

• • **PROGRAMA** [www.ispa.pt/spe](http://www.ispa.pt/spe)  
• • **XIV CONGRESSO**  
• • **SOCIEDADE**  
• • **PORTUGUESA**  
• • **DE ETOLOGIA**  
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## **BEM VINDOS**

Bem vindos à SPE 2017, XIV congresso da Sociedade Portuguesa de Etologia, que irá decorrer no ISPA - Instituto Universitário (Sala de Actos).

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.

Votos de um excelente congresso para todos!

## WELCOME

*Welcome to SPE 2017, the XIV 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.*

*We wish everyone a great conference!*

## Comissão organizadora

Clara Amorim (ISPA), Gonçalo Cardoso (CIBIO/UP), Rita Covas (CIBIO/UP), Paulo Gama Mota (CIBIO/UC), Rita Ponce (ESS-IPS, CE3C/UL), Marta Soares (CIBIO/UP), Susana Varela (IGC, CE3C/UL)

## Comissão científica

Clara Amorim (ISPA-IU), Emanuel Gonçalves (ISPA-IU), Paulo Gama Mota (CIBIO/UC), Manuel Eduardo dos Santos (ISPA), Sandra Trigo (CIBIO/UP), Gonçalo Cardoso (CIBIO/UP), Sara Hagá (CICPSI/UL), José Paula (MARE), Marta Soares (CIBIO/UP), Rita Covas (CIBIO/UP), Sara Magalhães (CE3C/UL), Rita Ponce (ESS-IPS, CE3C/UL), Susana Varela (IGC, CE3C/UL)



## HORÁRIO | TIMETABLE

8:30	<b>Registration</b>		
9:30	<b>Opening Remarks</b>		
9:45	<b>Invited talk</b> <b>Barbara Taborsky</b> Proximate and ultimate causes of developmental plasticity		
10:30	<b>Diogo Antunes</b> Lifelong early environment effects in a cooperatively breeding fish		
10:50	<b>Diogo Ribeiro</b> Genotype-environment interaction in the effects of the oxytocin receptor gene on zebrafish social behavior		
11:10	<b>Coffee break</b>		
11:30	<b>Gonçalo Faria</b> Fisher's runaway process as a greenbeard effect		
11:50	<b>Eliana Soukiazes</b> Consistency in vocal performance as an indicator of oxidative stress in a passerine bird		
12:10	<b>Andreia Ramos</b> Domesticated but fierce - The case of Siamese fighting fish <i>Betta splendens</i>		
12:30	<b>Lunch break</b>		
14:00	<b>Invited talk</b> <b>Sara Magalhães</b> The consequences of mating within and among spider-mites species		
14:50	<b>Francisco Borges</b> Effects of ocean acidification in mate detection of an intertidal amphipod ( <i>Gammarus locusta</i> ) [CRUSTACEA]		
15:10	<b>Eduardo Sampaio</b> The sensorial ecology behind <i>Anguilla anguilla</i> migration: cue perception and climate change-associated disruption		
15:30	<b>Coffee break</b>		
15:30	<b>Poster Session</b>		
16:30	<b>Sophie Brajon</b> The silence of the pups: Infanticide and cannibalism among laboratory mice		
16:50	<b>Leonor Carreira</b> Animacy perception in Zebrafish: neural mechanisms and modulation by oxytocin-like peptides		
17:10	<b>Plenary meeting</b> of the Portuguese Ethological Society		
17:40	<b>Vítor Almada award, poster awards</b>		
18:00	<b>Port of honour</b>		

## SESSÃO DE POSTERS | POSTER SESSION

**António Alexandre** Human presence and alarm calls in the Sumatran Orangutan *Pongo abelii* in North Sumatra, Indonesia

**Ana Cristina Gomes** Tracking social structure within bird flocks

**Daniela Santos** The role of an oxytocin-like peptide in social reward in Zebrafish

**Diana Rodrigues** Fast songs, slow songs. How the speed of the songs affects the singing behavior of male Serins

**Diana Vieira** *Taurulus bubalis* (Cottidae) an inshore vocal fish species

**Manuel Vieira** Lusitanian toadfish chorus dynamics: Do the males alternate, overlap or synchronize their calls?

**Eliana Sales** Viviparous reproductive seasonality in *Actinia schmidtii* (Cnidaria: Anthozoa) on the Portuguese west coast

**Filipa Abreu** Influences of color vision on the detection of insects by free-living common marmosets

**Joana Costa** Antidepressants at environmental concentrations affect fish predatory behaviour

**Mariana Matos** Comparing the feeding ecology of *Propithecus edwardsi* in disturbed and undisturbed forest in Ranomafana National Park, Madagascar.

