

NVG annual meeting: 19-21 November 2025

Dobberke lecture

Rita Covas (CIBIO/University of Porto) is broadly interested in the causes and consequences of sociality and cooperation, at the individual and population levels. She studies these topics in populations of the Sociable Weaver and Southern-Ground Hornbills in South Africa. She is also interested in adaptation to island environments and what this can teach us about the evolution of life-histories and behavioural traits, such as reproductive characteristics, ornamentation, immunity, and sociality.

Baerends lecture

Elodie Briefer, of the University of Copenhagen, studies the cognition and vocal communication of mammals and birds. Her research aims to improve our understanding of how animals use vocal signals to convey information about their identity or status, how emotions influence communication and cognition, and how the transmission of this information affects social interactions and relationships. This knowledge will ultimately help to improve animal welfare and can be used for conservation purposes.

Keynote lectures

Like humans, great apes exhibit striking diversity in social behaviour, communication and personality. In her research, **Nicky Staes** (Royal Zoological Society of Antwerp/University of Antwerp) explores the biological mechanisms underlying this variation across and within species, focusing on how neurochemicals such as serotonin, dopamine, oxytocin, vasopressin and sex hormones shape the social brain. She also investigates how genetic and epigenetic differences, as well as the gut microbiome, influence these neurobiological systems.

Suzanne van der Veldt is a behavioural neuroscientist and is based at the University of Groningen in the Netherlands. She studies how brain circuits in mice support adaptive behaviour—particularly learning, memory, and emotional responses—and how these processes may differ between sexes. Her research focuses on the septohippocampal system, a network involved in spatial navigation and the regulation of approach avoidance behavior. Using in vivo neural recordings combined with cell-type specific activation in mice, she investigates how animals assign emotional meaning to places and experiences, and how these associations guide future behaviour.

Jonathan Benichov is an Assistant Professor in Avian Neurobiology at the Institute of Biology, Leiden University. His research focuses on the neural circuits that coordinate interactive vocal behavior in songbirds. Using a combination of behavioral assays, neurophysiological recordings, and computational approaches, Jonathan aims to uncover how animals flexibly adapt their vocal behavior in real time, across social contexts.

Oral Presentations

Jealousy in dogs (*Canis lupus familiaris*): investigating human-directed jealousy and the role of attachment style in jealous-related behavioural responses

Giulia Abati, Jori Noordenbos and Giulia Cimorelli

Wageningen University

Jealousy functions to protect valued social bonds threatened by third parties. Pet dogs form attachment bonds to their caregivers and may display jealousy to safeguard these bonds. While past studies have examined canine jealousy toward conspecifics, little is known about jealousy directed at humans. We investigated whether dogs perceive humans as social rivals, and whether their attachment style (secure vs. insecure) influences this response. Dogs were classified via owner-reported questionnaires into jealous ($n = 13$) and non-jealous ($n = 20$). All dogs underwent a partial Ainsworth Strange Situation Test (ASST) to assess attachment security, and a Jealousy Test (JT) in which owners interacted verbally or physically with a stranger. Principal component analysis of JT data revealed a “social excitement” component (comprising arousal, barking at the owner, and contact-seeking with owner or stranger), which was mostly expressed in the JT phase involving physical owner-stranger interaction, thus interpreted as jealousy-related based on previous studies. This component was significantly higher in owner-reported jealous dogs. A similar component emerged from ASST data, also higher in jealous dogs, and associated with insecure attachment. JT and ASST components were positively correlated, indicating that dogs with insecure attachment show more jealousy-related behaviours, implying that dogs may perceive humans as social rivals, especially when insecurely attached to their owner.

Silent Hunters and Sonic Scouts: Context-dependent foraging in the frog-eating bat

A. Leonie Baier^{1,2,3}, Sebastian Mortensen¹, Lena de Framond^{1,2}, Kristian Beedholm¹, Michael Pedersen¹, Gregg Cohen², Rachel Page², Peter Madsen¹, Laura Stidsholt¹

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2. Smithsonian Tropical Research Institute, Republic of Panama

3. Naturalis Biodiversity Center, Understanding Evolution Group, Leiden

Actively sensing animals must integrate self-generated and environmental cues to guide behavior. Echolocating bats offer a unique model system to study such sensorimotor integration, as they balance active echolocation (EL) with passive listening. Here, we combine field and laboratory approaches to investigate how the carnivorous bat *Trachops cirrhosus* regulates these sensory modes during prey detection and capture. In the field, self-logging sound and movement tags revealed that wild *T. cirrhosus* flexibly alternate between eavesdropping and EL-based foraging. During gleaning, when bats attacked prey on the ground,

individuals relied heavily on passive listening and achieved high capture success rates (~50%), often spending more time consuming than locating prey. In contrast, during aerial captures of flying prey, bats used EL but deviated from the typical pattern of aerial-hawking species, omitting the approach phase and terminal buzz - demonstrating remarkable behavioral and acoustic flexibility in a gleaning specialist. Complementary lab experiments using a robotic frog and noise manipulations showed that noise masking EL reduced attack probability and elicited a strong Lombard response, while passive cues increased motivation but not capture success. Together, our results reveal that *T. cirrhosus* dynamically adjusts its sensory strategy according to cue reliability, integrating passive and active information streams to optimize foraging in complex acoustic environments.

Sharing immunity with friends: the role of collective parasite defence

Kat Bebbington, Kevin Matson and Sjouke Kingma

Wageningen University and Research

Animals living in groups are at greater risk of contracting infectious diseases than those that live alone. Why do so many animal species form groups if this is so costly for individual health? In this presentation, I will outline my plans to test whether group-living birds counteract the increased risk of infection by disinfecting each other and sharing immune-boosting molecules with each other in saliva, feather oils, eggs and perhaps even faeces. Understanding how social animals work together to defend themselves against infection will greatly advance our understanding of the role parasites play in animal social life.

Timing, Tuning, and Turn-Taking: Sensorimotor Foundations of Vocal Interactions

Jonathan Benichov

Institute of Biology, Leiden University

Vocal interactions often appear effortless, yet they depend on the finely tuned interplay between perception and action. Whether in duets, duels, or dialogues, individuals must dynamically shape and time their signals in response to - or even in anticipation of - the signals of others. Songbirds provide a powerful model for uncovering how social sensorimotor coordination emerges in real time. In zebra finches, both sexes exchange innate calls with sub-second precision and can adjust their timing to avoid acoustic interference. This flexibility relies on cortical premotor circuits, where inhibition gates when to call and auditory inputs transiently suppress call output. Social experience further tunes this system: hearing calls of familiar partners evokes stronger and more sustained neural responses, linking circuit activity to behavioral selectivity. In nightingales, whistle pitch matching and countersigning exemplify even richer forms of online vocal adjustment, including instantaneous mapping of what is heard onto what is sung. Together, these findings reveal that the specialized neural pathways that support learned courtship song also enable flexible, interactive timing and spectral control of vocalizations across contexts. By examining vocal behavior through the lens of real-time

interactive coordination, we can identify mechanisms of communication that are fundamental to social life.

