SPE2022

XIX
CONGRESS OF
THE PORTUGUESE
ETHOLOGICAL
SOCIETY

INSTITUTO GULBENKIAN DE CIÊNCIA

9/10 DEC

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http://webpages.icav.up.pt/beheco/spe/

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About the SPE

The Portuguese Society for Ethology was founded in 1987 and aims to promote the study of animal behavior in Portugal, considering its various aspects. The society's activities include the publication of the scientific journal Acta Ethologica, the organization of a National Congress and other scientific meetings, the promotion of international relations with similar societies and the dissemination of Ethology at secondary school level.

http://webpages.icav.up.pt/beheco/spe/

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Raquel O. Vasconcelos, Institute of Science and Environment, University of Saint Joseph

José Ricardo Paula, MARE/FCUL

Support and acknowledgments

Scientific Program
SPE 2022

December 9th

09:00 Registration

10:00 Opening Remarks (by Rui Oliveira)

10:10 Gün Semin (chair Rui Oliveira)
Intra- and Interspecies Communication Without Words, Hearing, Vision, or Even Awareness

11:00 Coffee Break

Cognition (chair Clara Amorim)

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Degrees of honesty: variation in cheating among cleaner wrasses

11:40 Pedro Santos
Sex-dependent covariation of behavioural lateralization and inhibitory control in the Common waxbill

12:00 Maddalena Ranucci
Variation in partner-choice cognition in cleaning gobies

12:20 Lunch Break

SPE 2022 + IGC Friday Seminar (chair Paulo Gama Mota)

14:00 Gonzalo de Polavieja
Using AI in collective animal behavior without (too many) tears

Social behaviour and brain (chair Magda Teles)

15:00 José Ricardo Paula
Neurogenomic patterns of social and asocial learning of cooperative rules in cleaner fish

15:20 Pedro Miguel Campos Oliveira
Arginine vasotocin regulation of social behaviour and dominance in the common waxbill

15:40 Poster Walk

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Behaviour development and health (chair Gonçalo Cardoso)

17:40 Victoria Alvarado
The impact of judgement bias on the individual's vulnerability to melanoma cancer

18:00 Magda Teles
Social developmental effects on adult zebrafish behaviour: an integrative framework

18:20 Tânia Marquês
Social distancing in the wild: immunostimulation decreases interaction motivation in cleaner wrasses

20:30 Social Diner

Scientific Program
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December 10th

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Evolution of female ornamentation in birds: what we have learned so far and insight from a long term study of female blue tit coloration

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Resilience of cleaner wrasse's (*Labroides dimidiatus*) social and cognitive behaviour to ocean warming and deoxygenation

10:40 Mélanie Court
Acute and chronic low oxygen compromise the survival and cognition of a fast-expanding coastal cephalopod

11:00 Coffee Break

Behaviour evolution (chair Susana Varela)

11:20 Patrícia Beltrão
Domed nests as an exaptation for compound nest construction: the case of the common waxbill

11:40 Manuel Sapage
Social learning by Mate-Choice Copying Increases Dispersal and the Speed of Range Expansion

12:00 Sophie von Merten
Foxp2 and the Ultrasonic Vocalization of Mice

12:20 Lunch Break

Final Session (chair Paulo Gama Mota)

14:00 Peter K. McGregor
acta ethologica: SPE's journal. Impact, developments and submission advice.

14:20 Vítor Almada Award + Posters Award

14:40 Plenary Meeting of the Portuguese Ethological Society

15:40 Closing Remarks

16:00 Grand Final

Scientific Program
SPE 2022

December 9th - Poster session

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Abstracts of Plenary talks

Gün Semin, William James Center for Research /ISPA-IU

Professor Gün R. Semin is currently Professor of Psychology at ISPA -Instituto Universitário and the founding Director of the William James Center for Research at the same institution in Lisbon, Portugal. His main research interests are in the communication of emotions via chemosignals, embodied social cognition, communication, language, and interspecies communication via chemosignals.

https://williamjamescr.org/people/social-cognition-and-body-odors-team/gun-r-semin/

Title: Intra- and Interspecies Communication Without Words, Hearing, Vision, or Even Awareness

Abstract:

My talk is organized around two research foci. The first concerns human odors (chemosignals) produced during emotional experiences (e.g., fear, disgust, happiness). The second is the effects of these odors on dogs. The guiding theoretical perspective is that these odors alter the sensory systems whose receptors reside on the face, augmenting or diminishing exposure to environmental stimulation. I shall document this with a selection of experimental studies. I shall then turn to observational (double-blind) studies on the effects of these odors (fear and happiness) on dogs (Canis lupus familiaris). The research overview will be concluded with a study contrasting the effects of human emotion odors between puppies (6 months or <) and adult dogs (1 year or >), elaborating on the adaptive origins of the systematic effects.

Gonzalo de Polavieja, Fundação Champalimaud/CNP

Dr. Gonzalo G. de Polavieja did a D.Phil. in Physical Sciences as 'Marie Curie' fellow (Oxford, UK) working in quantum geometric phases, a postdoc in Neurobiology as 'Welcome Trust' fellow in Mathematical Biology at the Laughlin Lab (Cambridge, UK). He was then Junior PI as 'Ramon y Cajal' fellow (Theoretical Physics, UAM), tenured at Cajal Institute (CSIC, Spain). In 2014 he moved to the CNP as Group Leader of the Collective Behavior Laboratory. His research aim is to reach a quantitative understanding of individual and collective behavior, including collective coordination, collective decisions and collective intelligence. His group's approach to this problem is by using a variety of techniques, including behavior, mathematical modelling, machine learning and artificial intelligence, virtual reality, neurobiology, and molecular biology.

https://fchampalimaud.org/pt-pt/research/groups/de-polavieja

Title: Using AI in collective animal behavior without (too many) tears

Abstract:

I would like to convey the opportunities that AI offers to study animal behavior. I will spend a few minutes giving an intuition of how AI works and then explain how we have used it in the lab to study collective animal behavior. One clear opportunity AI offers is to extract richer information from our experiments, that I will illustrate mainly with a tracking system. Less obvious is perhaps how to use AI to understand animal behavior. I will show how we used it to find a model of collective behavior that is both accurate and transparent. I believe the AI modelling is quite close to what a biologist expects from a model: a quantitative description that does not oversimplify too much the underlying Biology.

