time spent foraging (from 38% to 12%) and increased the time socializing (from 17% to 39%). They also took significantly longer to resume feeding after an interaction occurred. These results have management implications since feeding is a biologically critical activity. Potential disruption could lead to a decrease in energy intake for this population. On average, observed groups of dolphins spent 10% of their time in interaction with tour boats. With cetacean tourism likely to increase in the future, a precautionary approach to the issuing of new licenses is therefore advisable.

Movements and Acceleration as an Approach to Study Behavior and Daily Routines of captive bottlenose dolphins (*Tursiops truncatus*)

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Abstract: Bottlenose dolphins have an extensive and complex behavioral repertoire with rapid and smooth transitions. In an attempt to better quantify the activity of captive bottlenose dolphins, a novel unbiased MATLAB based classification algorithm has been developed, using triaxial accelerometer data. In order to calibrate/validate the accelerometry data, video cameras were used, allowing the subsequent analysis of the movements in the pool, as well as the study of routines and preferences in the use of the habitat. Preliminary results in the acceleration show promising data in dolphin's activity recognition, since the implemented algorithm identified the most common behaviors successfully. Therefore a library is under development characterizing all the measured behaviors/actions, with the aim of applicability to bottlenose dolphins in general. In terms of video analysis, preliminary results show that is possible to study the routines of the animals and quantify their preferences, as well as associate the actions that take place in each section of the experimental pool. These analyses may provide insights into the animals' behavior that could be useful both in terms of welfare management of captive dolphins and in the understanding of movements of wild cetaceans of Captive Bottlenose Dolphins (*Tursiops truncatus*).

The interplay between *Wolbachia* and haplotype-associated reproductive barriers among populations of *Tetranychus urticae*

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Abstract: In spider mites, both host (nuclear and/or cytoplasmic) factors and bacterial reproductive manipulators can lead to reproductive isolation among populations within a single species. However, the study of their interaction was still lacking so far. Here, we carried out a first experiment in which reciprocal crosses were performed between *Tetranychus urticae* haplotypes harboring different strains of the endosymbiotic bacteria *Wolbachia*. Our results show that both *Wolbachia* and host-associated incompatibilities lead to partial and asymmetric reproductive isolation among populations. However, these barriers are expressed in a different manner: while *Wolbachia* leads to an increase of female mortality in the brood, haplotype-associated incompatibilities induce an

overproduction of males. In addition, we found a reduced level of *Wolbachia*-induced incompatibility when associated to incompatibility between haplotypes. Next, we investigated whether such incompatibilities are expressed (i) during premating behavior, (ii) during prezygotic, postmating sperm transfer or fertilization, or (iii) postzygotically. Our results show that *Wolbachia* interacts with haplotype-associated incompatibilities, such that the end-result obtained differs from the effects analyzed in separate. This contributes to our understanding of ongoing differentiation process potentially leading to speciation, as well as their consequences for both spider mites population dynamics and *Wolbachia* spread among populations.

Is the within-plant distribution of herbivorous mites affected by differences in plant nutritious value or herbivore damage?

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Abstract: Although differences in plant quality, caused by plant nutrition or herbivory, are known to affect herbivore distribution, how these factors interact to determine within-plant distribution is unknown. We addressed this using two spider-mite species, *Tetranychus evansi* and *T. urticae*, known to down-regulate and up-regulate plant defences, respectively. We grew plants in high- and low-nutrition soils (i.e., different C/N ratios), then infested them with heterospecifics in young or old plants, or left them uninfested. On clean plants, both species preferred young leaves, and lost this preference when nitrogen availability was higher. This choice correlates with the C/N ratio on those leaves, and reinforces the potential for competition between these species. On heterospecifically-infested plants, mite distribution did not correlate with their performance. Indeed, *T. urticae* avoided infested leaves, although their performance was higher on those leaves than that on clean ones. *T. evansi* distributed evenly on infested plants while performing better on older leaves, independently of the position of the competitor. This behaviour may be explained by the long-term performance of mites, as *T. evansi* out-competes *T. urticae* on tomato. In conclusion, correlation between performance and preference is found for differences in quality due to plant nutrition, but not for herbivore damage.

POSTERS - RESUMOS | POSTERS - ABSTRACTS

Reproductive success in the Lusitanian toadfish: influence of calling activity, male quality and experimental design (Poster #1)

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Abstract: Acoustic signals are sexual ornaments with an established role on mate choice in several taxa, but not in fish. We made two experiments to test the hypothesis that vocal activity is essential for male breeding success in a highly vocal fish, the Lusitanian toadfish. First, we compared the reproduction success between muted and vocal males. We then related male reproduction success (number of obtained eggs) with acoustic activity and male quality. Muting experiments showed that successful mating depended on vocalising and reproductive success was positively associated with the male's maximum calling rate. In the second experiment male's reproductive success was positively associated with male condition and negatively related with circulating androgen levels and relative gonad mass, but not with vocal activity. Differences in results may be related with nest design which could have influenced mate choice costs and intra-sexual competition. In the muting experiment nests had a small opening that restrained the large nest-holder but allowed females to pass while in the second experiment fish could move freely. These experiments suggest that a combination of factors, including vocal activity, influence reproductive success in this highly vocal species.