Free-ranging dogs copy humans' actions in a manipulative task

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1. Behavioural Ecology Group, Wageningen University and Research

2. Domestication Lab, Konrad Lorenz Institute of Ethology, University of Veterinary Medicine Vienna

Free-ranging dogs (FRDs) are free-breeding and free-roaming domestic dogs, living in a varied and fast-changing, human-dominated environment, where learning from humans could be advantageous. FRDs represent 80% of dogs in the world, yet they are understudied in comparison to pet dogs, although they can help us understand fundamental processes linked to domestication and urbanization.

Here, we investigated whether FRDs can copy the action of a human in a manipulative task, and to which level of precision. We tested 186 FRDs in Morocco in a task where a human could show one of two actions, in one of two directions, to open one of two equal apparatuses containing food (Demonstration group). We controlled for local/social enhancement and for an already existing ability to successfully open the apparatus (Proximity group and Control group, respectively). We also tested whether the use of ostensive cues could facilitate dogs' learning.

FRDs in the Demonstration group matched with precision the actions of the human (same apparatus, same action, same direction). The use of ostensive cues increased FRDs' successful openings of the correct apparatus, using the correct action. This is the first evidence that FRDs can copy the actions of a human and that ostensive cues improve FRDs' performance in a social learning task, suggesting that social learning might play a key role in FRDs' ability to adapt and thrive in human-dominated environments.

Octave Equivalence in Parrots and Starlings: Insights from Citizen Science and Ringtones

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The evolutionary roots of octave equivalence, the perceived similarity between two notes separated by an octave, remain unclear. Two hypotheses have been proposed: one suggests that vocal production learning is linked to octave equivalence, while the other posits that the

harmonic structures of mammalian vocalizations are a prerequisite for this ability. Evidence for octave equivalence has been found in rats, two rhesus macaques and a bottlenosed dolphin. In contrast, studies on starlings, black-capped chickadees and budgerigars have failed to demonstrate this ability in the avian clade. Therefore, octave equivalence might be a trait exclusive to mammals, supporting the latter hypothesis. We studied octave equivalence in eleven parrot species and European starlings imitating ringtones. Using citizen science, we collected videos of 54 parrots and two starlings imitating ringtones on social media platforms and data from our citizen science project (Bird Singalong Project) where we directly collaborated with parrot owners. We extracted the fundamental frequency of the birds' imitations and converted these to musical notes for comparison with the original notes of the composition. Parrots and starlings transposed songs one to three octaves higher than the model songs. Our study shows that octave equivalence is not exclusive to mammals but more widespread than previously thought and highlights the power of citizen science to extend datasets beyond traditional animal studies.

Outsmarting the enemy: do lizards in dangerous environments show enhanced spatial cognition?

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2. Behavioural Ecology, Wageningen University & Research

Animals have evolved a broad diversity of morphological and behavioural adaptations to evade predation. One key trait often discussed in this context is cognition. Through learning, individuals can develop more efficient antipredator behaviour, and thus increase their survival in dangerous environments. Yet, how exactly predation shapes cognitive variation remains poorly understood, due to conflicting evidence and the challenges of studying this relationship in the wild. Here, we study the link between predation pressure and cognition using an ongoing biological invasion on the island of Ibiza. Populations of the Ibiza wall lizards (*Podarcis pityusensis*) have recently experienced a drastic shift in predation pressure due to the introduction and spread of the horseshoe whip snake (*Hemorrhois hippocrepis*). We expected that this increased predation pressure would lead to enhanced spatial cognition in lizards, a key aspect of their antipredator behaviour. Lizards were collected from sites with varying predation regimes (uninvaded, recently vs older invaded) and subjected to a standard spatial learning task. Lizards did overall show rapid learning, yet surprisingly, learning performance did not differ between predation regimes, indicating that predation has not selected for enhanced cognition in our study species. Our results provide relevant insights in understanding under which conditions predation may or may not drive cognitive evolution.

Between perception and reality: Social density effects on maternal hormones and nestling behaviour

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Mothers may use environmental cues to anticipate the conditions their offspring will encounter and adjust offspring development accordingly. In oviparous species, this adjustment often occurs through the transfer of maternal hormones to the eggs. In birds, females have been shown to alter yolk testosterone deposition in response to social density; however, whether this maternal effect translates into variation in offspring social behaviour remains unclear.

We conducted two experiments on wild blue tits (*Cyanistes caeruleus*) across two breeding seasons to test whether females adjust yolk testosterone allocation in response to social density and whether this affects offspring social traits. In the first experiment, perceived social density was manipulated using conspecific playbacks before egg laying, whereas in the second, actual social density was altered by modifying nest-box availability.

Females exposed to high perceived social density deposited less testosterone in their eggs, producing more sociable nestlings. In contrast, females breeding under high actual social density transferred more testosterone, and social density had a sex-specific effect: males reared at low densities showed stronger social preferences than females.

These findings suggest that maternal allocation of testosterone is modulated by social context and may link competitive environments to the development of offspring social phenotypes. Further research should evaluate whether these effects are adaptive.

Born to aggressive mothers – are certain chicks more susceptible to early life exposure to aggression?

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Early-life experiences critically shape behavioural development, with parental interactions playing a key role. While positive parental care buffers against stress, adverse conditions like maternal aggression (MA) can disrupt neurobehavioural outcomes. However, the extent to which genetic predisposition, environment, and their interaction contribute to these effects remains unclear.

We conducted a cross-fostering experiment in domestic canaries (*Serinus canaria*), where some mothers exhibit MA by pecking or plucking their chicks. Full clutches were cross-fostered between MA-exerting and non-MA mothers, creating four experimental groups to isolate genetic

and environmental influences. Juveniles were later tested for neophobia, learning, inhibitory control, aggressiveness, and social dominance.

We hypothesised that early MA exposure would increase impulsivity, reduce neophobia, and enhance aggression, potentially leading to higher dominance ranks. These effects were expected to be particularly pronounced when early and adult environments matched. Our findings provide insight into how genetic predispositions and early social experiences interact to shape behavioural outcomes, with implications for understanding plasticity in response to early-life adversity.