Claire Doutrelant, CEFE / CNRS

Dr. Claire Doutrelant is a tenure research scientist with the French National Centre for Scientific Research (CNRS) and a current post at the Centre d'Ecologie Fonctionnelle et Evolutive, Montpellier (CEFE). Her work is centered in the theoretical framework of evolutionary ecology, population biology and behavioural ecology, with the aim of understanding life history variation in order to determine the adaptive and evolutionary processes that explain and maintain animal diversity. She is particularly interested by three kinds of life history traits linked to behaviour: cooperation, animal communication and maternal investment. Using mainly birds as biological models and empirical methods, including large-scale experiments and analyses of long-term data sets on different populations in the field. Her focus is currently on the evolution of colour ornamentation in birds, the cause and life-history consequences of cooperation in sociable weavers, sexual and social evolution on islands and the evolution of weaver nests.

https://www.cefe.cnrs.fr/fr/recherche/ee/esp/777-c/152-claire-doutrelant

Title: Evolution of female ornamentation in birds: what we have learned so far and insight from a long term study of female blue tit coloration

Abstract:

Female ornamentation has long been overlooked by evolutionary ecologists, being considered as a genetic by-product of male ornamentation submitted to natural selection (e.g. predation) leading to more cryptic phenotypes in females. Nowadays, there is a general agreement that natural, sexual and social selection also impact female ornamentation, and that studies need to understand how these complex arrays of forces interact and explain the observed variability. I will first review the comparative analyses that lead to this change of view for bird coloration. I will then present the main results we obtained on blue tits (*Cyaniste caeruleus*) to determine to what extent female coloration can be functional and selected. This will illustrate the importance of conducting long term studies in tandem with experiments to evaluate the strength of selection in natural populations, and to work in both sexes to estimate the specificities of each sex and their resemblance.

Abstracts of Oral presentations (by order of appearance in the program)

Daniele Romeo (romeodan@connect.hku.hk)

Degrees of honesty: variation in cheating among cleaner wrasses

Daniele Romeo[1]; Beatriz Pereira[2]; Melanie Marques[2]; Maddalena Ranucci[2]; José Ricardo Paula[2,3]; Celia Schunter[1]

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[3]Departamento de Biologia Animal, Faculdade de Ciências Universidade de Lisboa, Campo Grande, 1749-016, Lisbon, Portugal

Abstract: In coral reef ecosystems, cleaner wrasses remove ectoparasites, dead skin and mucus from client fishes. However, cleaners prefer to eat the protective mucus from their clients instead of parasites, which constitutes cheating. This conflict likely caused the development of highly sophisticated decision-rules used by cleaners during interactions, including social tool-use, reconciliation and reputation management. This preference for mucus is present among all cleaner wrasses of the Labroides genus and the closely-related juvenile cleaner *Larabicus quadrilineatus*. Although some variation in cheating is predicted among these wrasses, proper classification of the degrees of honesty within these groups is lacking. Here we provide the first classification of cheating among cleaner wrasse species using two behavioural tests: honesty when inspecting a client with a present bystander compared with alone; honesty while cleaning predatory clients compared with resident clients or visitor clients. Since cleaners adjust their service quality in the presence of bystanders and different clients employ different partner control mechanisms to cleaners using these tests, we can stimulate cleaners to exhibit their proper range of honesty according to each situation. This classification is a valuable tool for comparative mechanistic studies on honesty.

Pedro Santos (pedro1598santos@gmail.com)

Sex-dependent covariation of behavioural lateralization and inhibitory control in the Common waxbill

Pedro Santos [1], Patrícia Beltrão [1], Beatriz Saldanha [1], Ana Cristina Gomes [1] & Gonçalo Cardoso[1]

[1]CIBIO – Research Center in Biodiversity and Genetic Resources, Universidade do Porto, Vairão, Portugal

Abstract: Behavioural lateralization consists in preferentially using one side of the body when performing certain behaviours. Because of its connections with cerebral lateralization, more lateralized individuals have been found to have better cognitive capabilities and perform better in various ecological contexts. Despite the apparent advantages of lateralization, differences in strength and direction of behavioural lateralization can be found between individuals of the same populations, which previous studies have suggested to be related with individual differences in other traits (e.g., personality type, sex). We studied a population of common waxbills (*Estrilda astrild*) using an experimental setup to quantify whether each individual preferentially used its left or right side to feed. We found evidence of population-level lateralization, since most waxbills chose the right side to feed, but also individual differences in the direction and strength of lateralization. Especially in males, the more left-side lateralized individuals also had better inhibitory control. Females were on average more right-side lateralized than males. These results highlight connections between behavioural lateralization and inhibitory control ability, indicating a sex-specific association between behavioural lateralization and cognitive performance.

Maddalena Ranucci (maddy.ranucci@gmail.com)

Variation in partner-choice cognition in cleaning gobies

Maddalena Ranucci[1], Melanie Marques[1], Beatriz Pereira[1], Daniele Romeo[2], José Ricardo Paula[1,3]

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Abstract: In the Caribbean, cleaner gobies provide an essential function for the ecosystem dynamics through their cleaning service. During their interactions with other reef fish, cleaner gobies remove ectoparasites, dead tissue and mucus, providing them with an essential service for their well-being. Cleaner gobies can vary their food intake dependency on cleaning interactions, being characterized as dependent (relying primarily on cleaning for food) or facultative cleaners (if also able to obtain food from other sources). Although evidence for partner-choice is present from natural observations, contrarily to their cleaner wrasse counterparts from the Indo-pacific, their capacity to solve partner-choice cognitive tests remains unknown. Here, we provide the first comparative study evaluating the capacity to solve a delayed reward partner-choice cognitive task among closely related goby species with variable degrees of cleaning dependency (dedicated cleaner, facultative cleaner and non-cleaner). We will describe the variation in gobies' cognitive abilities according to the ecological approach to cognition, predicting that cognitive performance should be higher in ecologically valid contexts (cleaner species) than non-relevant ecological contexts (non-cleaner species).