Peafowl (*Pavo cristatus*) social behaviour – Why to perform a train display without the conspicuous, long feathers of a peacock? (Poster #2)

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Abstract: Feral peafowl (Nine males, eleven females and ten chicks) were observed randomly at least one hour a day at the Tropical Botanic Garden (IICT) for three months, to check those birds with erect caudal and supracaudal feathers. Chicks, immature males, immature and mature females raise the caudal feathers and display a "train" much like the adult courting males in a variety of both aggressive and non aggressive contexts. Whenever possible (because displaying birds usually turn around) recipients were identified and include conspecifics as well as other species but it was not observed in isolated

birds. Yorzinski, J. et al. (2011) ⁽¹⁾ refers the raising of the tail feathers in peahens as part of the antipredator behaviour. These observations allow the hypothesis that the train display may have a signaling function related with peafowl social behaviour supported by the fact that peahens gaze to the lower train of a courting male ⁽²⁾. Under this hypothesis further investigation will lead to a better understanding of the function, evolution and internal processes of train display in peafowl.

⁽¹⁾Yorzinski, J. et al -The difference between night and day: antipredator behaviour in birds - J Ethol 30:211–218; ⁽²⁾ Yorzinski, J. et als(2013)- Through their eyes: selective attention in peahens during courtship J.Exp Biol 216, 3035-3046.

Space competition and genetic identity: a tale on the agonistic behavior of *Actinia fragacea* Tugwell, 1856 (Poster #3)

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Abstract: The occurrence of agonistic behavior in sea anemones is a relatively common phenomenon, widely documented for several species, both in defense and space competition contexts. Agonistic encounters may include behaviours like one individual moving away from the other, expansion and deflection of one individual column over the other and/or acrorhagial stinging. It has been speculated that aggression could be reduced or inexistent amongst clonal individuals, which are frequent in some species. This study aims to assess the frequency of agonistic behavior in artificially induced clones and different individuals of *Actinia fragacea*, a species presenting mainly sexual reproduction. In contrast with what has been previously described for the sympatric *Actinia equina* our results show that individuals of *A. fragacea* do not seem to differentiate clones of themselves from different individuals, in what concerns agonistic behavior. We hypothesize that, in this species, agonistic behavior is mainly related to space competition between individuals, regardless of its genetic relationship.

Are coral reef condition and reef fish diversity implicated in cleaning gobies behavior and physiological changes? (Poster #4)

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Abstract: The Caribbean coral reefs are suffering from a drastic coral reduction and degradation, which is affecting the behaviour, survival capacity and putative

stress levels of the reef fish species since this is leading to significant rises in parasite infestation. In view of such changes, we argue that positive interactions are as important as competition and predation in determining community structure and its behavioural dynamics. We aimed to find out more regarding the impact of variable coral reef condition and reef fish diversity on the behaviour of one cleaning goby species of unique relevance (*Elacatinus evelynae*) and determine the consequences of this potential disturbance to their behavioral and physiological response. We collected data on 5 Caribbean Reefs (in Curaçao) with different health status, where direct cleaning goby observations, biodiversity assessment transects and cleaning gobies collections for physiological analysis were made. We expect that reefs with better conditions will mean better feeding patches for cleaning gobies (higher abundance and diversity of potential fish visitors). However, good coral reef conditions may also equals lower fish parasite loads and hence lower necessity for fish to visit cleaning gobies territories which may increase competition and prompt a change in goby behavioural strategies and physiological response.

Insights on the reproductive behaviour and spawning substrate preferences of the critically endangered *Achondrostoma occidentale* (Pisces: Cyprinidae) (Poster #5)

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Abstract: More than 70% of the Portuguese endemic cyprinids are threatened, mainly due to anthropogenic-related causes, and their populations are small and fragmented. This is the case of the western ruivaco *Achondrostoma occidentale*, which inhabits only three small rivers near Lisbon: Alcabrichel, Sizandro and Safarujo. Although it has been one of the targets of an ex situ conservation program since 2006, some aspects underlying the reproduction of this species are still poorly known. In this study, we aimed to describe the ethogram of *A. occidentale* in a reproductive context and to infer microhabitat preferences for spawning, by quantifying the frequency of spawning behaviours occurring in each of the three tested substrates: aquatic plants, gravel and wool spawning mops. Observations were conducted with an underwater video camera between April and June 2015 and allowed the description of its reproductive ethogram. Results revealed a higher preference for aquatic plants for egg laying. This study highlights some aspects of the reproduction of *A. occidentale* which are relevant for the ongoing ex-situ conservation of the species and for the implementation of future restoration measures in its natural habitats, reinforcing the view that ethological data are essential for the conservation and management of imperiled species.