Cooperation allows breeding during low-resource, low-risk periods in the Arrow-marked Babbler

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Cooperative breeding is often associated with harsh or unpredictable environments, suggesting that helpers buffer adverse conditions. Cooperation could enable groups to breed successfully during early, food-limited periods that precede seasonal peaks in nest predation and brood parasitism. We tested this idea in arrow-marked babblers (*Turdoides jardineii*), quantifying seasonal dynamics of nest initiation, predation, and brood parasitism across multiple seasons. We predicted that larger groups would initiate breeding earlier under poorer food conditions, thereby avoiding the later seasonal rise in predator and parasite pressure that coincides with broader avian breeding activity. As predicted, group size was negatively associated with initiation date. Larger groups bred earlier while insect biomass remained low, and this early period coincided with lower predator presence and an absence of brood parasites. Thus, early initiation also coincided with lower predation and parasite rates, and larger groups generally showed higher daily nest survival, indicating additional benefits beyond timing. These results suggest a temporal-buffering strategy in which cooperation can shift reproduction into a safer seasonal window, helping to explain how cooperative breeding evolved and is maintained and will potentially be favoured as environmental variability intensifies.

Behavioural evolution in real time: Artificial selection in guppies

Alexander Kotrschal, Mingfang Yang

Wageningen University & Research

To understand animal behaviour, we need to unravel its evolution. Over the past 15 years, we have used the Trinidadian guppy (*Poecilia reticulata*) as a model system to study evolution in real time through controlled artificial selection experiments. Our long-term research has

focused on selecting for key traits—relative brain size, sociality, telencephalon size, and survival under predation pressure—to explore the mechanisms and consequences of behavioural evolution. These parallel selection lines have revealed striking and sometimes unexpected results: cognitive and neural traits respond rapidly to selection, trade-offs emerge between brain investment and other fitness components, and shifts in social and antipredator behaviours accompany neural changes. By integrating behavioural, neuroanatomical, and ecological data, we provide insights into how complex traits coevolve and how selection shapes the architecture of behaviour. Here I showcase new results, summarize our main findings, and discuss their implications for understanding behavioural evolution.

Collective hunting in the open ocean

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Collective hunting has mostly been studied in terrestrial animals. In this talk, I will give an overview of the work we have been doing on studying collective hunting in the open ocean, specifically on sailfish, striped marlin, and sealions targeting prey schools. Combining, underwater footage, drone footage, CT scanning, accelerometry and agent-based models, I will describe how collectives work together to catch schooling prey, the species-specific attack strategies, subsequent prey responses, and interactions between different predator species.

Choosing on the carousel: temporal patterns preference in zebra finches

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Rhythmic patterns, elements occurring in a specific class of intervals, are a fundamental feature of fast communication systems and music across cultures. The simplest rhythmic pattern is isochrony, which consists of a steady metronomic repetition, found in the vocal production of many species across taxa.

Despite the widespread presence of rhythmic patterns in animal vocalisations, the reasons behind their occurrence and adaptive function remain unknown. This leaves it unclear whether rhythmic patterns are shaped by physical or cognitive constraints, or by species-specific preferences.

In this framework, the highly structured song of zebra finches (*T. castanotis*) is of particular interest. In this species, only the male sings, and the song is made of repeated motifs learned by the tutee from their tutors during the critical period. The song has been reported as isochronous

with a shared rhythm between tutee and tutors, making this species highly suitable for investigating whether species preference or sexual selection shapes rhythmic patterns.

Here, we inspected the preference for different rhythmic patterns in zebra finch songs using a two-choice and a four-choice preference test. Our results show that zebra finches do not have a general preference for a rhythmic pattern, while showing a tendency of preference among females, suggesting sexual selection as a possible driver of rhythm in zebra finch song.

Does social learning guide food preferences of free-ranging dog's puppies?

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Biologically relevant decisions that an animal must make can be affected by social learning and information related to food sources are among the most relevant for omnivorous species, especially for younger individuals. Domestic dogs are an important subject to study social learning, although little is known about free-ranging dogs' propensity to use social information. Free-ranging dogs (FRDs) live alongside humans, scavenging on human refuse. Thus, they are an interesting model to investigate social learning in food-related contexts since they are constantly exposed to new choices regarding food sources. We tested FRDs' puppies (N=222, 24 litter) in a food choice task after they have been exposed (experimental groups) or not (control groups) to a novel type of food via their mother. Each experimental and control group was divided in two: the mother was fed right after the delivery for 2 weeks, or starting at three weeks of puppies' age for 2 weeks. We tested all the puppies two times, at 5 and 8 weeks of age, in a two-choice task to investigate whether they would prefer the type of food their mother was exposed to. Preliminary results show that free-ranging dogs' puppies do not seem to exploit social information to make a food choice, although puppies at 5 weeks spent more time investigating the food they have not been exposed to, showing that they are able to recognize the familiarity of the food given indirectly to them.

Modeling active sensing collectives

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2. Indian Institute of Science Education and Research

Active-sensing animals, such as bats, probe their environment by emitting energy and analyzing returning signals. A single bat's call generates a cascade of echoes from multiple objects, which the auditory system must segregate into one coherent spatial scene. This problem is exaggerated in social groups, where one must also discriminate own echoes from the calls and echoes of conspecifics. Then, how do bats navigate dense swarms without colliding when facing jamming?

To answer this, we developed biologically-parameterized models of bats. First, we use a static model to characterize the auditory scene of individual bats. We find that echo-acoustic information in collectives is limited and is constrained by the group's orientation and individual's spatial position. At large group sizes, bats only detect their nearest neighbors, that too only 52-75% of the time, depending on swarm orientation. However, is complete information even necessary for collective behavior?

We therefore construct a dynamic model to investigate collective coordination despite compromised sensing and heuristic behaviors that bats could be utilizing. We demonstrate significant reduction in collision rates when individuals integrate information over larger times and respond to calls of others than relying on self-echoes. We also explore echo-acoustic flow, where bats may be utilizing the consistency in sound arrival time and angle to enhance echo detection to mitigate the costs of jamming in dense groups.

Be cool: Savanna breeding dark-capped bulbuls benefit from building their nest with cooler micro-climate

Elke Molenaar

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For birds, to ensure correct embryonic development and avoid adults and eggs overheating, temperatures within the nest should not become too high. Reproducing birds can affect nest microclimates through nest site selection and modulate egg temperatures through incubation. Yet, how microclimates vary across nests and how this relates to parental behaviour is hardly understood. Thus, we here determined if and how nest microclimates deviate from the temperature of the wider environment and how nest attendance as a measure of parental care, varied across nests with different microclimates. We used dark-capped bulbuls, *Pycnonotus tricolor*, that breed under extreme conditions in Eswatini as a model system. We show that bulbul parents with nest microclimates that were consistent with ambient weather ("consistent") increased their nest on-bout durations, even at high temperatures, whereas birds with nest microclimates that were hotter than ambient weather ("hotter") maintained their nest on-bout duration. Birds with 'hotter nests' took shorter and more frequent off-bouts, possibly a sign of compensation. Moreover, birds at hotter nest sites gaped more, likely paying a physiological price of being in a lower quality microsite. Thus, overall we show that birds with nests with different microclimates differ in nest attendance and heat-regulation behaviours.