**Pedro Vieira** Neuronal Mechanisms of Behavioral Plasticity in the Peacock Blenny *Salarias pavo*

## ORADORES CONVIDADOS | INVITED TALKS

BARBARA TABORSKY, University of Bern, Switzerland

### **Proximate and ultimate causes of developmental plasticity**



The environment experienced early in life can shape phenotypes lifelong, sometimes inducing major phenotypic change of key life history traits or behavioural strategies. Such lasting effects of developmental plasticity impacts Darwinian fitness and should be subject to selection. Nevertheless, the adaptive value of developmental plasticity is still subject to ongoing debate. One key problem hampering the understanding of developmental plasticity is that its mechanisms and function are mostly studied in simple laboratory environments testing for the effects of only a single environmental factor during a single ontogenetic period. However, most natural environments are multi-dimensional and complex and environmental influences affect development at multiple ontogenetic stages. Here I will present results of experimental studies, which address effects of more natural levels of environmental complexity, revealing that adding complexity can lead to unexpected effects on behaviour and its underlying brain mechanisms. I aim to answer two main questions: (1) When should environmental information influencing development be obtained, and when is this information beneficial? (2) How is information obtained during multiple life stages or from multiple environmental parameters integrated during phenotypic development?

SARA MAGALHÃES, cE3c, Faculdade de Ciências da Universidade de Lisboa

### **The consequences of mating within and among spider-mites species**



Mating strategies allow optimizing the outcome of mating events, an essential component of individual fitness that also entails several costs. As species often co-occur with others, this means that organisms need to maximize the outcome of intraspecific matings while minimizing the costs of mating with the wrong species.

In spider mites, only the first mating of a female is effective. In line with this, males prefer to mate with virgin females. Still, polyandry exists. We provide evidence that such behaviour entails indirect benefits for males, as by mating with mated females they reduce the relative fitness of first males. Although this is costly for females, this behaviour also entails benefits for them. Indeed, we also show that second matings in females allows them to overcome the costs of incompatible matings, deriving from either the presence of endosymbionts or heterospecific males.

Overall, these results contribute to improve our understanding of mating strategies in species with first male sperm precedence.



# COMUNICAÇÕES ORAIS | CONTRIBUTED TALKS

## **Lifelong early environment effects in a cooperatively breeding fish.**

ANTUNES D\*, TABORSKY B

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Developmental plasticity has pervasive effects on phenotypic traits and helps individuals to adapt to changeable conditions. However, in long-lived species plastic early-life effects often vanish already during the juvenile stage. We investigated if early-life experiences can affect the reproductive performance of adults in a long-lived vertebrate, the cooperatively breeding cichlid *Neolamprologus pulcher*. *N. pulcher* live in family groups consisting of a dominant breeder pair and subordinate alloparental brood care helpers. In our experiment we used *N. pulcher*, which had been reared in a 2x2 full factorial design experiencing one of two types of family structure [with guarding parents and siblings (+F) vs. with siblings only (-F)] and one of two predation risk levels [with (+P) or without (-P) predator] for their first two months of life. At an age of 3.5 years, we created 10 pairs from each of the four rearing treatments and monitored their reproductive performance over 4 months. Social and predator experience interactively influenced reproductive performance: Fish raised with parents but without predation risk (F+P) and fish raised without parents but with predation risk (F-P+) laid more and larger eggs compared to fish of the F+P+ and F-P- treatments. Our results provide evidence on lifelong early environment effects in *Neolamprologus pulcher*.