Dopamine and familiarity effects in a mutualistic cleanerfish system (Poster #6)

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Abstract: The cleaner-client mutualism of the cleaner wrasse *Labroides dimidiatus* system is a rare example of cooperation between genetically unrelated individuals. Partners in this system engage in cooperative interactions where conflicts of interest arise, leading to complex decision-making strategies: clients need cleaners to cooperate and remove ectoparasites off their body surface; in turn, cleaners prefer to defect by eating clients' mucus (which is detrimental to the clients), but need to balance this with cooperation. These strategies are affected by individual recognition, as cleaners have preference for familiar clients since the cost of investment in a new relationship is higher than the maintenance of an already established one. Furthermore, with previously acquired experiences, cleaners flexibly adjust their cheating and cooperation to familiar clients, optimizing their gains. Dopamine has an important role on social attachment as well as in decision-making. Thus, it should have great influence on cleaners' behaviour towards their clients: dopamine agonists should potentiate cleaners' approach and cooperativeness towards both familiar and unfamiliar clients; dopamine antagonists should interfere with cleaners approach and cooperation towards familiar clients, and possibly won't approach unfamiliar clients. Here we aimed to test if dopaminergic modulation influences the development and maintenance of bonds between unrelated individuals.

Habitat associations and behavioural patterns of *Symphodus* spp. (Pisces: Labridae) (Poster #7)

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Abstract: The complexity and diversity of physical and biotic habitats are important features influencing the composition of shallow water reef fish assemblages, especially in temperate regions where abundant and diverse algal cover have an habitat-forming role. Coastal fish have adapted to these diverse habitats and to the temporal and spatial variations of algal assemblages in different ways. Wrasses are an important group of coastal rocky reef fish which present particular associations to algae in temperate systems. In this study, habitat associations were analyzed in three species of wrasses: *Symphodus bailloni*, *Symphodus melops* and *Symphodus roissali*; and their behaviour was

recorded. Eight main behavioural categories (comprising a total of 42 different behaviours) were identified: exploring, foraging, resting, agonistic interactions, cleaning, courtship, reproduction and nesting. *S. melops* occurred on shallower depths and was frequently involved in both intra- and interspecific agonistic interactions, although rarely with *S. bailloni*. *S. roissali* was associated with microhabitats of smaller size where it frequently hides. Feeding occurred mostly on bedrock habitat when compared to other microhabitats. Foraging and resting showed a marked seasonality in the three wrasses, related to shifts in biotic habitat structure and to changes in the behavioural repertoire during the breeding season.

Can damselfishes handle the crowds? Costs and benefits of living nearby a cleaning station (Poster #8)

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Abstract: Damselfish are known for having a strong territorial and aggressive behaviour. These species experience variable energetic costs that may be associated with cortisol level variations. However there are several variables that can influence stress levels, such as parasite infestation. Here, we aimed to investigate the nature of two brazilian damselfish species trade-offs, between the benefits of having easy access to cleaners (and consequently easy parasite removal) with the costs of a potential rise in territorial intrusions by other species increased by the presence of cleaning stations. In order to do so, we observed the behaviour of *Stegastes fuscus* and *S. pictus* and later capture them to access ectoparasite load and cortisol levels. We expect that the benefits of having an easy access to cleaners will depend on the baselines levels of ectoparasitism. In case of lower infestation, the existence of a cleaning station within the territory may be a disadvantage considering the higher level of intrusions by other species seeking also to be clean. In contrast, damsels with lower levels of ectoparasite and with no cleaning station within their territories may score lower stress levels, which could also be linked to a decrease in the number of intruders.

Are levels of ectoparasite infestation responsible for shifts in reef fish abundance and behavioural response? (Poster #9)

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Abstract: Caribbean coral reefs have been extremely affected by massive coral reef degradation. Recent studies have demonstrated that coral depletion is not solely influencing biodiversity and ecosystem functions but it is also contributing for a significant increase in fish disease and parasitisation levels, since reefs with less live coral cover seem to experience higher emergence rates of ectoparasites with benthic life stages. Nevertheless, other types of ectoparasites, whose abundance may be associated with fish density, may be indirectly affected by reef coral health. Under such drastic changes, cleaner organisms become crucially important. Indeed, through a symbiotic relation, cleaners are known to reduce clients' ectoparasite load, directly contributing to their health and welfare. Here, we expected that fish inhabiting lower quality reefs to have higher ectoparasite infestation levels and, therefore, to seek cleaning stations more often. We sampled from five Curaçao reefs, with different quality levels based on live coral, algae cover and substratum complexity. On each reef, Longfin Damselfish (*Stegastes diencaeus*) and Ocean Surgeons (*Acanthurus tractus*) were observed and collected for ectoparasite assessment. With this study we intend to better understand how coral reef degradation impacts ecological and behavioural components of coral reef dynamics.