Do dogs take the knowledge of conspecifics into account in competitive settings?

Jori Noordenbos, Julie Sprietsma, Anne van Leeuwen, Giulia Cimarelli

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Theory of Mind (ToM) is the ability to attribute knowledge and emotions to others. ToM has been increasingly researched in dogs, with contrasting results emerging from studies using dog-human interactions, and almost no studies using dog-dog settings. Here, we tested whether dogs consider another dog's knowledge in a competitive food task, where N=10 subjects were

tested with a dominant partner. Subordinate dogs always observed food being hidden, while dominants were either knowledgeable, ignorant, or held a false belief about the food location. Subordinates were released first, shortly followed by the dominant. Given that subordinate dogs generally avoid conflicts with dominant partners, we expected that they would avoid to approach the food when the dominant partner was knowledgeable, but approach it when the dominant was ignorant or misinformed, if dogs would understand a partner's knowledge. Preliminary results show that subordinates were more likely to arrive first when dominants were ignorant or misinformed, but did not consistently avoid the food location when dominants were knowledgeable. This may be due to tolerance among familiar pet dogs. These findings suggest that dogs take competitors' knowledge into account to a certain extent.

The complex, graded vocal repertoire of Rüppell's vultures reflects sociocognitive evolution

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The evolutionary origins of complex communication remain contentious, with social, ecological, and environmental factors proposed as selective drivers. The Social Complexity Hypothesis for Communicative Complexity (SCHCC) predicts that the cognitive demands of navigating socially intricate groups favour the evolution of complex communication. While widely supported, evidence for the SCHCC comes predominantly from a few well-studied taxa, limiting its generalisability across animals, therefore novel study systems are needed. Vultures, with their varied social structures, provide a unique system to test this hypothesis. Here, we present the first quantitative analysis of the vocal repertoire of the social Rüppell's vulture, based on 2,500 calls recorded from two captive populations across diverse social contexts. Using a fuzzy clustering approach, we reveal a repertoire far more complex than previously assumed, comprising multiple discrete and graded call types, with gradations likely conveying additional information. Calls serve diverse functions, with their repertoire exceeding the average repertoire size observed across birds, aligning with SCHCC predictions given this species' social complexity. Our results establish vultures as a promising model for studying the evolution of communication and provide a framework for comparative analyses that can illuminate the selective pressures shaping complex signaling and the evolution of language.

On the Watch for Foraging: Automated Assessment of Foraging Enrichment Efficacy in Captive Macaques

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In captivity, animals have easy access to food, leading to lower time investment in foraging. Food enrichment aims to limit boredom and increase animals' foraging activity, for example through the spreading of foraging items. However, the efficacy of different enrichment techniques is often not measured, as manual monitoring is time intensive and sensitive to observer effects. Here, we used a novel automated tracking method to measure efficacy of various foraging items in captive macaques at the Biomedical Primate Research Centre (BPRC).

At the BPRC, macaques are provided with various types of small foraging items, such as herbs and garlic. We monitored a group full-time through multiple cameras inside the enclosure, from which we extracted videos before and after distribution of foraging items as well as comparable timeframes on other days. A custom trained yolo segmentation model then mapped the presence of macaques on the floor as a proxy for foraging behaviour. Its performance was validated using manually annotated video clips. We then tested how long the enrichment was effective in stimulating foraging and whether this differed between foraging item types. Our results highlight the possibility of efficient, large-scale assessment of captive animals' engagement with enrichment. Furthermore, we show how automated tracking of behaviour can help develop and complement successful, informed enrichment programs.

Rethinking the bonobo–chimpanzee divide: Genetic clues to shared and divergent behaviors

Nicky Staes

Behavioural Ecology and Ecophysiology Group, University of Antwerp & Antwerp Zoo Centre for Research and Conservation, Royal Zoological Society of Antwerp

Bonobos and chimpanzees, our closest living relatives, are often portrayed as behavioral opposites: bonobos are considered peace-loving and cooperative while chimpanzees are described as aggressive, impulsive and dominance-driven. However, our research on zoo populations suggests that this dichotomy oversimplifies the complex behavioral variation within and between these Pan species. Here, I explore how genetic and physiological mechanisms contribute to behavioral diversity in bonobos and chimpanzees, and challenge conventional narratives about their differences.

Using a comparative approach in zoo populations, I integrate multiple genetic methodologies, such as candidate gene analyses, epigenetic profiling, and microbiome characterization, to investigate how variation in neurotransmitter and neuropeptide systems shapes individual and species-level behaviors. A particular focus is placed on the serotonergic system, given serotonin's central role in modulating key differences in reactive and prosocial tendencies across species, including Pan.

By linking behavioral observations with molecular and microbial data, this work aims to uncover the pathways through which genes and environments interact to produce behavioral diversity. Ultimately, this research reframes our understanding of bonobo and chimpanzee behavior, not as static contrasts, but as dynamic outcomes of shared biological mechanisms expressed in different ecological and social contexts.

Learning to impress: Female presence tunes the structure and attractiveness of male zebra finch songs

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Institute of Biology, Leiden University

Vocal learning depends not only on auditory models but also on the social context. In zebra finches, only males sing, yet silent females may also influence male song development. We tested whether the presence of a female companion during the sensitive learning phase affects the attractiveness of adult male song. Yoked pairs of males—one housed with a female companion and one isolated—were exposed to identical tutor songs. Adult songs were later assessed in operant female preference tests. In the tests, adult females preferred songs from males raised with females, which featured longer syllables and shorter inter-syllable intervals. These results demonstrate that non-singing females can shape both the structure and attractiveness of learned song in zebra finch.