## **Genotype-environment interaction in the effects of the oxytocin receptor gene on zebrafish social behavior**

RIBEIRO D<sup>1</sup>, NUNES R<sup>1,2</sup>, TELES M<sup>1,2,3</sup>, ANBALAGAN S<sup>4</sup>, BLECHMAN J<sup>4</sup>, LEVKOWITZ G<sup>4</sup>, OLIVEIRA RF<sup>1,2,3</sup>

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Oxytocin-like peptides have been implicated in the regulation of social behavior across taxa, affecting a diversity of behaviors across functional contexts. However, in a number of the studies that have investigated the effects of oxytocin on social behavior the relative contributions of the genotype and of the environment have not been disentangled. In this study we have used the Zebrafish (*Danio rerio*), a highly social fish species, to study the genotype-environment interaction in the effects of the oxytocin receptor gene in different aspects of social behavior, namely: sociality (i.e. social approach); social habituation; social recognition; and shoaling behavior. For this purpose we have raised zebrafish of different genotypes (WT, OXTR-/-) indifferent social environments (WT groups, OXTR-/- groups). There was a main effect of genotype on social recognition, with OXTR-/- individuals not being able to discriminate between conspecifics. In contrast there was no effect of genotype on sociality. A genotype-environment interaction was found both for social habituation and for shoaling

behavior, such that OXTR<sup>-/-</sup> individuals raised in OXTR<sup>-/-</sup> groups exhibited deficits that were rescued in OXTR<sup>-/-</sup> individuals raised in WT groups. Thus, it is demonstrated that the social environment interacts with genotype in the development of social behavior and it can revert phenotypes associated with specific genes. Our results suggest that more caution is needed in the interpretation of studies using transgenic or mutant individuals that are raised in cohorts of the same genotype.

#### **Fisher's runaway process as a greenbeard effect**

FARIA GS<sup>1</sup>, VARELA SAM<sup>2</sup>, GARDNER A<sup>3</sup>

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Recent years have seen an explosion of interest in linking the theories of kin selection and sexual selection, and researchers have explored each of the three basic mechanisms of generating kin selection – population viscosity, kin recognition and the greenbeard effect – in relation to sexual selection. Regarding the latter mechanism, Pizzari and Gardner have suggested that Fisher's runaway process of sexual selection can be viewed as a greenbeard effect. Fisher's runaway potentially explains why males developed conspicuous traits and why females preferentially mate with conspicuous males, and it has enjoyed extensive attention in the sexual selection literature. Greenbeard effects potentially explain the existence of altruism between individuals who are not genealogical kin and has received much attention in the kin selection literature. Here, we follow up on Pizzari and Gardner's suggestion, formalising the connection between Fisher's runaway and the greenbeard effect, and using this conceptual bridge to import theoretical results from the field of kin selection to sexual selection, and vice versa, yielding new insights into both topics.

#### **Consistency in vocal performance as an indicator of oxidative stress in a passerine bird**

SOUKIAZES E, MOTA PG

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Singing is one of the most common forms of communication used by birds. Several studies have demonstrated that song can be a quality indicator, and that among other measurements, vocal consistency has a biologically important role in vocal performance, as it demands a very strong coordination of movements by the brain, of syringeal and respiratory muscles. During this demanding process, by-products of normal metabolism are produced and when not accurately eliminated from the system can cause high levels of oxidative stress. Thus, song consistency may be an honest signal of quality.

In this study we used spectrogram cross-correlations (SPCC) as a measurement of consistency in the songs of male Serins, from which we had collected information concerning oxidative stress status. We assessed if the consistency of syllables and trills could predict measurements of oxidative stress in the red cells and plasma. Preliminary results show a positive relationship between the antioxidant capacity of the plasma and the consistency of the trills in 11 males.

### **Domesticated but fierce - The case of Siamese fighting fish *Betta splendens***

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Short-fin Siamese fighting fish known as "plakat" or "fighters", are domesticated strains of *B. splendens* that have been selected across many generations for street fighting contests. Thai breeders selectively reproduce these fish for fighting by discarding losers batches and allowing winners batches to breed, claiming that they are significantly more aggressive than wildtypes. We tested this claim by comparing the aggressive behavior of males and females of wildtypes captured in nature and of fighters originated from one selected strain. To understand the effects of domestication across different generations and conditions, we compared the same behaviors in the F0 parental line and F2 animals reared under laboratory conditions.

A mirror and size-matched conspecific test were used to assay aggressive displays.

We show that fighters have higher frequency and spend more time displaying aggressive behaviors in both generations and treatments. We further show that these differences are not exclusive for males, with females from the fighting strain also being more aggressive. Fighters displayed energetically more costly displays, as inferred by the frequency of surface air breathing events. These differences seem to have a genetic component, as when bred and reared under the same conditions, same age fighters were consistently more aggressive than wildtypes. This model offers an excellent opportunity to study the effects of long-term artificial selection for aggression in behavior and genetics.