José Ricardo Paula (jrpaula@fc.ul.pt)

Neurogenomic patterns of social and asocial learning of cooperative rules in cleaner fish

José Ricardo Paula[1,2,3]; Beatriz Pereira[2], Melanie Marques[2], Celia Schunter[1]

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Abstract: Cleaner wrasses, *Labroides dimidiatus*, engage in cooperative cleaning interactions to remove ectoparasites, dead skin and mucus from other reef fishes (so-called clients). However, cleaners prefer to eat the protective mucus from their clients rather than parasites, which is considered cheating. Juvenile cleaners can socially learn the cheating consequences, and social learning has been proposed as a potential mechanism for the evolution of cooperation. We used an experimental paradigm derived from cleaners' cooperative interactions with client fish to investigate the neuro-molecular mechanisms of social vs asocial learning of cooperation rules in cleaner wrasses. In this paradigm, juvenile cleaners had to learn how to behave more cooperatively with client models using social information (adult cleaner demonstrator) or by themselves. Here, using transcriptomics in three brain regions (forebrain, midbrain and hindbrain), we show that, although cleaners were equally able to learn socially or asocially, social learners elicit a higher transcriptional response in the forebrain while asocial learners respond in the hindbrain. Our results suggest a localized activation of social learning with transcriptional changes in social decision-making network-related regions (forebrain), while asocial learning is localized in a region related to associative learning (hindbrain).

Pedro Miguel Campos Oliveira (pedromiguel58@live.com.pt)

Arginine vasotocin regulation of social behaviour and dominance in the common waxbill

Pedro Miguel Campos Oliveira[1]

[1]Faculdade de Ciências da Universidade do Porto

Abstract: Neuropeptides are a group of hormones known for their ability to play a role as neurotransmitters as well as neurohormones, depending on the location of their production. Such is the case with Arginine vasotocin (AVT), a neuropeptide produced in fish and birds, homologue to mammal arginine vasopressin, that has long been thought to only have two functions, vasoconstriction and antidiuresis. But, recently, a wider spectrum of behaviours has been shown to be influenced by it, especially sexual and aggressive behaviour. In this study, adult common waxbills (*Estrilda astrild*) were subjected to injections of two dosages of AVT and Manning compound, a V1a antagonist, to determine their effects on social behaviour, using a food competition test. The results showed a significant reduction of waxbills' activity with the AVT treatments, with the lower dosage being responsible for a decrease that becomes more intense with the higher dosage. Besides, high AVT treatment reduced all the observed behaviours. These results are likely due to this neuropeptide's role in the stress response. Lastly, the lower dosage of the AVT antagonist (Manning compound) led to a tendency to increase aggression, but solely in males. This last result suggests that male common waxbills' aggressive behaviour should be modulated by V1a pathways."

Victoria Alvarado (v.alvaradoferdz@gmail.com)

The impact of judgement bias on the individual's vulnerability to melanoma cancer

Alvarado, Maria Victoria [1]; Espigares, Felipe [1,2]; Faisca, Pedro [3]; Paixao, Tiago [4]; Oliveira, Rui Filipe [1,5,6]

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[6] Champalimaud Neuroscience Programme, Champalimaud Foundation, Lisboa, Portugal

Abstract: We have recently developed and validated a behavioral assay for measuring judgment bias in zebrafish and our preliminary results suggest that cognitive bias towards pessimistic judgments (i.e. some individuals consistently evaluate ambiguous stimuli as negative) may predict an individual's susceptibility to the detrimental effects of chronic stress (UCS). In this scenario, inter-individual differences in cognitive bias seem to be linked to inter-individual variations in stress responses, thus revealing the potential for evaluating biases of stress that affect the individual's vulnerability to stress-related diseases. To test this hypothesis, we used a transgenic zebrafish model for melanoma formation and progression named Tg (mitfa:HRAS-GFP) which is characterized by the presence of tumour nodules, mainly in the anal fin. Firstly, zebrafish were tested in a cognitive bias paradigm to be categorized in an optimistic/pessimistic dimension. Following this, we used a validated UCS protocol for zebrafish to treat for one month. Our results show that transgenic zebrafish displayed more pessimistic-like behaviours in response to ambiguous cues as compared with their WT siblings, which suggest the occurrence of a negative affective state associated with the presence of the oncogene. Furthermore, the apparition of visible tumor nodules was delayed in optimistic controls as compared with pessimistic controls and stressed phenotypes. These results suggest that optimistic individuals exhibit a lower susceptibility to the apparition of melanoma cancer.

Magda Teles (msaturnino@igc.gulbenkian.pt)

Social developmental effects on adult zebrafish behaviour: an integrative framework

Magda C. Teles[1], Miguel Correia[1], Rita Gageiro[1], and Rui F. Oliveira[1,2,3]

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[2] Instituto Gulbenkian de Ciência, Rua da Quinta Grande 6, 2780-156 Oeiras, Portugal

[3] Champalimaud Neuroscience Program, Champalimaud Foundation, Lisbon, Portugal

Abstract: The social environment of an animal can have a profound and determining effect on its behaviour. During development, variations in the social structure provide inadvertent information that influences many aspects of individual development on a wide range of physiological and cognitive traits. In the present work, we studied the influence of environmental complexity in the development of different adult social phenotypes by combining the study of gene expression, number of neurons and behaviour. Therefore, zebrafish were raised in different social environmental complexities, by varying group size and group stability, until adulthood and then tested in different behavioural contexts. Our results indicate that distinct aspects of social complexity (i.e. group size and group stability) influence differentially adult social behaviour, for instance, group cohesion is influenced by group size, while the preference for conspecifics changes depending on group stability. At the neuronal level, animals raised in less complex social environments experience changes in neuronal densities and a significant reduction in specific brain regions related to social information processing. Differences in the transcriptional profiles were also found between treatments, indicating distinct regulation patterns. These results reveal that variations in the social environmental complexity during development can profoundly impact individuals throughout their lifetime.

Tânia Marquês (trsmreg@gmail.com)

Social distancing in the wild: immunostimulation decreases interaction motivation in cleaner wrasses

Tânia Marquês[1]; Beatriz Pereira[1]; Tiago Repolho[1,2], José Ricardo Paula[1,2]

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Abstract: Within the recent COVID-19 pandemic, social distancing has provided a powerful example of the relationship between infectious disease and social behaviour. The cleaner wrasse *Labroides dimidiatus* removes ectoparasites, dead skin and mucus from other reef fishes (so-called "clients") engaging in close contact interactions with them. As cleaners can engage in thousands of daily interactions, they have been recently considered potential super-spreaders of infectious pathogens. Here, using non-infectious immunostimulation, we tested if "sick" cleaner wrasses employ social distancing and adjust the quality of their cleaning interactions. We injected cleaner wrasses with lipopolysaccharides (LPS) to induce a pathogen-like response in cleaners without infecting them with any pathogen. Following this immunostimulation, cleaners' social preference, interaction behaviour and capacity to cooperatively solve a cognitive problem (bystander test) were tested. Although we did not observe social avoidance in the social preference test, "sick" cleaners engaged in fewer cleaning interactions. Moreover, in a cooperation-dependent cognitive test "sick" cleaners were unable to adjust their behaviour to increase their cooperativeness. We suggest that the decrease in cleaning activity might provide a social distancing-like barrier against pathogenic spread.