An exploratory study on the development of rhythmic ‘dueting’ in Southern Ground Hornbills (*Bucorvus leadbeateri*)

Sita ter Haar

Education and Child Studies, Leiden University

Southern Ground Hornbills (*Bucorvus leadbeateri*) live in large family groups and are known for their social behavior, cooperative breeding and remarkable vocalizations. Adult SG hornbills produce a rhythmic ‘duet’ which can last for several minutes. The pattern consists of vocalizations alternating at relatively constant intervals between male and female. This study takes a first step in investigating the development of this rhythm in juveniles. We explore if regularity of the rhythm changes with age, and with mating context. We also study if the rhythmic vocalizations are associated with prey carrying behavior, possibly associated with social status. Preliminary findings on Southern Ground Hornbills in the zoo show that adult rhythms of a well-formed pair show most regular intervals, whereas new couples showed more variability in their rhythm. Juveniles show the least regularity, with often overlapping vocalizations between individuals. Results are mixed with regard to the relation between vocalizations and food display. These findings are relevant for evolution and mechanisms of rhythmic capacities, related to e.g. speech and musical patterns. Moreover, the research in long run is relevant for animal welfare, particularly breeding; if development of the coordinated duet is in jeopardy, the breeding and reintroduction may be at risk as well.

Heightened excitability of female serotonergic neurons drive sex-specific anxiety responses in mice

Suzanne van der Veldt

Groningen Institute of Evolutionary Life Sciences (GELIFES), University of Groningen

Mood and anxiety disorders affect women nearly twice as often as men, yet the brain mechanisms behind these sex differences remain poorly understood. In our work, we focus on serotonin neurons in the median raphe region of mice, which send projections to the ventral hippocampus. We find that in female mice, these serotonin neurons are more excitable and are active longer when the animals face stressful environments. Using tools to record and manipulate this pathway, we show that activating it increases anxiety-like behavior in females but not in males. We find that self-grooming may serve as a possible coping strategy under stress. These findings point to a specific serotonin-hippocampus circuit as a key player in shaping sex differences in anxiety.

What are we? Diving into how pairbonding shapes female zebra finch perception

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Social context can strongly influence how sensory stimuli are perceived. In species that have long-term sexual partners, pair bonding is a meaningful and social experience. Vocal communication within pair bonds is common among birds, playing a crucial role in coordinating parental efforts. This study investigates how a meaningful pair-bonding experience shapes female zebra finches' perception of their male partner's song. We used phosphorylated S6 (pS6) as a marker of neural activity in secondary auditory areas (NCM and CMM) and in nuclei of the Social Decision-Making Network (SDMN, which includes the dopaminergic midbrain region and hypothalamus). We compared neural responses between paired females with long-term bonds who were presented with their partner's song, and unpaired females who heard the song of an unfamiliar male. Preliminary results showed higher pS6 expression in CMM and NCM of unpaired females, whereas paired females exhibited greater activation in the dopaminergic midbrain region VTA. To explore novel neuronal projections, I injected neuronal tracers near NCM and CMM. Preliminary results show a novel connection between a primary auditory region (field L) and the hypothalamic region VMH.

Poster Presentations

Mixed evidence for sociality in invasive lionfish (*Pterois miles*) across laboratory and field experiments.

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Environmental and social cues affect animal movement and space use, influencing the formation of aggregations. Lionfish (*Pterois miles*), invasive predators, are often found in groups but little is known about the drivers behind their aggregation behaviour. To investigate the roles of environmental and social factors in lionfish aggregations, we conducted laboratory and field experiments. In the lab, lionfish were given the choice between shelters in compartments that differed only by the presence or absence of a conspecific. Individuals generally preferred the

social compartments, providing evidence of social attraction. In a natural setting, artificial structures were deployed around a rock formation populated by lionfish. Some structures included caged lionfish used as a social stimulus, while other structures had an empty cage as control. Although lionfish visited the structures, no preference was observed for the ones with conspecifics, possibly because the stimulus group was unfamiliar to the local population. Together, these findings suggest that social attraction in lionfish may be strongly affected by experimental set-up and familiarity among focal and stimulus individuals. Future studies are needed to test whether familiarity among individuals or conspecific positioning influences social aggregation in lionfish. Studies on lionfish sociality could inform more effective management strategies to mitigate the ecological damage in their invaded ranges.

Communication networks of wild zebra finches (*Taeniopygia castanotis*)

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Communication networks are widespread across species, permitting information flow and facilitating social connections across space and time. In birds, communication networks are well studied in territorial species with long-range songs connecting individuals across space, where unintended listeners extract information from others' signalling interactions. Yet acoustic signals also play important social roles at short range, forming communication networks that connect individuals within larger social units. Wild zebra finches (*Taeniopygia castanotis*) provide an excellent model system to examine such communication networks in a non-territorial species with multiple males singing at shared locations in close temporal proximity. Zebra finches breed in loose colonies in the Australian arid zone, typically stay near their partner, move around in pairs or small groups, and gather at social hotspots, thus forming dynamic, potentially multi-level, societies. Here, we recorded the individually distinctive male song at breeding sub-colonies and social hotspots. We identified males based on spectrographic similarities, verified by a deep learning model (BirdNET), and constructed communication networks based on temporal singing proximity at shared locations, social hotspots and the breeding colony. Our approach opens the way towards improving the understanding of communication and social networks.

Headphones for Zebra Finches: Pilot study to test feasibility

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Auditory feedback is essential for vocal control in vocal learners such as zebra finches. Studying how birds adjust their song in altered auditory environments requires calibrated song recordings and precise control of auditory input. This pilot study evaluated the feasibility of custom-made,

lightweight, removable headphones (1.3 g) in adult male zebra finches. We tested whether these headphones could be reliably constructed and fitted, if birds could carry them comfortably without behavioral changes, and how the headphones (without sound) affected auditory sensitivity during and after use. Two adult males were assessed at four time points: before, while wearing, right after and two months after removing the headphones. Auditory sensitivity was measured by observing behavioural responses to playbacks of pure tones through a cage speaker (250-9000 Hz; 5-77.5 dB SPL). Behaviours including vocalizations, flying and social interactions were also monitored. Birds tolerated the headphones while housed socially, maintaining normal behaviors. However, increased alertness to sounds was observed. Auditory thresholds decreased during and after headphone use, suggesting a behavioral change that increased birds' hearing sensitivity with headphones, which persisted afterwards. We are currently controlling for effects of handling and habituation to the playbacks. Future experiments will further develop the headphones' system for real-time alteration of auditory feedback.

Causes and consequences of jet-blowing behaviour in a stalking predator (lionfish, *Pterois miles*)

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Predation is pervasive in the natural world, where virtually every animal is prey or predator at some point of their life. Consequently, predation is a strong evolutionary pressure for predators and prey. Lionfish (*Pterois miles* and *Pterois volitans*) are predators and the most successful invasive marine species. Native to the Indo-Pacific Ocean, they invaded the western Atlantic Ocean and are now invading the Mediterranean Sea. Lionfish sport one of the highest success rates among predators and their invasiveness is attributed to their predation success. How lionfish reach such a high predation effectiveness remains enigmatic. Lionfish are stalking predators and show a peculiar behaviour while approaching their prey: they actively blow jets of water at them. The causes and consequences of jet blowing behaviour have never been investigated. We tested the hypothesis that jet blowing is used by lionfish to orientate their prey head-first through rheotaxis, facilitating capture and swallowing of large prey. We show that blowing lionfish catch more prey head-first, have a higher strike success rate and catch larger prey. Prey that are blown at orientate to face an approaching lionfish and swim to maintain their position. When a lionfish strikes, a swimming prey will move towards their mouth, allowing blowing lionfish to strike from a further distance. Our results show that jet blowing increases lionfish predation success through a unique mechanism of prey manipulation.

