



## Why risk it? Linking diet, nutrition and risk-taking behaviour through meta-analysis and experimental study

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conflict over care, which might have important implications in other processes such as intrasexual competition.

- 15:30 Rebecca Goldberg (University of Oxford)  
Philip Downing, Ashleigh Griffin, Jonathan Green

#### **The costs and benefits of paternal care in fish**

Male-only parental care is a rare strategy in most animal groups but is highly prevalent among teleost fish. Lower investment in parental care by males than females in other animals is usually explained by sexual selection acting more strongly on males to increase re-mating rates, yet in many fish species with male-only care, males are also under stronger sexual selection (as judged by high sexual dimorphism and dichromatism). The high prevalence of male-only care in fish may reflect unique features of fish biology that act to reduce the costs of care to fathers while generating substantial benefits in terms of improved reproductive success. Here, we present the results of a phylogenetic meta-analysis quantifying the costs and benefits of paternal care across 48 teleost species. We find that, on average, care of offspring imposes little cost on males in terms of loss of body condition. Surprisingly, however, we also find little evidence for a benefit of care in terms of offspring survival. Instead, our results show that investment in paternal care increases male reproductive success through attraction of additional mating partners. Thus, across fish species, there is evidence that male-only care has evolved in part through sexual selection arising from female preference for caring males and that in fish, unlike in many other animal groups, male investment in care does not necessarily trade-off against mating success.

- 15:45 Elisa Fernández Fueyo (University College London)  
Alecia Carter

#### **Primates' reactions to death: why do mothers carry the corpses of their dead infants?**

The carrying of dead infants by non-human primate mothers (CDIM) is the most reported response to the death of a conspecific. Despite its prevalence, quantitative analyses of this behaviour is scarce and inconclusive. Drawing on published records, we compiled the largest database of cases of primate mothers' responses to their infants' deaths to test hypotheses proposed to explain between- and within-species variation in the duration of the CDIM behaviour. We used Bayesian phylogenetic regressions to analyse 416 cases across 50 different primate species. Three factors were found to possibly affect CDIM duration: infant age, habitat conditions and the infant's cause of death. These results may provide support for two hypotheses suggested to explain CDIM: the mother-infant bond strength hypothesis and the infant-dependency hypothesis, both of which suggest that CDIM is a by-product of a strong mother-infant bond. The results are discussed in the context of the evolution of emotion and the awareness of death.

- 16:00 Nicholas Moran (Technical University of Denmark)  
Alfredo Sánchez-Tójar, Holger Schielzeth, Klaus Reinhold, Andre Visser, Jane Behrens

#### **Why risk it? Linking diet, nutrition and risk-taking behaviour through meta-analysis and experimental study**

The food an animal eats is one of the most intimate and influential interactions that they will have with their environment. Here I explore: (1) how an animal's diet can influence of their behavioural phenotype, specifically in relation risky situations such as predator and novelty

responses; and, (2) how individual differences in risk-taking traits (e.g. boldness traits) correlate with diet variation in the wild. Theory makes contrasting predictions that animals in better physical condition (i.e. nutritional- or energetic-state) should either take greater risks (state-dependent safety) or fewer risks (asset protection principle). A preregistered meta-analysis systematically quantified the effects of diet variation (e.g. high versus low quality or quantity diet treatments), on a wide range of risk-taking behaviours. Phylogenetic multilevel meta-analyses of mean effects (126 studies, 1297 effect sizes) revealed that animals with poor diets overall showed on average a 26% greater tendency towards risky behaviours, but this was influenced by an animal's life stage and the experimental context. Meta-analysis of variance (120 studies, 1241 effect sizes) instead did not show an overall effect of diet on behavioural variation, but also showed life stage- and context-specific effects of diet on phenotypic variance. Following this, an experimental study is exploring state-behaviour covariation in the invasive round goby (*Neogobius melanostomus*) in the Baltic Sea. This combines behavioural analysis with food-web analysis via stable isotopes, to directly quantify the impacts of intraspecific behavioural differences on diet interaction in the wild. Together, this work highlights the interactive effects of diet and nutrition on individual's behavioural choices, as well as the benefits of combining theoretical and empirical approaches in behavioural ecology.

16:15 Aileen MacLellan (University of Guelph)

Agustina Resasco, Miguel Ángel Ayala, Lindsey Kitchenham, A. Michelle Edwards, Sylvia Lam, Stephanie DeJardin, Georgia Mason

#### **Validation of a novel mouse judgement bias task and its application in biomedical research**

In humans, emotional states can bias responses to ambiguous information. Such 'judgement biases' (JB) have great potential for assessing animal welfare. In animals, relative optimism or pessimism can be detected by training individuals to perform operant responses to one cue to receive a reward, and another cue to avoid punishment, before assessing responses to intermediate, ambiguous cues. If a task has construct validity, then similar to humans, animals in positive affective states will respond 'optimistically' when presented with ambiguous stimuli (as if expecting reward), while animals in negative affective states will instead behave 'pessimistically' (as if expecting punishment or no reward). New animal JB tasks always require construct validation. However, for laboratory mice (*Mus musculus*), the most widely used vertebrate in research, successful validation of a JB task has proved elusive. We first validated a novel mouse JB test, a Go/Go task in which subjects were trained to discriminate between odour cues and dig for high- or low-value food rewards. In female C57BL/6 and Balb/c mice, responses to ambiguous odour cues were sensitive to housing-induced changes in affective state: environmentally enriched animals demonstrated relative optimism, through shorter latencies as if expecting high-value rewards ( $p=0.014$ , Cohen's  $d=1.148$ ). Having achieved construct validation, we then tested for 'pessimism' in mice bearing subcutaneous lung adenocarcinomas (using a shortened protocol). Tumour-bearing males (albeit not females) treated ambiguous cues more pessimistically than did healthy controls ( $p=0.005$ , Cohen's  $d=1.425$ ). To our knowledge, this is the first validation of a JB task for mice, and the first potential evidence of pessimism in tumour-bearing animals. Refinements to improve its sensitivity are still needed, but this new JB task has great potential for assessing mouse welfare and addressing fundamental questions about how state affects decision-making.