### **Effects of ocean acidification in mate detection of an intertidal amphipod (*Gammarus locusta*) [CRUSTACEA]**

BORGES F, SAMPAIO E, FIGUEIREDO C, ROSA R, GRILO TF

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Most marine organisms rely on chemoreception to detect food, prey/predator awareness, homing, or finding mates for reproduction. Progressive ocean acidification could interfere with organisms' ability to produce and/or detect olfactory cues and to recognize and choose their mates, thus posing great challenges for reproduction and sustainability of natural populations in the future. In this context, we investigated the effects of ocean acidification on female pheromone detection by males of *Gammarus locusta* (Crustacea) – an ecologically relevant amphipod species – under a transgenerational approach. Successive generations of males reared from birth to maturity at current pH (8.1) and acidified conditions (7.7) were tested for detection of female scent cues. Adult males were tested on a binary-choice setup with two

opposing olfactory cues: filtered seawater and seawater from an exclusive adult-female stock. Here, we aim to present results from the first generation (F1) by registering the male's direction of movement upon trial start (first choice). Animals from acidified conditions showed a less clear preference for first movement towards the female scented cue compared with control individuals, suggesting for potential interference of olfactory acuity. A brief discussion about the possible consequences that may arise for future generations under an acidified scenario was also provided.

### **The sensorial ecology behind *Anguilla Anguilla* migration: cue perception and climate change-associated disruption**

SAMPAIO E, GRILO TF, PAULA JR, FIGUEIREDO C, BORGES F, SANTOS C, ROSA R

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The european eel *Anguilla anguilla* is a catadromous species, well-known for their awe-inspiring migration from the Sargassum Sea to Europe's freshwater basins. Predicted changes in Earth's climate may influence the success of this charismatic migration by interfering with optimal migratory temperature and sensorial ecology. Here we evaluated river-linked cue reception (lower salinity and geosmin) and how ocean warming ( $\Delta T = 4\text{ }^{\circ}\text{C}$ ) and acidification ( $\Delta p\text{CO}_2 = 500\text{ }\mu\text{atm}$ ) affect eel migratory behaviour. Test subjects were maintained for 60 days under salinity 35, to simulate climate change firstly to ocean conditions, and subsequently upstream the river, through a series of salinity gradients. Using a choice chamber with two Kitasato containers, we measured responsiveness to cues, as well as correct decision-making in groups of 10-15 individuals. Eels showed attractive response to stimuli provided to simulate riverward migration (geosmin and lower salinity levels), especially so under warming. Warming also increased the stimulus for counter-flux migration, even though precipitating wrong choices. Survival was lower in the warming treatments, while acidification showed a disruptive effect in stimuli sensorial capacity. Metabolic overdrive promoted by higher temperatures and  $\text{CO}_2$ -linked odour reception impairment reduced sensorial capability and overall organism fitness, eliciting profound effects on migratory behaviour.

### **The silence of the pups: Infanticide and cannibalism among laboratory mice**

BRAJON S<sup>1,2</sup>, GILBERT C<sup>2</sup>, HULTGREN J<sup>3</sup>, OLSSON A<sup>1</sup>

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Perinatal mortality is frequent in laboratory mouse breeding and is often manifested in the disappearance of pups overnight. We followed 109 litters of C57BL/6 mice (54 from single-housed dams (S), 36 from trio-housed dams without another litter (G0), 19 from trio-housed dams with another litter (G1)) through video-recordings to track pup mortality and determine whether missing pups were actively killed (infanticide) or only eaten after death (cannibalism). From a behavioural biology perspective, cannibalism of dead pups is generally adaptive (reallocating energy, maintaining nest hygiene), whereas infanticide may sometimes be adaptive. The preliminary results suggest a mismatch between the human view that all required physical provisions have been met and the mice' perception of their conditions for breeding and raising a litter. Results will be discussed during the talk.