Variation in nest and hatchling characteristics of sea turtles on Bonaire

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Sea turtles are known to be crucial for maintaining a healthy and balanced marine ecosystem. As keystone species, they support the ecosystem services of their habitats. As such, many conservation initiatives focus on protecting sea turtles across their different life stages. This project investigates the variation in nest and hatchling characteristics among the three sea turtle species nesting on Bonaire: the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), and loggerhead turtle (*Caretta caretta*). We use a complementary combination of nest monitoring, behavioural assays, morphometric analyses, and environmental monitoring to examine both intra- and interspecific variation. By improving our understanding of these early life stages, our project aims to inform how we can include this variation in and, as such, improve the conservation efforts on these early life stages.

From brain to cloaca - an unexpected journey: AAVs shedding dynamics following CNS administration in birds

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Adeno-associated viruses (AAVs) are widely used in research due to their diverse applications, yet the potential biosafety risks associated with the shedding of functional viral particles from AAV-injected animals remain understudied. This has contributed to variability in biosafety regulations across institutions, with guidelines that often do not reflect the actual viral shedding dynamics. Moreover, current knowledge is mostly based on studies of viral shedding following systemic administration and blood sampling, which may not completely replicate natural risks. Viral transfection is more likely to occur via other biological routes than blood, such as feces. Also, shedding might be dependent on the method of administration, which in AAV applications often is through microinjections in the CNS. However, only one study exists for mammals receiving CNS injections of AAVs, and no data have been reported in avian species. To address this knowledge gap, we injected zebra finches (*Taeniopygia guttata*) with AAV2.9 constructs encoding calcium indicators, and analyzed viral shedding dynamics in feces, blood, and uropygial gland oil. This is the first study providing insights into AAV shedding routes in birds following CNS administration, with implications for refining biosafety assessments and regulatory policies.

Dupassive acoustic monitoring to assess the impact of water and road traffic noise on migratory fish spawning: Twaite shad in the Belgian Scheldt river

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A migratory fish species that used to be abundant from the Mediterranean to Norway is the twaite shad (*Alosa fallax*). Dams built in the 19th century along migratory routes like the Rhine in the Netherlands caused a drastic decrease in shad populations (Aprohmanian et al., 2003). Concurrently, anthropogenic noise has steadily increased in river systems, with vessels as the most prominent sound source in river systems. As fish may use underwater soundscapes to gain information from predator or prey presence to substrate type, frequency overlaps between natural and anthropogenic sounds may lead to masking (Slabbekoorn, 2019).

Shad mating behaviour consists of female fish being chased in a circle by one or more male fish close to the water surface, producing loud splashing noises. Splashing sounds may attract males to the location where they compete to spawn via swimming speed and proximity to the females (Langkau et al., 2016). Masking could reduce overall spawning success, as fewer males may hear the spawning splashing.

To investigate this, passive acoustic monitoring was conducted at several sites along the river Scheldt. We will use a spawning detection algorithm trained on shad spawning sounds, and track boat passage. Our study will yield insights into the potential effects of anthropogenic sound on shad spawning and thereby into the potential for mitigation measures to relief the ecological impact of anthropogenic noise on a migratory fish species.

Giraffe networking: how do changes in group composition affect social networks amongst male bachelor groups?

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Giraffe (*Giraffa camelopardalis* spp.) breeding groups usually comprise one male and several females. Females tend to form long lasting bonds with other females and their calves, while males form bachelor groups during their adolescence, but leave these to live a more solitary life once sexually mature. In captivity surplus males are often housed in all-male groups. While this husbandry approach may be a viable alternative to culling surplus animals, consequences for behaviour and welfare remain understudied. Using focal observations, we observed two captive herds of male giraffes (+/- 15 individuals) across two years to analyze social bonds and the response to removal/addition of individuals. The stability of the social networks was examined using sociograms and Quadratic Assignment Procedure (QAP) analyses. We then compared the networks of the core group, thus the individuals that remained in the herds throughout the entire

study period, before and after events. Both sociograms and QAP analyses suggest that the social networks show a short period of instability right after the removal or introduction of individuals (three months), but are overall stable across the study period. Our study is the first of its kind to investigate the dynamics of social networks of captive male giraffes. Whereas so far social bonds were thought to mostly occur amongst females, we show that male giraffes develop social bonds and have stable social preferences, as well.

Sound localisation in common marmosets (*Callithrix jacchus*): a comparative lab and field approach

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Perceiving and localising acoustic information provided by the environment is crucial for survival in both humans and non-human animals. Although sound localisation cues have been studied in several animal species, research on active sound localisation behaviour in primates is still sparse. We conducted two studies, one in captivity and one in the wild, to investigate sound localisation abilities and the influence of prior information on sound localisation acuity in common marmosets (*Callithrix jacchus*). In total we tested 6 captive (5m/1f) and 13 wild (7m/6f) individuals. We applied a controlled and automated approach in captivity to track individuals' head orientation in response to conspecific's food calls using 11 speakers in a semi-circle array with an angular separation of 14° each. For the field this setup was simplified and adapted, resulting in a semi-circular 5-speaker setup placed 28° apart horizontally and we used unknown conspecifics' contact calls. To our knowledge this is the first study to test sound localisation abilities and acuity in freely moving, unrestrained marmosets. I will present our experimental approaches as well as their comparability and will give some preliminary insights into our results.

Group differences in social learning dynamics are not explained by social tolerance in captive rhesus macaques

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Recent studies on intraspecific variation highlight social tolerance as both a central and flexible aspect of a group's sociality. Investigating the fitness consequences of this flexibility is key to understanding the evolutionary roots of behavioural plasticity in animals and humans alike. Social tolerance is thought to covary with social learning and dominance steepness but this relationship remains empirically understudied in non-human primates. We aim to fill this gap by

comparing two similarly housed captive groups of rhesus macaques (*Macaca mulatta*). We 1) assessed their social tolerance levels through behavioural observations and experimental cofeeding experiments and 2) conducted an open-diffusion experiment and evaluated their social learning dynamics using Network Based Diffusion Analysis. Contrary to expectations, our results do not show group-level differences in dominance steepness and social tolerance. Nonetheless, we found significant differences in social learning levels and pathways: in one group, at least 13% of skills were transmitted socially and predicted by grooming relations, while in the other, at least 5% was socially transmitted and predicted by the close-range observation network. Our study highlights the flexibility of social learning dynamics in primates and questions the theoretical link between social tolerance and learning. We invite researchers to conduct similar studies, to capture the extent of within-species behavioural plasticity.