Impacts of CO₂-induced ocean acidification on predator detection ability of temperate fish larvae (Poster #10)

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Abstract: Ocean acidification is recognized as a serious threat to marine ecosystems, but the effects on fishes are still poorly studied. Recent studies on early life stages of tropical reef fishes suggest that behaviour may be highly affected by ocean acidification. Fish reared under high CO₂ levels fail to recognize predator cues, therefore increasing vulnerability to predators. Here we tested if larvae of temperate fish species have the capacity to recognize the olfactory cues produced by predators and whether this ability is disrupted by exposure to high levels of CO₂ (pH~7.8 and 7.6). Larvae of two temperate species with different life history strategies - clingfish, *Lepadogaster lepadogaster*, and sand smelt, *Atherina presbyter* - were reared in different acidification conditions and

tested in a choice chamber after spending 7-14 days in each treatment. Results suggest that species are differently affected by exposure to acidified conditions, and sand smelt might be in a greater risk of predation.

Are all cleaners fish the same? The cognitive and learning abilities of a facultative cleaner fish (Poster #11)

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Abstract: Due to their evolutionary history and ecology context, obligatory cleaner fish species demonstrate fast cognitive and learning abilities, however, for facultative cleaner fish species, information is still inexistent. Here, we aimed to assess the learning ability of the facultative cleaner fish *Thalassoma pavo* under alternative tasks, that differed in ecological relevance: 1) cleaners had to identify the plate that consistently provided food; 2) cleaners had to identify location where food was consistently provided. The first experiment (cue discrimination) is socio-ecologically more relevant while the second experiment (spatial discrimination) is not. When cleaners were able to solve the tasks (within 10 experiment sessions), they were subjected to reverse tasks. Of all individuals (n=12), seven learned the cue task while 11 learned the spatial task. Any fish learned the reverse cue task but nine fish learned the reverse spatial task. Facultative cleaner fish seem to be better prepared to learn a spatial related problem than otherwise a cue related task, which is a clear contrast with the performance of the obligatory cleaner fish *Labroides dimidiatus*. Our results demonstrate that not all cleaners are the same but provide valuable indications on the evolution of cleaner fish cognitive and learning abilities.

How to find a virgin in a mated female haystack (Poster #12)

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Abstract: In spider mites *Tetranychus urticae*, the first male fertilizes most of the offspring of their partner. In line with this, males prefer to mate with virgins relative to mated females. However, the cues underlying such distinction remain unknown, being chemical cues the most likely candidate. To test this, males were placed in the centre of a bridge connected to two patches with a virgin or

a mated female, under different treatments: (a) Females were removed from a patch where they had left chemical trails during 24h, (b) females were dead, hence not displaying mating behaviour, and (c) patches with females were not connected to the arena, thus males could perceive volatile cues only. Alive females in connected patches and dead females in unconnected patches were, respectively, positive and negative controls. Males preferred virgin to mated females, in both alive connected and unconnected patches and when females were removed from the patches before the test. In treatments where females were dead, the preference was lost. Our results suggest that volatile cues or chemical trails are sufficient to trigger male preference for virgins. Female behaviour, although not necessary, may also contribute to this choice. Future studies should address cue composition.

Female spider mites uninfected with *Wolbachia* do not discriminate between infected and uninfected males, despite clear benefits (Poster #13)

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Abstract: *Wolbachia* is a widespread endosymbiotic bacterium, commonly found in populations of the two-spotted spider mite *Tetranychus urticae*. In such populations, *Wolbachia* often induces cytoplasmic incompatibility, whereby a cross between an uninfected female and an infected male yields no fertilized offspring. Hence, uninfected females should prefer uninfected males to infected ones. Indeed, this has been shown in a laboratory population of spider mites. Here, we investigate whether this result can be generalized to other populations of spider mites. We used 5 naturally-infected populations of *T. urticae* and maintained them in the lab for some generations prior to testing. Populations were either kept infected or treated with an antibiotic to generate *Wolbachia* free mite populations. Female mate choice tests were performed and duration and latency to copulation recorded. Populations differed in latency to copulation, suggesting genetic differences among populations. Uninfected females did not show any preference in any of the populations, although copulation duration was longer when crosses involved infected males. Therefore, even though in these populations *Wolbachia* does not affect mate preference, its presence may modify male mating behaviour.

Play and welfare in a family of captive gibbons, *Hylobates lar* (Poster#14)

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Abstract: Play is an important behavioural category in primates. It helps in the acquisition of adaptive adult behaviours, like prey capture, escaping predators or sexual interactions. It is self-rewarding, being associated with an individual's wellbeing. Play is frequently observed when animals are in favourable conditions. When, on the contrary, the ecological conditions are stressful, it can rapidly drop out of the behavioural repertoire. For this reason, play has long been identified as a potential indicator of the current welfare state of an individual, which makes it a particularly interesting tool in conservation ex-situ. Here, we studied play for three years in a family of gibbons, *Hylobates lar*, made up of five individuals, the progenitors and their three young, living at Lagos Zoo, Portugal. Our aim was to characterize the frequency of their play behaviours and to assess their levels of wellbeing across time. We found that this family of gibbons plays frequently. As expected, non-adults played more than adults, but adults played differently across time, with a significant decrease after the death of an infant. This suggests that the frequency of play is, indeed, a sensitive measure of the animals' wellbeing in their social and ecological environments.