Beatriz Pereira (bppereira@fc.ul.pt)

Resilience of cleaner wrasse's (*Labroides dimidiatus*) social and cognitive behaviour to ocean warming and deoxygenation

B. P. Pereira[1]*; M. D. Martins[2]; R. Oliveira[1]; M. C. Marques[1]; M. Macau[1]; T. Marquês[1]; R. Rosa[1,2]; J. R. Paula[1,2]

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Abstract: Mutualistic cleaning interactions are one of the key ecological features of coral reefs. Most fishes (so-called 'clients') engage in cooperative interactions with cleaner fishes, where cleaners benefit from food and protection while providing clients with parasite load control and ultimately increased fitness. By promoting population and community health, cleaning mutualisms influence local abundance and species richness. Ocean warming and acidification have been showed to impair cleaners' physiology and behavior, disrupting its previously documented cognitive sophistication. Yet, research on ocean deoxygenation's impacts caused by climate change have been mostly neglected. This study aimed to assess the effects of ocean warming (OW) and deoxygenation (OD) on the social behaviour and cognition of the Indo-Pacific bluestreak cleaner wrasse's, *Labroides dimidiatus*. Here we describe and discuss a comprehensive set of behavioural responses of wrasses acclimated to control and predicted climate change scenarios of OW (+3ºC) and OD (90% O2 sat) in a full factorial design, tested in ecologically relevant tasks — cleaning behaviour (i.e, social interactions with clients, Naso elegans) and cooperativeness (i.e., ability to feed against preference). "

Mélanie Court (courtmarques96@gmail.com)

Acute and chronic low oxygen compromise the survival and cognition of a fast-expanding coastal cephalopod

Mélanie Court[1], Marta Macau[1], Tiago Repolho[1,2], Vanessa Madeira Lopes[1], Rui Rosa[1,2], José Ricardo Paula[1,2]

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Abstract: The ocean is undergoing deoxygenation and spread of hypoxic areas. Ocean deoxygenation and standing levels of hypoxia are shrinking fundamental niches, particularly in coastal areas, yet documented repercussions on species physiology and behavior are limited. In this perspective, we tackled the impacts of deoxygenation (7 mg O2 L-1), mild hypoxia (nocturnal 4 mg O2 L-1) and severe hypoxia (2 mg O2 L-1) on Sepia officinalis' physiology (hatching success, development time, mantle length) and behavior, i.e., ability to learn (associative- and socially), to camouflage, and to spatially explore its surroundings. We found that hypoxia yielded lower survival rates, smaller body sizes, and inhibited social learning and anti-predator behaviors. Acute and chronic exposure to low oxygen produce similar effects on cognition (increased latency to attack and activity levels). It is thus expected that, although cuttlefish can withstand oxygen limitation to a certain degree, expanding hypoxic zones will diminish current habitat suitability.

Patrícia Beltrão (pbsantospt@cibio.up.pt)

Domed nests as an exaptation for compound nest construction: the case of the common waxbill

Patrícia Beltrão[1] , Cristiana I. Marques[1] , Soraia Guerra[1] , Paulo A. Silva[1] , Gonçalo C. Cardoso[1] , Ana Cristina R. Gomes

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Abstract: Nests are essential for breeding in many birds, and differ widely in morphology across species. Only a few bird species build compound nests, with different nest chambers as part of a continuous structure. Knowing the ecological and social conditions leading to compound nest construction in species where this behaviour is not the norm can improve our understanding of their functions and evolution. We studied how limited space availability affected nest building behaviour in a population of wild-caught common waxbills (*Estrilda astrild*), across 4 years, in a mesocosm with abundant vegetation (e.g. grass, brambles, bushes). In addition to their typical isolated domed nests, built mostly on or near ground level, we found that 141 out of a total of 423 nest chambers were in compound structures, each comprising 2 to 11 nest chambers, and that most compound nests were above the ground on bushes. Compound nests were never reported for common waxbills in nature, and we thus conclude that compound nest construction is a plastic response caused by the high density of this population relative to available nesting sites in the mesocosm. Since the morphology of domed nests resembles that of nest chambers in compound structures, domed nests may be an exaptation for high-density nesting and may facilitate the evolution of more specialised compound nest construction.

Manuel Sapage (masapage@fc.ul.pt)

Social learning by Mate-Choice Copying Increases Dispersal and the Speed of Range Expansion

Manuel Sapage [1,2], Susana Varela [1,3,4], Margarida Matos [1,2], Mauro Santos [1,5,] Hanna Kokko [6], Ingo Schlupp [7]

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Abstract: Mate-choice copying happens when an individual's mate preference is influenced by others. Using individual-based models, we examined how copying can affect the evolutionary dynamics of populations at three levels of complexity: within a patch, between patches, and between habitats. Our question was whether copying can reduce dispersal costs and, thereby, be relevant at large ecological scales. We show that in a single patch copying can evolve though indirect selection and increase population fitness. Then, in a model simulating a multi-patch environment, we show that copying is especially adaptive to migrating females because it informs them of locally adapted males, promoting greater dispersal, but it weakens local adaptation, increasing homogeneity between patches, which made us ask whether copying is less adaptive when animals disperse between habitats. We found that copying can still be adaptive, increasing the speed of expansion, but depends on the type of mate preference rules and copying behaviours females use. These studies shows that copying is not only relevant to the dynamics of sexual selection, but that it has a more general role, involving the ecology of species. In particular, they shine a light on future research avenues on the correlated evolution of copying and dispersal.