### **Animacy perception in Zebrafish: neural mechanisms and modulation by oxytocin-like peptides**

CARREIRA L<sup>1</sup>, NUNES AR<sup>1,2</sup>, OLIVEIRA RF<sup>1,2,3</sup>

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Animacy perception is one of the fundamental aspects of social-cognitive processes that can help individuals to differentiate between other living organisms and non-living objects in the environment. This cognitive ability is conserved across species and is critical for filial attachment, detection of predators and perception of social dominance. Moreover, an evolutionary conserved mechanism for animacy detection seems to be present across taxa and is probably innate. Therefore, we aimed to characterize the underlying neural mechanisms for this cognitive ability and to test if it is regulated by oxytocin-like peptides (isotocin in fish), a family of neuromodulators implicated in the regulation of sociality. We used zebrafish as a vertebrate model organism since it exhibits robust social behaviour, has relatively simple neuroanatomy and has an available genetic toolbox that allows gain/loss of function experiments. Using a two-choice test and video playbacks as a tool to present the stimuli, we demonstrated that adult zebrafish can detect animacy based on acceleration cues.

Additionally, we found that isotocin modulates this cognitive ability in male, but not in female zebrafish. Markers of neuronal activity were used to assess which brain regions were being activated during animacy perception, in order to disentangle the mechanisms underlying this social-cognitive ability.

## POSTERS

### Human presence and alarm calls in the Sumatran Orangutan *Pongo abelii* in North Sumatra, Indonesia

ALEXANDRE A<sup>1</sup>, VARELA SAM<sup>2</sup>

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Forest loss, land conversion, poaching and illegal trading are some of the major drivers responsible for the loss of biodiversity. As conflict between humans and wildlife increases, in terms of space or resources, it becomes clear that comprehending how wildlife responds to human disturbances in the wild is vital to the sustainability of the species, populations, communities, ecosystems and ultimately human kind. Here we intend to present the impact of human disturbance to a population of the Sumatran Orangutan *Pongo abelii*, one of the most endangered great ape species in the world. We studied a natural population that resides in a secondary forest targeted for logging programmes in its early history, within the most important National Park in Indonesia – the Gunung Leuser National Park. We focused on alarm calls towards the human observers to measure orangutans' state of alert. The majority of vocalizations were, indeed, alarm calls and despite a call rate reduction after consecutive days following the same subjects, orangutans maintained a constant state of alert in the presence of humans. The frequency and duration of the calls constitutes a significant allocation of time and energy and hence a significant impact of humans in the daily activities of orangutans.

### Tracking social structure within bird flocks

GOMES ACR<sup>1\*</sup>, TRIGO S<sup>1\*</sup>, SOARES MC<sup>1</sup>, CARDOSO GC<sup>1,2</sup>

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



their changes through time, including the important transitions that occur from the non-breeding to the breeding seasons.

#### **The role of an oxytocin-like peptide in social reward in Zebrafish**

SANTOS D<sup>1</sup>, PINHO JS<sup>1, 2</sup> LEVKOWITZ G<sup>3</sup>, OLIVEIRA RF<sup>1, 2, 4</sup>

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3 - Departments of Molecular Cell Biology, Weizmann Institute of Science, Rehovot, Israel

4 - Champalimaud Center for the Unknown, Lisboa, Portugal.

Zebrafish (*Danio rerio*) live in shoals and express a preference to associate with conspecifics from very early on during their development. This social motivation plays an important role for their survival, providing protection against predators and improving foraging and mating efficiency. Thus, it has been hypothesized that conspecifics have acquired a reward property (aka social reward) in social living animals, that promotes group living. The aim of this project is to investigate the occurrence of social reward in zebrafish and to characterize its neural mechanisms. Given the role of oxytocin in the regulation of social behaviour across vertebrates we hypothesized that isotocin (the fish homologue of oxytocin) can be involved in social reward in zebrafish. We have used a conditioned place preference test (CPP) to assess the rewarding value of conspecifics vs. an established reward in zebrafish (food). Subsequently, we used a knockout line for the oxytocin receptor to assess the impact of oxytocin KO on social reward. Finally, we have used the expression of an immediate early gene (*c-fos*) as a marker of neuronal activity to map the brain regions involved in social reward in zebrafish.

#### **Fast songs, slow songs. How the speed of the songs affects the singing behavior of male Serins.**

RODRIGUES D; MOTA PG

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Birdsong is a very important way of communication in birds, used both in mate choice and in agonistic interactions between males. The aggressive singing competition between males may involve song overlapping, changing of types of songs or changes in the rhythm. Previous studies performed with male Serins (*Serinus serinus*) showed that faster songs are aggressive signals, since males increased the speed of the songs when challenged. We wanted to determine if indeed faster songs are perceived as aggressive and slower songs as less or not aggressive, by performing interactive playbacks to males with two types of stimuli. We increased or decreased the speed of song stimuli by removing or adding silences between syllables (adding silences made the songs slower), within the normal range of variation. We tested 42 males, half under each condition, and recorded their songs before, during and after the playbacks, and also recorded whether they approached or flew around the speaker. Males did respond differently in face of the two stimuli. Results will be discussed.