The Reading the Mind in the Eyes Test: A Portuguese Version of the adults' test (Poster #15)

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Abstract: The Reading the Mind in the Eyes Test (RMET) is a widely used instrument that assesses the ability to understand others' emotional and mental states. Given its importance for investigation with both healthy and clinical populations, the present study aimed to translate the revised version of the adults' RMET to the Portuguese (European) language, and investigate psychometric properties of this version. The English original was translated into Portuguese and 5 pilot studies were run. After these procedures, 130 adult participants (71 females) answered a computer version of the RMET. Thirty items showed appropriate answer distribution, while the remaining six did not meet the initially stipulated criteria for item validity. Out of these, items 1 and 17

are the most problematic, while items 7 and 23 exhibit enough discriminative power to be considered as difficult items. Confirmatory factor analysis provided evidence for a one-dimensional model, and mean scores for this adaptation were similar to those found in the original test and other translations. Significant gender differences were not observed in our sample. Future investigations should further explore the psychometric properties of this instrument, as well as address in more depth what cognitive factors underlie this specific mindreading skill.

The role of testosterone in the regulation of cooperative behaviour (Poster #16)

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Abstract: Recent empirical research, refers that individuals' physiological state affects levels of cooperation. An individual's internal state may affect the perception and payoffs of behavioural alternatives, which in turn could influence the decision to either cooperate or to defect. However, little is known about the physiology underlying condition dependent cooperation. Here, we aim to find out if shifts in testosterone levels affect levels of cooperation in wild Indo-Pacific Bluestreak cleaner wrasse *Labroides dimidiatus*. These cleaners cooperate by removing ectoparasites from their visiting reef "client" fishes but prefer to eat client mucus, which constitutes "cheating". We exogenously administered one of three different compounds to female adult cleaners; (a) testosterone, (b) anti-androgen flutamide or (c) sham (saline), and observed their cleaning behaviour during the following 45 min, on 10 different reefs around Lizard Island, Australia. Results should provide first evidence of androgen-dependent effects to cooperative behavioural activities of this notorious cleanerfish species.

Living dangerously: mutualistic associations between cleanerfish and sharks (Poster #17)

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Abstract: Mutualistic interactions between the obligatory Indo-Pacific Bluestreak Cleaner Wrasse (*Labroides dimidiatus*) and marine apex predators (e.g. sharks) are still poorly understood. Sharks have been reported to visit cleaning stations however information regarding the range of benefits these large predators may gain and how it may influence their ecology and movements is limited. On the

other hand, cleaner wrasse behaviour when handling these top predators in comparison to other visiting teleosts is also missing. Here we aim to document the occurrence and frequency of visits by sharks, rays and teleost fish to a cleaning station at Osprey Reef (an Oceanic Seamount in the Coral Sea, Australia) while studying the behavior of both cleaner and predator partnerships during these interactions. We measured general visiting frequencies and species behavioural patterns at this cleaning station, but primarily whether cleaners would behave differently when dealing with predators. Results should reveal key insights on the behavioural mechanisms of these large predators and of these interesting mutualistic associations.

Who's whistling? Signature whistles and group composition in resident bottlenose dolphins (Poster #18)

MIGUEL N. COUCHINHO, ANA RITA LUÍS, PATRÍCIA RACHINAS-LOPES, MANUEL E. DOS SANTOS, MARE – Marine and Environmental Research Centre, ISPA - Instituto Universitário, Projecto Delfim – Centro Português de Estudo dos Mamíferos Marinheiros

Abstract: Whistles are key elements in the acoustic repertoire of common bottlenose dolphins (*Tursiops truncatus*). Between 38 and 70% of all whistles' emissions in the wild are unique, stable, stereotyped signals often called signature whistles. According with the signature whistle paradigm, each individual produces a unique, well-defined contour that conveys individual identity information. However, identifying the whistles' emitters in the wild can be challenging. A stable, well-known community, in which the long-term occurrence of stereotyped calls has been documented, presents an opportunity to further explore this link between signature whistles' production and group composition. Acoustic recordings of bottlenose dolphins' vocalizations were made in Sado estuary from 2011 to 2015. Through visual inspection of sonograms, 628 stereotyped whistles were classified in 27 categories. Individuals present during each recording were photo-identified to assess group composition. Preliminary results reveal that the occurrence of specific whistles contours and specific individuals is not independent ($P=0.017$; FET). Furthermore, the most-likely emitters were pin-pointed for 7 contour profiles (5 previously identified as signature whistles, based on SIGID criteria). These results are significant as they point to a potential, non-invasive technique to determine the most-likely emitters of signature whistles in the wild.