Sophie von Merten (svmerten@fc.ul.pt)

Foxp2 and the Ultrasonic Vocalization of Mice

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Abstract: House mice (*Mus musculus*) live in social groups where they frequently interact with conspecifics using acoustic communication. Both male and female mice produce complex ultrasonic vocalizations (USV) that remind of high-pitched birdsong. Mice use USV in different social contexts, among others for mate attraction and mate choice, and during hierarchy establishment and familiarization. The transcription factor FoxP2 is involved in vocal communication of animals. It is important for vocal learning in several bird and mammal species and presumably played a special role in the evolution of human speech and language. It has been shown that an allele with a humanized version of the murine Foxp2 gene affects the ultrasonic vocalization of mouse pups. We tested if this humanized allele would also affect the ultrasonic vocalization of adult female and male mice. We found differences in temporal, spectral and syntactical parameters between the genotypes in both sexes, and between sexes. Mice carrying the humanized Foxp2 allele were using higher frequencies and more complex syllable types than mice of the corresponding wildtype inbred strain. Independent of the Foxp2 genotype, males used more complex syllable types with larger frequency bandwidths than females. Our results confirm the importance of Foxp2 in mouse ultrasonic vocalization.

Peter K. McGregor (pkmcgregor@ispa.pt)

acta ethologica: SPE's journal. Impact, developments and submission advice.

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Abstract: acta ethologica, launched in 1998 with ISPA, is the society journal of the Portuguese Ethological Society (SPE). Three hard copy issues are published per year and online by Springer Nature. Its standing as a journal within the field of behaviour is shown by the several measures of impact that I will present in this talk. I will report on recent journal developments including the adoption of STRANGE guidelines and progress on a special issue. I will also outline the challenges of the rapidly changing academic publishing environment, including what Springer Nature's hybrid open access model means for SPE and authors, and implications of open access publication requirements of research funders. I will also highlight ways authors can maximise the chance that their ms will be accepted for publication, from initial submission to responding to referees' comments. (And why is the journal title in lower case letters?)

Abstracts of Posters (by poster number)

P1

Sandra Trigo   (strigo@cibio.up.pt)

Sex differences in common waxbill social behavior following mesotocinergic manipulation

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Abstract: The neuropeptide oxytocin is implicated in the regulation of sociality across vertebrates. Non-mammalian homologs of oxytocin, such as isotocin in fish and mesotocin in amphibians, reptiles and birds, all play crucial roles modulating social and reproductive behavior. In this study, we exogenously manipulated the mesotocinergic system in a highly social bird, the common waxbill *Estrild astrild*, and tested the effects on affiliative and aggressive behavior by performing tests of competition over food. Birds treated with mesotocin showed a sedative state, decreasing almost all the behaviors we studied (movement, feeding, allopreening), while birds treated with an oxytocin antagonist showed a decrease only in social behaviors (aggressions and allopreening). We also found two sex-specific effects: mesotocin reduced allopreening more in males than females, and the oxytocin antagonist reduced aggressiveness only in females. Our results suggest sex-specific effects in the modulation of affiliative and aggressive behaviors via mesotocinergic pathways, pointing to an evolutionary conserved role for oxytocin vertebrates.

P2

Gonçalo Cardoso (gcardoso@cibio.up.pt)

Age and environment affect female more than male colouration in a mutually ornamented bird

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Abstract: Long-term studies of colour ornamentation are rare, which limits our understanding of senescence in ornamental colours. We measured carotenoid-based red colour in the plumage and bill of common waxbills, first at capture from the wild and again in 4 Autumns while living in a large open-air mesocosm. Individual differences in plumage colour, but not in bill colour, were repeatable across these 5 Autumns, and we found a longitudinal decrease in the size of the red mask patch and in the redness of both plumage and bill colour, suggestive of senescence. For bill colour, this longitudinal effect was stronger in females. We also found evidence of environmental effects, in the form of differences in colour between the time of capture in the wild and while in the mesocosm. Again, some of those effects were stronger in females. Lastly, we found no evidence for seasonal effects on coloration, neither when comparing Autumn measurements with measurements made during one Spring for birds in the mesocosm, nor when monitoring colour during one year in a group of 26 waxbills in bird cages. These results indicate more plasticity in female than male ornamentation, both with respect to environmental and physiological changes.

P3

Ana Leitão (anamvleitao@gmail.com)

Two is better than one? Song function for joint territory defence and within-pair communication in Lovely fairy-wrens

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Abstract: Song in birds has been extensively studied and is considered a classical example of a sexually selected trait. However, this interpretation is based on studies of predominantly one sex, the male. Female song is still underrepresented, and there are only a few species for which song similarities and differences between the sexes have been described. In this study, we investigated the function of female and male song in the Lovely fairy-wren (*Malurus amabilis*), a tropical species that defends territories year-round. We found that females and males had similar song metrics and natural song rates across breeding and non-breeding events, except for during the incubation period. Pairs sang more when not nesting compared to all breeding stages, and when apart from their partner. Both sexes had coordinated and similar responses to simulated intrusion: male song playbacks elicited stronger responses than female song playbacks, as did simple playback songs when these were followed by complex song playback. Overall, observations and experiments suggest that female and male songs function primarily in joint territorial defence of resources and within-pair communication.

P4

Paulo Mota (pgmota@uc.pt)

Birdsong evolution in Cardinals and Manakins shows divergent constraints on song

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Abstract: Birdsong has important functions, such as territory defense, species recognition, and mate attraction. Song structure can be shaped by several ecological and morphological factors and phylogenetic relationships. Here, we analyzed the evolution of birdsong and its constraints in Cardinalidae (oscine) and Pipridae (suboscine), two groups that differ widely in acoustic, morphological, and life-history characteristics. This has rarely been attempted and it would allow elucidating evolutionary patterns in acoustic signals. We assessed the effect on song structure (measured by 6 acoustic parameters) of several possible modulators: 5 ecological/life-history measurements, and 2 morphological variables. Phylogenetic information was included in the analysis for controlling and evaluating its signal. PGLS results showed that morphological characters (beak shape and body size) impose the greatest constraints on song structure in both families, affecting 6 song parameters. In Cardinals, those that inhabit open areas produce higher peak frequency and frequency bandwidth, while migratory species showed a higher number of notes compared with sedentary species. There was a high phylogenetic signal for most of the cardinal's song parameters and some of manakin's. Our results corroborate the importance of known morphological factors as constraints on birdsong and bring new insights into characters involved in birdsong evolution in distinct groups.