### ***Taurulus bubalis* (Cottidae) an inshore vocal fish species**

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Several small bottom-living cryptic marine fish have been described to produce sounds during intraspecific communication. The family Cottidae, namely the genus *Cottus*, has already been described to include vocal species. However, sound production in the monospecific genus *Taurulus* has not been documented. This is the first report of sound production for the cold-temperate longspined bullhead, *Taurulus bubalis*, inhabiting rocky inshore habitats from northern Europe boreal region southward to Portugal. One distinct tonal vocalisation was the most common call recorded with a peak frequency around 300 Hz. This call falls within the hearing range reported for other cottids in the literature. Preliminary results showed that sound production rate was low (average of 1.5 vocalization/hour) and sound emissions were not clearly associated to a specific behavioural context. Other vocalizations, with the peak frequency around 3500 Hz, but with some energy within the hearing range, were also recorded. Fish could detect the low frequency component of those sounds as well as substrate-borne vibrations resulting from movements associated with sound production. Additional observations will be needed to describe the full vocal repertoire of this species and to evaluate if signals travelling through the substrate can play a fundamental role in intraspecific communication.

### **Lusitanian toadfish chorus dynamics: Do the males alternate, overlap or synchronize their calls?**

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The Lusitanian toadfish forms breeding aggregations in coastal waters. Toadfish males dig burrows under rocks to prepare a nest for spawning from where they use acoustic signals (mostly boatwhistles) for mate attraction. While chorusing males may benefit from enhanced mate attraction (a female is more likely to detect a chorus than a single male); they also face increased competition from neighbours. The strategies to cope with competition are diverse in insects, anurans and birds but are hardly known in fish. We used round-the-clock recordings to monitor toadfish vocal interactions in a natural habitat in the Tagus estuary. Fish vocalizations were identified with the help of a pattern recognition methodology based on the Hidden Markov Model System. Territorial males adjust the timing of their vocalizations, often producing boatwhistles time-locked to their neighbours'. The most common type of interaction appears to be alternation, although synchronized emissions could be observed when one male presented low vocal activity. The occasional synchrony situations (call overlap), usually involving 3-6 boatwhistles, is likely the result of a direct confront. Acoustic interactions



appear to occur between fish nesting up to 10 m apart, suggesting a considerable interaction area in such shallow waters (< 3m).

### **Viviparous reproductive seasonality in *Actinia schmidt* (Cnidaria: Anthozoa) on the Portuguese west coast**

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Sea anemones display a wide range of reproductive strategies, including asexual reproduction by transversal and longitudinal fission and internal and external budding, and sexually produced offspring both by internal and external fertilization. However there is a lack of data concerning the use of these different forms of reproduction in natural conditions. *Actinia schmidt* Monteiro, Thorpe and Solé-Cava, 1997 is distributed in the Northeastern Atlantic from the Bay of Biscay to Morocco and in the Mediterranean coastline. In its original description, this species is considered to reproduce sexually by external fertilization, and not perform brooding within the gastrovascular cavity. In more recent papers, the occurrence of brooding, of asexually produced offspring, was recorded in this species. In this study the seasonality of brooding in *A. schmidt* on the Portuguese west coast was investigated along 2014/2015. Viviparous reproductive activity peaks were recorded during the summer months, when the water temperature is warmer, and decreases in the remaining seasons. The pattern observed was discussed considering previous knowledge on the reproductive sexual and asexual seasonality of *A. equina*, a distinct species from the same genus.