What can feral pigeons tell us about multiscale spatial patterns of Psittacosis in urban environments?

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Given the rapid pace of urbanization, cities must be recognized as unique habitats that attract large populations of synanthropic bird species, such as feral pigeons, which thrive due to abundant food and fewer predators. However, these advantages come at a cost—the increased risk of disease transmission. Most studies on disease ecology in urban environments focus on either large-scale or fine-scale patterns, yet cities are dynamic and heterogeneous, with conditions varying between neighborhoods. In this study, we investigated spatial variation in *Chlamydia psittaci* prevalence not only between cities but also within different locations of the same city using *C. psittaci*, a generalist bacterium capable of infecting over 400 bird species, and feral pigeons – one of the most abundant city bird. We conducted a sampling campaign in Antwerp, Belgium, collecting data from 500 pigeons across 47 locations, and compared our results with a comprehensive review of existing literature on *C. psittaci* prevalence in pigeon populations within and across cities and countries. Our findings show a significant spatial heterogeneity in *C. psittaci* prevalence at fine scale, suggesting that disease heterogeneity may be influenced by factors such as pigeon population density, host contact rates, and the degree of urbanization. Understanding these fine-scale patterns and what drives them is essential for improving urban disease ecology research and assessing potential public health risks.

Black birds with white nests; why do jackdaws decorate their nests with white paper?

Berber Maarsingh, Wendy Hegge, Simon Verhulst

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Birds frequently incorporate anthropogenic material when building nests to aid isolation, humidity control and anti-parasitic or predation. We observed Jackdaws to decorate their nests with white papers, placed on the nest surface. As a step towards identifying the function of this

behaviour, we measured the proportion of the nest covered by white paper material during two breeding seasons (2024 & 2025). We found an increase of paper coverage during the nest building, egg laying and incubation phase, and a rapid decline after the eggs hatched. In 2025, we removed the white paper material from half of the nest boxes in one colony after clutch completion. Jackdaws responded to the paper removal by rapidly (within three days) replenishing the paper material. Nest coverage did not significantly predict breeding success. Although the functional explanation remains a mystery, the deliberate nature and timing of the incorporation of white paper material suggests it to be beneficial during the phase where eggs are present in the nest.

Age-related plasticity of vocal intensity in zebra finches

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In environments with ambient noise, many species are known to increase the amplitude of their vocalisations, including zebra finches. It is unknown if zebra finches modulate vocal intensity acutely (like humans), or slowly change it over time (like in auditory feedback perturbation experiments), and how age plays a role in the control of vocal intensity. Here, we investigated how day-long increases of ambient noise affected song intensity in socially-housed zebra finches, and whether this response was influenced by age. For this, audio recordings were made of male zebra finches, four young adults (100d-1y) and four >3y-olds, housed with a female companion. We matched white noise playbacks to the average intensity of each bird's song (range: 67,8 – 80 dB). We designed a special perch with a calibrated microphone to measure song intensity reliably in large, standard-housing cages. Mean and max intensity was measured before and after white noise exposure. No consistent group-level increase in song intensity was found. Intensity changes varied considerably between birds. When averaged per age group, the normalized changes in song intensity suggested a nonsignificant trend of increased song intensity after ambient noise exposure in young adults, and decreased intensity in old birds. These findings contribute to the understanding of age-related changes to the auditory feedback loop in zebra finches, and suggest that vocal intensity may be controlled acutely in zebra finches.

Aggressive Mothers - A Study of Mental States in Maternal Aggression Mother Canaries and Non-Maternal Aggression Mother Canaries.

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Maternal behaviour is critical for offspring development, yet in some species - including the domestic canary (*Serinus canaria*) - females may exhibit aggression or neglect toward their chicks. Recent work suggests that maternal affective states may influence caregiving behaviour, but empirical data remain limited. We used a judgment bias test to investigate whether female canaries that exhibit abusive behaviour towards their offspring also show evidence of a more

pessimistic affective state. While MA-mothers and noMA-mothers did not differ in overall latency to approach or open ambiguous cues, we found a significant interaction between maternal aggression and brood size: MA-mothers with one or two chicks opened the ambiguous dish significantly faster than noMA-mothers. This unexpected pattern may reflect impulsivity or stress-related disinhibition rather than genuine optimism. Our findings highlight that maternal aggression is not straightforwardly linked to negative affect and may instead reflect a trade-off between the immediate demands of parental care and the cognitive resources available for decision-making.

Adaptive Social flexibility – a powerful mechanism to cope with a rapidly changing world

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In this era of rapid climate change, organisms need to be able to adapt rapidly to reduced and unpredictable food availability. Given that adaptation through evolutionary change or phenotypic plasticity is probably too slow to keep up with these changes, animals might use alternative mechanisms, such as social flexibility (i.e. individuals helping each other more to survive in adverse conditions than in benign conditions, or vice versa), to counteract these changes. Indeed, social flexibility may be a key, largely overlooked, factor that shapes an organism's adaptive capacity. We will identify when and how environmental change elicits changes in social life and how this, in turn, affects the capacity to cope with environmental variation and change, using the Seychelles warbler (*Acrocephalus sechellensis*) in an environment that is highly variable between and within seasons. Our hypothesis is that the adaptations observed in social behaviour are strategic and improve individual fitness, thereby increasing group persistence. We will test this in an experimental setting and with a demographic model, adapted to the Seychelles warbler but also applicable to other species. Our research will investigate whether social flexibility provides resilience to environmental change, exploring its short- and long-term implications on population demography and viability in response to environmental change.

Vocal Behavior and Health in Captive Humboldt Penguins

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Humboldt penguins (*Spheniscus humboldti*) face increasing threats to their populations due to human activities. As a result, captive populations play an important role in conservation efforts. This creates a responsibility to ensure optimal welfare and breeding success, which requires reliable, non-invasive methods to monitor health status. Vocalizations play a central role in penguin social communication and have recently been shown to vary with respiratory disease in hand-reared chicks of the closely related African penguin (*Spheniscus demersus*). In this study, however, we examined this relationship in adult Humboldt penguins housed in a zoo population. Vocalizations were recorded by following the penguins from a distance using a directional microphone to minimize disturbance. Preliminary analyses indicate that penguins suffering from aspergillosis vocalized less frequently than their healthy counterparts. Ongoing work focuses on assessing whether and how the disease alters the acoustic characteristics of the calls. Such information could support the development of non-invasive methods for early disease detection, enabling timely veterinary intervention and improving animal welfare.