P5

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Characterization of the vocal fish community in Mozambican tropical coral reefs.

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Abstract: Coral reefs are biodiversity hotspots in urgent need of protection due to increasing anthropogenic pressures and climate change. Sounds produced by fishes are an important component of soundscapes in these ecosystems, making passive acoustic monitoring (PAM) an effective tool to map the presence of target species or to estimate changes in biodiversity. The present study aims to identify sound producing fishes in Mozambican coral reefs based on the literature and catalogue fish sound types recorded 'in situ'. Based on the literature, we found 183 potentially vocal species and 29 vocal species with characterized sound production. Using acoustic recordings from coral reefs near the Mozambique island on March-April 2017 and 2018, a total of 47 putative fish sound types were recognized, from which the 37 most common were further characterized for several temporal and spectral features. Additional video recordings allowed to identity 5 sound producing species, including *Chromis weberi, Dascyllus trimaculatus, Abudefduf sp., Amphiprion akallopisos* and *A. allardi*. This study provides the first fish sound library for Indian ocean African coral reefs. Such knowledge may pave the way to use sounds to assess changes in single-fish species or reef fish biodiversity.

P6

Raquel O. Vasconcelos (raquel.vasconcelos@usj.edu.mo)

Characterization of the vocal behavior in the miniature and transparent *Danionella cerebrum* (Cyprinidae)

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Abstract: *Danionella cerebrum* (Cyprinidae) has recently been proposed as a promising model system to investigate the structure and function of the adult vertebrate brain, including the vocal-auditory neural pathways. This newly discovered species, endemic to Myanmar, exhibits body transparency and the smallest brain known among vertebrates. We aimed to characterize the acoustic repertoire of *D. cerebrum*, as well as the circadian variation of vocal activity. In addition, we investigated whether sound production related to egg laying, in order to assess the importance of vocalizations for reproductive success. Our preliminary findings point to high vocal complexity associated to both agonistic male-male interactions and reproductive contexts, with vocalizatios varying from sequences of short pulsed sounds (2-10 short segments) up to long continuous bouts (of over 1.3 min). The results indicated a significant effect of the time of day on sound production, with greater activity in the early morning and absence of vocalizations at night. In addition, a significant correlation between vocal rate and number of eggs was identified, suggesting that acoustic communication is important for reproduction. This work reveals the potential of using this species in future research to tackle the biological function of vocal signaling and underlying neural motor vocal control.

P7

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The effect of temperature on agonistic sound production in a small marine fish

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Abstract: Acoustic communication can be strongly affected by environmental temperature, especially in ectothermic animals. The two spotted gobies, Pomatoschistus flavescens (Teleostei: Gobiidae), is a marine fish with elaborate visual and acoustic behavioural displays associated with territorial defence and reproductive behaviour. The present study aimed to 1) describe the production of acoustic signals in an agonistic context, 2) compare agonistic with courtship sounds and 3) test the effect of temperature on agonistic sound features. Males made mainly drums when defending their territory from intruders. Agonistic drums were low frequency trains of pulses (c. 35 pulses) typically lasting just over 1 s. Pulse period averaged 29 ms. Agonistic drums presented higher pulse emission rates than courtship sounds. The exposure to different temperatures (16°C, 19°C and 21°C) affected acoustic features. Pulse rate increased with temperature. Sound duration and the number of pulses was also affected by water temperature and were lowest at 21°C. Our study suggests that temperature can change the sounds produced by this and other fish species which may compromise the effectiveness of acoustic communication and social interactions. Addressing the effect of temperature variation on fish communication during reproduction is especially relevant to understand possible impacts of climate change.

P8

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The effect of noise on twittering and stress in *Crocidura russula*

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Abstract: Noise pollution is rising as urbanization continues to grow. Numerous species rely on vocalizations for echolocation and communication. Several studies investigate the impacts of noise pollution on the vocalizations and stress levels of different animal taxa, but little is known about these impacts in small mammals. *Crocidura russula* is distributed all over southwestern Europe and inhabits a range of different habitat types in Portugal, including cities. They are very vocal and use different call types for communication and echolocation. They produce a short, weak, and high-pitched call type, called twitter. This study aims to determine whether noise pollution affects shrews' twittering calls and stress levels. We hypothesize that animals from places with higher noise pollution will have different vocalizations and stress levels than those from places with less noise pollution. We trapped shrews at differently disturbed sites, analyzed their fecal corticosterone levels from field samples and recorded and analyzed their vocalizations in captivity considering the number, duration and frequencies of twittering calls. We did not find any influence of noise pollution on either the stress levels or twittering calls. This result might be explained by the generalist lifestyle of *Crocidura russula*, which might not be affected strongly by acoustic disturbance.

P9

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Does traffic noise influence behaviour and stress levels of small mammals?

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Abstract: Urbanization has been growing at alarming rates, and with it the pressure on wildlife has increased. More and more areas are affected by different types of pollution and disturbances caused by cities and their connections (roads and train tracks) which can have consequences on the animals that live there. The main objective of this ongoing study is to assess the impact of traffic noise on the behaviour and physiology of small mammals. Our study species are the insectivorous greater white-toothed shrew (*Crocidura russula*) and the rodent Algerian mouse (*Mus spretus*). Based on results on birds and other animal taxa, we expect that also small mammals will differ in their behaviour and physiology depending on the level of sound pollution. To test our predictions, we captured individuals of both species in sites with different levels of sound pollution and assessed their behaviour and stress levels in the field. We performed a behavioural test (bag/bucket test) to assess the proactivity/reactivity of the individuals and analysed their levels of faecal corticosterone from samples collected upon capture. Our preliminary results show differences between sites, but with no evident relation to noise. The impact of other factors on the animals is also discussed.

P10

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A noisy lifetime: behavioral effects of noise exposure and senescence in the zebrafish model

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Abstract: The increasing levels of environmental noise are creating a serious hazard to the human auditory system, but also a wide range of adverse health effects including stress and anxiety. Noise pollution is considered a threat to the public health especially in developed countries, where there also is a high prevalence of senescence-related diseases due to the increasing life expectancy. We relied on the zebrafish model to test the effect of both noise and age on anxiety, aggression, and social behavior. We used a sequence of multiple behavioral assays, namely the novel tank diving, mirror-biting (aggression), social interaction, and shoaling, and tested young reproductive adults and old zebrafish. The animals were either tested after noise treatment for 24 h (150 dB re 1Pa) or silent/control conditions. Significant differences were found between experimental groups regarding social attraction, with age promoting social avoidance, which was exacerbated in the presence of noise. Both age and noise induced higher social aggression and anxiety in a novel environment. This study is a first comprehensive attempt to characterize the effects of age and noise at the behavioral level in the zebrafish model, which is key for identifying physiological coping mechanisms associated to aging and environmental stress.