Can pipefish males reduce development heterogeneity within their broods? (Poster #19)

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Abstract: The family Syngnathidae is characterized by the unique phenomenon of male pregnancy, an extreme form of paternal care translated into protection and nourishment of developing embryos. In several syngnathid species, males are able to receive eggs from different females, and larger males display higher multi-maternity rates from mating with different size females. Larger females produce larger oocytes, likely to originate larger juveniles. Therefore, the male's brood pouch is a likely arena for post-copulatory sexual selection. Here, using the black-striped pipefish, *Syngnathus abaster*, we aimed to understand whether males are able to compensate for female's oocyte investment. This will be accomplished by measuring embryos in pregnant males in order to assess heterogeneity in the brood development. Our null hypothesis is that males do not compensate for female's initial investment in reproduction and embryo development heterogeneity is a direct result of differential female investment. Alternatively, if males are able to compensate female's investment, embryo development heterogeneity should be lower, especially in larger males that consistently show higher reproductive success. Understanding if males are able to differentially allocate resources to developing embryos of different females is key to allow for the unraveling of new processes underlying male post-copulatory selection.

Nesting habits of *Mischocyttarus parallelogrammus* (Hymenoptera, Vespidae, Polistinae) (Poster #20)

OLGA C. TOGNI, CAMILA LOPES CAVALHEIRO, GABRIELA A. LOCHER, EDILBERTO GIANNOTTI, *Departamento de Zoologia – Instituto de Biociências, UNESP*

Abstract: *Mischocyttarus* is a genus of neotropical, primitive, eusocial wasps with nests consisting of a single comb, without an envelope, fixed to a substrate by a peduncle. Nesting habits and nest architecture are relevant in taxonomic, phylogenetic, behavioral, ecological and evolutionary studies of social behavior. This study presents architectural data from 59 nests of *Mischocyttarus parallelogrammus*, a Brazilian endemic species, which were analyzed in regard to: substrate and height of attachment, peduncle position in relation to the ground and substrate, direction of comb orientation and nest size. In general, *M. parallelogrammus* nests are secured by a short peduncle on the top of the comb, perpendicular to the substrate, with the peduncle generally parallel to the

ground. Moreover, nests of this species have some peculiarities, such as thick and parallel sidewalls, differentiated form for the oldest cells and an elongated nest shape, being only a few cells in width. *M. parallelogrammus* demonstrated nesting preference on anthropogenic substrate. This synanthropic nesting behavior could be explained by the fact that these sites provide superior protection from the elements, or could be an artifact of the ease of finding these nests, as opposed to locations on tree trunks, which can be nearly imperceptible.

Foraging activity of *Mischocyttarus parallelogrammus* (Hymenoptera, Vespidae, Polistinae) (Poster #21)

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Abstract: *Mischocyttarus parallelogrammus* is a wasp species endemic to Brazil. The genus has a total of 245 primitive eusocial species, with independent foundation and without morphological differentiation of caste. In addition to being influenced by external environmental factors, social wasp foraging behavior is controlled by colonial nutritional requirements and foraging patterns are characteristic of the type of material being collected. The aim of this study was to evaluate the frequency of daily foraging in *M. parallelogrammus*, the collection frequency for each material, the relative contribution of dominant and subordinate wasps for these tasks, and the intra-colonial interactions involved in these activities. Sixteen colonies located in Atlantic Rainforest fragments in Brazil were observed between August 2010 and July 2011. Activity peaked in these colonies between 10:00AM and 4:00PM, with more than 80% of nest departures happening in this period. These outflows were largely triggered by interactions with immatures in the nest. Most of returns were with nectar (37.04%), 11.64% with prey, 10.58% with wood pulp, 8.47% with water, and 32.28% were considered to be unsuccessful foraging trips. Nectar and prey were retrieved mostly by subordinates, whereas construction materials were brought to the colony with equal frequency by dominants and subordinates.

Cleaning associations between the facultative cleaner wrasse *Centrolabrus exoletus* and its client fish (Poster #22)

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Abstract: Cleaning mutualisms in the marine environment have long been seen as a classical example of mutualistic cooperation. This phenomenon occurs all over the world. Nevertheless, studies of cleaning interactions in temperate

regions are very few in comparison with the studies already made in the tropics. Little is known about the ecology and ethology of cleanerfish species of the Northeast of the Atlantic Ocean. The rock cook wrasse *Centrolabrus exoletus* is a facultative cleaner present in temperate waters of the Portuguese continental coast. Here we aim to expand the current perspective and the framework to another potential cleaning model by investigating the presence/absence of cleaning stations, cleaner preference indices, such as whether or not other visiting fish (known as clients) are cleaned, client diversity, duration of cleaning and the number of bites taken by cleaners, the occurrence of queuing as well as the time client's wait before being inspected, the number of jolts and clients response. Moreover, benthic parasite emergence, client ectoparasite levels and cleaner stomach contents will also be assessed. The results gathered in this study can be applied to control parasitic infestation, i.e., sea lice infestation in sea-cage farming of Atlantic salmon.