### **Influences of color vision on the detection of insects by free-living common marmosets**

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*Callithrix jacchus* are small Neotropical primates, which presents visual polymorphism where females can be either trichromatic or dichromatic, while males are always dichromatic. Trichromats are expected to capture more insects, and to be more successful in identifying conspicuous insects. Alternatively, dichromats should capture more cryptic insects. Here we present the outcomes of the effects of color vision on insect foraging in free-living *Callithrix jacchus*. The study was conducted in a semiarid environment in Northeast of Brazil. We recorded the foraging behavior of 8 females and 7 males. For all records of insect captures, we measured the insect and substrate coloration. In general, females captured more insects than males. Conspicuous insects have also been more captured by females. On the other hand, females and males capture the same number of cryptic insects. Regarding the dichromatic females and males, we did not find differences between them on the capture of conspicuous

or cryptic insects. Our results suggest that the behavioral differences between sex were due to the visual polymorphism. Furthermore, we discuss that, in this particular environment, maybe trichromatic females have an adaptive advantage over dichromatic and that the visual polymorphism in our population might be maintained by heterozygous advantage.

#### **Antidepressants at environmental concentrations affect fish predatory behaviour**

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The advancement of both the pharmaceuticals and cosmetics industries has been followed by a substantial increase in the concentrations of chemicals found in superficial water bodies all around the world, which has led to severe repercussions in these ecosystems. One of these compounds is the fluoxetine, often found in antidepressants such as prozac, which inhibits the presynaptic neurons from reuptaking serotonin. This study aimed to determine the effects of different levels of fluoxetine on the feeding behaviour of *Lepomis gibbosus* (pumpkinseed sunfish), an exotic fish species in Portugal. Fish were individually placed in 18L aquaria and exposed for 24 hours to control water or to different concentrations of this chemical (1 µg/L e 30 µg/L), mimicking similar or higher environmental concentrations. We gave 10 waterfleas (*Daphnia magna*) to each individual and measured the time to capture 1, 5 and 10 prey. There was a significant effect on the time to capture the first prey, which increased significantly with fluoxetine concentration. Time to capture subsequent prey did not differ among treatments. This study shows that even low levels of fluoxetine commonly found in waterbodies can affect predator-prey interactions and thus has the potential to impact ecosystems.

#### **Comparing the feeding ecology of *Propithecus edwardsi* in disturbed and undisturbed forest in Ranomafana National Park, Madagascar.**

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The non-human primates of Madagascar, lemurs, have been greatly affected by several unsustainable human practices that lead to their decline, making their conservation a priority. In this study, we intend to understand in which way habitat disturbance affects the feeding ecology of *Propithecus edwardsi*. The data was collected during the cool/ dry season, at Ranomafana National Park, Madagascar, through daily observations in disturbed and undisturbed forest. After statistical analyses, we observed no significant behavioral differences between sexes at each site, but when comparing individuals of the same sex between sites, differences start to appear. At feeding behavior level, individuals living in the disturbed forest spend more time feeding, regardless of sex, with also significant differences in diet compared to those living in the undisturbed forest. Our results, were mostly explain by differences in food availability caused by habitat disturbance, leading to different diets and life strategies. Still, these differences may also influence the time sifakas spent feeding and engaged in other activities.

**Neuronal Mechanisms of Behavioral Plasticity in the Peacock Blenny *Salaria pavo***  
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Behavior is a highly plastic trait compared to other phenotypic traits. Changes in more permanent behavioral states, for example when animals transition from a dominant to a subordinate position or during sex-change, are likely to depend on major neuronal reorganization. It can thus be predicted that species with more plastic behavior may have higher levels of brain plasticity and that, within the same species, animals in transitional behavioral states should exhibit higher levels of brain reorganization. We tested this idea in the Peacock blenny *Salaria pavo*. In this species, females engage in courtship behavior in order to access the nest of large nest-holder males. Younger males, morphologically similar to females, mimic female behavior in order to enter the nests and parasitically fertilize eggs. These sneaker males transition into nest-holders, undergoing major morphological and behavioral changes. We hypothesize that this transition in male-state relies on the reorganization of brain circuits related with sexual and dominance behavior. We built a setup with circular pools where we placed 12 nesting males with nests, 24 females and 24 sneaker males. Sneaker males were given 12 extra nests to promote transition from sneaker to nesting males in some, but not all, sneakers. After 10 days, some sneaker males occupied the vacant nests and did start the transitional process to become nesting males while others remained sneakers. Animals were injected with a BrdU marker that labels newborn cells in the brain and the number of new born cells in nuclei known to relate to social and sexual behavior was compared between sneakers and transitional males. As hypothesized, our results suggest that animals in transition have a higher cell proliferation rate than animals that remain in the same behavioral state. These results support the hypothesis that variation in behavioral plasticity, both within and across species, may correlate with variation in neuronal plasticity.

## NOTAS | NOTES







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