P11

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Molecular evolution of the oxytocin signalling pathway during the radiation of cichlids in Lake Tanganyika

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Abstract: Oxytocin is a neuromodulator known for playing an important role on social behaviour across vertebrate species. However, the mechanism by which this neuropeptide regulates social phenotypes is still far to be unravelled. By using the entire radiation of cichlid species in Lake Tanganyika, in which repeated evolutionary transitions between social phenotypes occurred, this ongoing project aims to map the evolution of four social traits (pair bonding, brooding type, sex of the brooding parent and group size) and study its potential association with mutations in the oxytocin signalling pathway genes. For this purpose, the gene sequences of 129 genes and homologues of all the cichlid species living in Lake Tanganyika (243 spp.) were obtained and positive selection analysis based on dN/dS ratio was performed. To detect correlations between the social traits and mutations, a comparative analysis for discrete variables across phylogenies was used. Future research will address other genes involved in social behaviour as well as the role of gene regulation on social phenotypes.

P12

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Oxytocin modulation of socially driven adult neurogenesis in zebrafish

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Abstract: Adult neurogenesis, the formation of new neurons from precursors cells, is regulated by both intrinsic and extrinsic factors. The social context is a key environmental factor that can modulate positively or negatively the formation of new neurons. Preliminary work from our lab shows that social isolation has a negative impact on cell proliferation in zebrafish, which can be rescued by the exposure to a social stimulus (a sex-mixed shoal). Moreover, in rats, adult neurogenesis can be modulated by the action of oxytocin receptors present in the hippocampus, an area belonging to the social decision-making network (SDMN). The SDMN is a network that regulates social behaviour and is influenced by the action of hormones and neuromodulators, like oxytocin. Here, we used a zebrafish mutant line for oxytocin receptor, to test if oxytocin mediates the effects of the social environment on adult neurogenesis in the brain nuclei belonging to the SDMN. The results indicate an effect of oxytocin on brain cell proliferation in Dm, Vc, PPa, PPp, Vd and the pretectum. Thus, this study can be considered a steppingstone to clarify the role of oxytocin on the social modulation of adult neurogenesis in vertebrates.

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Impacts of marine heatwaves and acute hypoxia on the short-snouted seahorse *Hippocampus hippocampus* behaviour

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Abstract: Seahorses are teleost fish with unusual anatomical and behavioural characteristics, which makes them one of the most unique and enigmatic animals, recognized as flagship species for several conservation issues. Unfortunately, seahorses' populations have been declining worldwide, mainly due to anthropogenic pressure. Their unique lifestyle, namely, their reduced swimming ability, small distribution, high site-fidelity and monogamy, constrains the ability of these animals to adapt and evolve in the future climate scenario, especially when exposed to short-term extreme events. Thus, our study tested the individual and combined effects of a marine heatwave (21.5°C) and an extreme hypoxia event (23% dissolved oxygen) on the temperate seahorse *Hippocampus hippocampus* resting, individual and social activity patterns and their associated behaviours. In general, the marine heatwave exposure did not change seahorse behaviours. In contrast, seahorses showed signs of movement and feeding lethargy whenever there was oxygen depletion, both with control and marine heatwave temperatures. Social activity behaviors did not change in any of the environmental conditions. The results show that, although seahorses may have a behavioral elasticity to heat stress, an extreme decrease in dissolved oxygen may result in behavioural changes that jeopardize the development and survival of these iconic organisms.

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Genetic architecture of social and asocial learning in *Drosophila melanogaster*

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Abstract: Social and asocial learning are required to cope with the complexity of the environment. However, whether they use a single (general-purpose) or distinct (special-purpose) cognitive mechanisms remains elusive. This study aims to address this question by studying the genetic architecture of social and asocial learning in Drosophila melanogaster. We firstly tested social and asocial learning abilities in 40 lines of the DGRP, a panel constituted of isogenic sequenced lines that together represent the genetic variation of a natural Drosophila population. We used aversive conditioning paradigms for oviposition sites. We obtained significant learning performance variation across the tested lines that showed no correlation between social and asocial learning. Secondly, we performed a GWAS between the genetic variants in the DGRP and each learning phenotype. We obtained two different sets of candidate genes for social and asocial learning, ranging from genes with unknown biological activity to genes already known to be related to learning. Thirdly, to functionally validate the role of each candidate gene on each learning phenotype, we used GAL4/RNAi-UAS lines, with a pan-neuronal knockdown. We found genes associated with specific learning types. Finally, we analysed the expression patterns of these genes in the Drosophila brain and found that some are expressed in the mushroom body, a brain region previously described to be involved in the associative learning process. Together, these results suggest, so far, the occurrence of a domain-specific genetic architecture for social learning in Drosophila.

P15

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Deconstructing collective cognition in Drosophila: neurobehavioural mechanisms of social and asocial learning

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Abstract: The cognitive system has an important function in filtering the information an animal receives from the environment and in determining the appropriate responses, therefore affecting animal performance at the behavioural level. Currently, there is a debate on whether there is a specialization of cognitive mechanisms for the processing of asocial and social information. Cognition in Drosophila is usually studied using olfactory collective conditioning. However, this approach does not allow to disentangle between social and asocial learning. Nonetheless, many studies using this paradigm have already identified genes that disrupt the different phases of memory storage, as well as the input and encoding of information. In order to disentangle to disentangle the social and asocial components in collective learning and to what extent the same genes are implicated in both learning types, we developed new paradigms of social and asocial olfactory conditioning using the classic T-Maze Drosophila learning set-up. We will present the preliminary results of these tests in established mutant lines for memory in Drosophila (e.g. radish mutant line which is associated with anaesthesia-resistant memory)."