What lies beneath the surface: The importance of underwater video to study cetacean behaviour (Poster #23)

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Abstract: Boat-based behavioural studies of cetaceans can be difficult and sometimes observations are insufficient to fully evaluate the actual behaviour of animals. Nowadays, researchers have been developing alternative approaches to study behaviour of aquatic animals using new technologies, such as drones and underwater cameras. This study aimed to review underwater videos of cetaceans captured during boat-based surveys and compare observations made by the researchers on boat with recordings. Since 2007 surveys have been conducted in Setúbal Bay and other areas such as Peniche and Nazaré have also been surveyed with less regularity. During these surveys, data about ecological parameters of the sighted species as well as photographic data were collected. From 2011 onwards underwater recordings were also collected using GoPro. There were additional behaviours that were not registered by the researchers, such as fin whale feeding on sardines, bottlenose dolphins in bottom feeding and mating. Recordings of common and striped dolphins showed injuries and fishing line tangling that were also not registered at surface. Footage was limited by water visibility and was dependent of boat movement. This study presents few examples of case studies where underwater footage proved to be a very helpful tool to uncover the secret habits of cetaceans.

Audience effects in territorial defence of male cichlid fish (Poster #24)

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Abstract: In the natural environment, animal communication occurs on a network with several potential signallers and receivers. Given that in a signalling interaction sender and receiver can be observed by a third-party who will collect relevant information, it would be advantageous for those who interact to modulate their behaviour according to the presence of an audience (audience effect). In this study we investigated the audience effect on behaviour, steroid hormone levels, and Immediate Early Genes expression in males of the African cichlid *Oreochromis mossambicus*, specifically, the influence of two factors: i) exposure to an audience; and ii) exposure to an intruder. We found an audience effect in males' behaviour resulting in an increase of attention directed towards the audience when intruder is absent, which reveals an interest of the focal male in the audience, and an increase of the agonistic behaviour towards intruders in the presence of the audience. The presence of an audience also had an effect on hormone levels, namely in testosterone and cortisol. Concerning Immediate Early Genes expression, we analyse the genes cFos and ERG1 in seven different brain regions and preliminary results show significant correlations between areas in the different treatments.

One year on the life of *Chioglossa lusitanica* (Poster #25)

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Abstract: Video footage of the behavior in the wild of *Chioglossa lusitanica* was obtained over a period of 10 months. Each video of 24 hour period are recorded with two session of 12 hour in consecutive days and collected with an interval of 3 weeks between each. The recording was made in a gold mine in Valongo, where the species is present during mating season. We observed a large number of social behaviors linked to courtship, such as sexual interference and amplexus, aggression, territoriality and species recognition, as well as some individual behaviors. We observed too differences along the year and some along the day. We used the Observer program to analyze the images and to calculate the frequency and duration of the observed behaviors.

Do personality and social status influence sounds production in *Metriaclima zebra*? (Poster #26)

LAURA CHABROLLES, T. TAMIN, JOEL ATTIA, MARILYN BEAUCHAUD, *Université Jean-Monnet*; MARIA CLARA AMORIM, *MARE – Marine and Environmental Sciences Centre, ISPA-Instituto Universitário*; PAULO FONSECA, *Departamento de Biologia Animal and cE3c - Centre for Ecology, Evolution and Environmental Change, Faculdade de Ciências, Universidade de Lisboa*

Abstract: Many gregarious species have a social hierarchy¹. It is the case for *Metriaclima zebra*, a sounds producer cichlid's fish. In this species, dominant fish have favored access to resources because of their social status. Social status is therefore a very important criteria to qualify an individual. Otherwise, individuals from a same group can show different levels of locomotor activity, attractiveness for novelty, willingness or avoidance for fights with fellow creatures². All of these behavioral expressions form what we call «temperament» or «personality» in animals³. But the link between social status and temperament is not always so obvious. Moreover, even if we begin to understand the role of acoustic signals during interactions between two individuals, we do not know yet the impact of the social status and the temperament on the sounds production for *Metriaclima zebra*. Firstly in this study we used neophobic device to test fish personality. Then we performed dyadic interactions between fish showing different status and personality. All behaviors and sounds emitted during the fights have been recorded and analyzed. First results showed that the dominant fishes were bolder and more aggressive than the dominated fishes. But now remains the question about a correlation between the sounds production and the protagonist's status. Is there any difference in sounds production between a fight among two dominant fishes and another fight among two dominated fishes?