Male Body Size Matters in Population Dynamics

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The variation in morphology between the two sexes of a given species is an important aspect of intraspecific diversity. In particular, sexual difference in body size (sexual size dimorphism, SSD) is a common form of sexual dimorphism. Since the sexes often have the same size at birth, SSD emerges during the development; therefore, it is closely linked to environment during development and many life history rates. Yet, the ecology of SSD has often been neglected in the past. Additionally, most models of population dynamics tend to implicitly or explicitly focus on female density only and do not take ontogenetic development into account, limiting their ability to accurately predict the dynamics of sexually dimorphic species. In this study, we explicitly incorporated sexes and SSD in a size-structured population model with an explicit resource. Here, the reproductive output depends on resource availability, the adult sex ratio, and sexual dimorphism which emerges from differences in sex-specific energy allocation. We demonstrated with the change in male body size, and hence change in sexual size dimorphism, leads to the change in adult sex ratio. The influence of male is present in both monogamous and polygyny mating system, although weaker in the latter. Overall, our study contributed to the existing knowledge on SSD by adding an ecological perspective.

Who is the early bird? Activity onsets in great tits from Arctic and temperate populations

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In the northern hemisphere, many animal species have been found to expand their range northward. In line with this, great tits (*Parus major*) have recently established populations above the Arctic Circle where light/dark cycles differ drastically from temperate regions. In the Arctic, these cycles are weak or absent during polar day and night, challenging the ability of great tits to keep their daily rhythms synchronised. Because light/dark cycles are the primary cues for circadian clocks, extreme light environments may impose selective pressures on timekeeping traits. Therefore, in the wild, activity patterns differ between populations, but it remains unclear whether populations have genetically adapted to local light/dark cycles or respond through phenotypic plasticity. Here, we tested if great tits from Arctic populations are more sensitive to differences in light intensity than temperate populations. We conducted a common-garden experiment in the Netherlands using 73 hand-raised great tits from nine northern European populations. We exposed birds to standardised light/dark cycles but with the addition of 0.5 lux at night to test whether they would differ in their start of activity. Contrary to our expectations, Arctic and temperate populations did not differ in activity onset. Ongoing work will test whether differences in timekeeping patterns emerge when the contrast between day and night is further reduced, mimicking the weakened light/dark cycles of the Arctic winter.

Context-specific expression of anti-predator and aggressive behaviour in female blue tits

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Female blue tits display a wide range of anti-predator and aggressive behaviours, from hissing displays involving loud broadband calls and wing fluttering to deter nest predators, to attacking conspecific intruders. Such behaviours are often repeatable and may reflect aspects of personality and impact fitness, yet it remains unclear how different aggressive and anti-predator responses relate to each other. We performed a series of behavioural assays on breeding females to quantify aggression towards conspecifics, a nest predator (woodpecker), and a human handler, as well as boldness towards a novel object, tonic immobility, and stress-related breath rate. Each behaviour was measured twice per individual to assess repeatability. Preliminary analyses indicate that although most traits are individually repeatable, correlations

among them are weak, suggesting context-specific expression of aggression and anti-predator behaviour. Join us at our poster for a sneak-peek at our preliminary results!

Experiencing Maternal Aggression Early in Life Improves Social Capacities of Juvenile Canaries

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Early-life exposure to maternal aggression (MA) can cause lasting behavioural changes. These experiences may alter competitive and social behaviours, influencing an individual's ability to navigate hierarchies and maintain group cohesion later in life. Specifically, given previous evidence of increased aggressiveness, we predicted that individuals that were exposed to MA would attain higher dominance, but that this might come at a social cost, i.e., reduced sociability. To test this, we conducted a competitive feeding task with 104 juvenile canaries (*Serinus canaria*), that were housed in groups of varying social densities. Those exposed to MA achieved higher dominance ranks in high-density groups, where competition was strongest. However, contrary to our predictions, this dominance advantage was not associated with reduced sociability as measured by social network metrics. These findings suggest that early-life exposure to MA can affect social status without impairing social capacities, and that it might, therefore, relate to mechanisms other than increased aggression. Understanding the mechanisms linking early experiences to social outcomes, such as motivation, coping styles, or behavioural flexibility, will provide insight into how early-life adversity shapes behavioural strategies across social contexts.

Sequential social information use in great tits (*Parus major*).

Clara Vinyeta Cortada, Lysanne Snijders, Chris Tyson, Kees van Oers, Marc Naguib

University of Wageningen & Research

Animals can rely on social information—by observing or interacting with others—to optimize foraging. Using social information involves three steps: acquisition, application, and exploitation, with success depending on individual traits, social dynamics, and ecological context. Distinguishing between sequential steps is key to identify the selective pressures on the users of social information. In my PhD, I study the great tit (*Parus major*), a territorial songbird that forages in groups during food-scarce winters. In the first season, I aim to 1) address which transmission mechanisms modulate acquisition of social information aboutIn my PhD, I study the great tit (*Parus major*), a territorial songbird that forages in groups during food-scarce winters. I ask (1) Which mechanisms modulate acquisition of social information about food? And (2) does dominance prevent subordinates from using social information across steps? To answer these questions, I am currently manipulating food availability at RFID feeder

sites in a Dutch forest (Westerheide), monitoring feeding patterns, radio-tracking, and analysing acoustic signals of wild great tits. I expect dominance to strongly shape how females and juveniles use social information. This project will reveal how individual variation shapes the value of social information, advancing our understanding of animal behaviour.

Adult predation shapes brain evolution in guppies (*Poecilia reticulata*)

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Predation is a powerful evolutionary force shaping many traits of prey species. As the brain is the neural substrate of all behaviours, including essential anti-predator actions, its morphology is expected to be directly shaped by predation. However, while correlative evidence supports this relationship, causal evidence of predation driving brain morphology is currently lacking. Here, we investigated how predation pressure changes brain morphology in guppies (*Poecilia reticulata*) from replicated artificial selection lines for adult predation survival. We found that after three generations of selection, predation-selected females evolved relatively larger brains, but smaller dorsal medullae compared to control fish. In males, while brain size was not affected by predation selection, predation lines showed relatively larger olfactory bulbs. These results demonstrate that predation can directly shape the evolution of brain morphology, remarkably fast and in a sex-specific manner. Comparing our findings to those from natural populations with divergent predation pressures allows us to disentangle the direct predation effects from the indirect ecological effects of high predation pressure that drive brain evolution.