P16

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Using supervised machine learning to quantify cleaning behaviour

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Abstract: In coral reefs, cleaner wrasses, *Labroides dimidiatus*, are known for their cleaning activity. These cleaner fishes inspect client fish to mainly remove and feed on ectoparasites. These cleaners' fish can interact with more than 2,000 clients daily, and some clients look for cleaners to interact around 145 times a day. Cleaning behaviour includes a vast repertoire from cleaning bites, client jolts, tactile stimulation, chasing, advertising dances, punishment and manipulation – all measures of cleaning motivation and interaction quality. The analyses of these interspecific interactions among the fish have usually been made through the manual processing of video recordings. Apart from being very time-consuming, manual processing can be unreliable due to variation across human observers. Automatic posture tracking and behavioural classification are rapidly becoming indispensable to studying animal behaviour accurately. Within this context, we present a semi-automated tracking and behaviour classification supervised machine learning pipeline to observe, record and classify cleaning behaviour events automatically.

P17

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Has artificial selection for shoal preference in zebrafish driven the evolution of enhanced cognition?

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Abstract: The social intelligence hypothesis posits that group living generates the selective forces that drive the evolution of enhanced cognitive abilities. This hypothesis has generated a large debate and experimental approaches that test their assumptions and predictions are necessary. We have been doing this with an artificial selection experiment for sociality, using zebrafish (*Danio rerio*). We started by phenotyping a base (F0) population with a social preference test. The test consisted in presenting a social stimulus (a shoal of four fish) against a non-social stimulus (four objects, circles). We established four F1 selection lines by crossing F0 fish with the highest (Shoal population), the lowest (Circles population), equal (No-preference population), or random (Random population) preference for shoal. The selection experiment reached the F6 generation with a clear increase in shoal preference by the shoal population. We used fish from the F6 to test whether selection for greater sociality has also driven the evolution of enhanced cognition. We tested reversal and detour learning, which assess cognitive plasticity and inhibitory control, respectively. We found that artificial selection does not seem to have enhanced cognitive plasticity, but the Shoal line showed to be better at inhibitory control, which support the social intelligence hypothesis. However, future studies must still be done due to some limitations of our experiments.

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Behavioural repeatability & consistency in groups of a social vole

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Abstract: Social species live in groups composed of many individuals. The behavioural traits displayed by the different elements of the group can play a key role in the fitness of the colony. The dynamics of groups will depend on the personality composition of individuals, which could help explain group organisation and sociality. However, there are growing indications that personality traits can change among life stages, due to developmental changes. Having to dig underground tunnels, forage for food, and helping to care for the young, wild Lusitanian pine voles are perfect candidates to understand the interplay between personality of individuals and that of the group. We evaluated the repeatability of boldness and activity in the short-term and long-term, to be able to study personality within and between different life stages. We examined how personality develops at the individual level, and at the group level, measuring variability of personality types among groups. Our results show that some traits are not consistent over time, changing according to life stage. While some traits seem to be more fixed, others appear to be more flexible, possibly to allow responding to age-related needs. Additionally, each group was found to be composed of individuals with different boldness levels.

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Characterizing the behaviour of bait-attracted *Prionace glauca* using pelagic drift video

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Abstract: Baited pelagic underwater video is becoming increasingly common to assess biodiversity and abundance, but it could also be useful to register behaviour of pelagic species during feeding. In this study, the behaviour of 79 individuals of blue shark (Prionace glauca) was registered using pelagic baited drift videos (BRUV) deployed outside the Professor Luiz Saldanha Marine Park, Portugal. This is a widely distributed species considered since 2019 as "near threatened" by IUCN and little is known about their behaviour. Blue sharks mainly showed recognition activities of the BRUV and presented agonistic behaviour less frequently. Visibility, depth, temperature and salinity influenced behavioural patterns. Interestingly, juveniles were more frequently sighted closer to the coast (maximum bathymetry 200m) , while adult sightings were associated with offshore deployments over canyons (bathymetry 1200-2000m). Moreover, juveniles presented longer and more frequent interactions with the BRUVs than adults. A preliminary analysis of the reaction of blue sharks to boat passages suggest that sharks spend longer time interacting with the BRUVs when they are not exposed to noise. Our study suggests that BRUVs are useful to assess the distribution of existing blue shark populations and to evaluate the behaviour of this key species in the natural ecosystem.

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Understanding variation in vigilance behavior in a highly social bird

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Abstract: Natural selection has shaped many anti-predator strategies, such as predator detection through vigilance. Here I aim to describe for the first time vigilance behavior in the sociable weaver (*Philetairus socius*), a cooperatively breeding species. We used video recordings and developed a methodology based on deep learning to automatically detect vigilance behavior at artificial feeders. I expected vigilance behavior to 1) decrease with group size and 2) to be more prominent in males, since males are more related to their colony members than females; We also tested if 3) age and time of the day would be related with this behavior, as reported in other species. Finally, 4) as more cooperative individuals could be preferred as partners, I examined if vigilance behavior is repeatable within individuals. Our results, achieved through deep learning technology, show that the proportion of individual vigilance decreases with colony size, in agreement with the "many eyes" hypothesis. There were no significant differences between the sexes in vigilance proportion and we found that vigilance has low but significant repeatability and is equally repeatable in both sexes. Therefore, our results suggest that any possible signaling function might be used in both sexes.

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Social modulation of neuronal complexity in zebrafish

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In response to variation in the social environment individuals can alter their behavioural phenotypes, a phenomenon known as phenotypic plasticity, which is normally based on neural plasticity. Neural plasticity is the ability of the brain to reorganize its neural connectivity in response to environmental changes and might include changes in morphology, in neurophysiological functions, as well as modification in the neural networks. The main goal of this work was to assess the impact of environmental complexity in the dendritic arborization of zebrafish reared in distinct social environments. The complexity of the social environment was induced through variation in group size (small vs. large) and group stability (stable vs. unstable) leading to four experimental treatments (small stable, small unstable, large stable, large unstable). The quantification of dendrites was performed in five different brain areas - Telencephalon, Diencephalon, Optic tectum, Cerebellum, and Brain stem - , using the microtubule-associated protein 2 (MAP2) has a dendritic marker. We found differences in the dendritic density related with the complexity of the social environment, such that animals raised in less complex social environments (i.e. small and stable shoals) present a decrease in their dendritic density, which was paralleled by changes in their social behaviour. Our results indicate the relevance of the social environment in the modulation of neuronal complexity during development which is paralleled by changes in behavioural performance.