(1). Jameson et al., 1999; (2).Gosling, 2001; (3). Réale et al., 2007

Specialization on hard soil substrates could have favoured the evolution of sociality in ground-nesting bees and wasps (Poster #27)

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Abstract: In digging animals nest excavation incurs costs which vary according to the hardness of the soil substrate. Ground-nesting bees and wasps (Hymenoptera: Apoidea) vary in specialization of soil types, ranging from soft sandy soils to hard compact soils. For the latter species, strategies to reduce costs of digging may include both nest usurpation behaviour and cooperative behaviour, with the second strategy even reducing costs of fights with conspecifics. I hypothesized that species nesting in hard soil belong to lineages more likely to have evolved sociality, and that nest-initiating females within social populations limit costs associated with this specialization by avoiding areas of

highest soil hardness. I found that social species of ground-nesting bees and wasps tend to colonize harder soils than solitary species. Few solitary species in which nest-usurpation commonly occurs and one socially polymorphic bee departed from this trend. Within nest aggregations of eusocial species, nest density was higher in areas of moderate soil hardness, possibly to avoid fragile soils that could affect nest integrity, as well as very hard soils particularly difficult to dig. Overall, these results agree with my hypothesis, which could be further tested with experiments on field and by a formal correction for phylogeny.

Can caulerpin induce changes on fish behaviour? Unexpected conservation problems from invasive alien species (Poster #28)

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Abstract: Invasive species are a worldwide leading threat to wildlife conservation. Recently, the invasive alga *Caulerpa cylindracea* showed an explosive dispersal and had a deep impact on indigenous communities in the Mediterranean becoming an important component of the diet of the omnivorous Mediterranean white sea bream, *Diplodus sargus*. In fact, this edible fish was described to ingest large quantities of the invasive alga. Noteworthy, the changes in the fish alimentary behaviour have been related with cellular and physiological alterations, while it was also established that one of the most abundant secondary metabolites of *C. cylindracea*, the bis-indole alkaloid caulerpin, enters the food chain and accumulates in the fish tissues. This led us to explore whether caulerpin may have some role in the behaviour control of *D. sargus*. Preliminary results point to changes in frequencies of aggressive behaviour in *D. sargus* subsequent to administration of food enriched with purified caulerpin, and set the stage for further research exploring the possible interactions between caulerpin and molecular targets involved in fish behaviour.

Complex pulsed sounds of bottlenose dolphins: how to tell them apart? (Poster #29)

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Abstract: Common bottlenose dolphins (*Tursiops truncatus*) produce a complex acoustic repertoire that comprises frequency-modulated tonal whistles, echolocation click trains, and other broadband pulsed-sounds with high repetition rate. Although distinct packets of pulses have inter-click-intervals that cannot be perceived by the human hearing, classical attempts to classify these signals rely mainly in aural aspects and graphical representations. We applied discriminant function analysis (DFA), based in quantitative time-frequency acoustic parameters, to assess the most important characteristics for pulsed sounds' discrimination and classification. Recordings were collected in the Sado estuary, Portugal (2011-2015). Acoustic parameters were extracted from 930 pulsed signals, previously classified using conventional methodology. Our results revealed repetition rate as the most important feature to discriminate pulsed sounds (DFA main function: $\Lambda = 0.073$; $\chi^2_{(12)} = 2174.65$; $P < 0.001$; structure coefficient = 0.979; 98.8% of total variance). Using the classification functions, 93.5% of cases were correctly classified. Creaks and slow click trains were the sound types most consistently allocated to their original, conventional categories (93.9% and 98.1%, respectively). The use of quantitative procedures is necessary to improve the categorization of dolphins' signals, to assess the functional significance of the different pulsed sounds and to document geographic variations in acoustic repertoires.

Modulation of acoustic perception in the cichlid fish *Metriaclima zebra* (Poster #30)

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Abstract: The Malawian cichlid fish *Metriaclima zebra* emits sounds. These sounds are produced during the territory defence. Playback of these sounds alone have no effect on the aggressiveness of the receiver on the contrary to visual stimulation that triggers the aggressiveness of the receiver attenuator role of the sounds on the aggressiveness of the receiver. Interestingly, when visual stimulation and sound playbacks are played together, the aggressiveness of the recipient is largely reduced when compared to the sending of visual stimulus only (Bertucci *et al.*, 2010). All these results were obtained under daylight conditions, where visual perception was efficient. Otherwise, we noticed that aggressive behaviours including sounds could occur during dawn, dusk, or night, when

visual perception is disturbed (unpublished data). The following question emerged: do ambient lighting intensity change the sound perception? To answer, we have investigated the impact of acoustic playbacks on the aggressive behaviour of adult males defending their territory both in very low lighting conditions ("dim light", 3.2 lx) and under daylight conditions ("daylight", 165.0 lx). We found that the acoustic playbacks make decreasing the aggressiveness of the receptor fish both in "dim light" and "daylight" conditions, but the decrease of aggressiveness was four times higher in "dim light" than in "daylight" conditions, for the same amount of sent sounds. *Metriaclima zebra* reacts more to sounds when visual perception is disturbed, suggesting a cross-sensory modulation phenomenon.

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