ECBB 2024

Conference Booklet

16-19 July, 2024

Generated on July 17, 2024

Conference Information

Welcome!

Welcome to ECBB 2024 in Zurich!

We are excited to be hosting members and participants from the animal behaviour, behavioural ecology, and ethology societies across Europe and beyond. The next three days are full of amazing science, reflecting the rich and diverse research being conducted in our field. This year, we particularly wanted to highlight the contribution of long-term studies to the knowledge that our community produces, and to acknowledge the many people that keep these long-term studies running. It is impressive that over 25% of all abstracts submitted include long-term studies as a keyword (this was only second to "group-living and social behaviour" in terms of prominence). Abstracts are also distributed quite evenly across the classical topics in our field, including cognition, behavioural plasticity, foraging, physiology, movement, communication, cooperation, and learning. This breadth and range of topics highlights why we find behaviour such an enthralling topic of research.

We hope that you will enjoy these few days. We are excited by the scientific stimulation from seeing the latest and greatest that our field has to offer as well as the opportunity to expand our social networks and catch up with new friends. Don't forget that Zoo Zurich is offering free entry for participants after the end of the conference on Friday, which is a great place to relax and spend some time with friends.

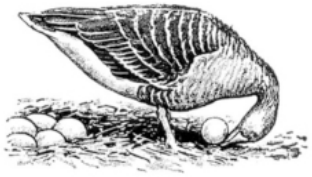
Sincerely,

The ECBB 2024 Organising Committee

zooh!
ZÜRICH

ethology
international journal of behavioural biology

Ethologische Gesellschaft e.V.



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Universität
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General Information

Registration and information: We look forward to welcoming you to Uni Zurich. Our registration desk will open at 3pm on the 16th of July, and remain open throughout the conference for your information. This will be located in Building Y22 - Floor G - outside of Room 74 (this is near the main entrance, just after the Mensa).

Coffee and tea breaks: These will be held in the main Foyer of Irchel Campus, Floor G ("Lichthof")

Lunch: Lunch will available from the upper floor of the Mensa (located near the main entrance to the Irchel campus, Floor H). Every participant will receive a voucher for one meal from either the Garden (usually vegan), Farm (vegetarian), or Butcher (meat) options. Please see this link for details of the menu, which allows filtering by dietary restrictions. Please note that drinks and other menu options are not included in the voucher (water is available free after the payment registers, or other drinks are available at your own cost). If you have a student or staff identity card from a Swiss university, please show this at the check out.

Dinners: While you can find restaurants serving food from all over the world, Zurich is known for its hearty cuisine, which includes sausages, schnitzels, bread, and fondue. There are numerous options, some in beautiful dining rooms, in the pedestrian areas of the city center. For take-away, Sternen Grill is a favourite for inexpensive Swiss classics. If you are looking for something else, then Haus Hiltl , which has been a vegetarian restaurant since 1898, is a good choice. On a tight budget? Visit a grocery store, and picnic by the shores of Lake Zurich.

Wifi: Free access through 'eduroam', or using the UZH Guest Wifi (requires a mobile phone number to receive an SMS code).

Childcare: The conference childcare is located in room Y25-G-11.

Oral presentations: Oral presentations should be 10 minutes long, which will be followed by 2 minutes of questions. Talks will need to be uploaded in the presenters room (Y22-G-74, just behind registration) at least one session prior to the alloted talk time. Please name your talk starting with your surname. Talks will be given on conference MacBooks with powerpoint and keynote installed. Please ensure that any media files work on this platform (e.g., do not use the Windows .avi format for videos). Beamers will be set to 16:9 slide format but other size formats will work as well. Please examine your presentation at this time to ensure that all elements work as expected on the conference MacBooks.

Posters: Posters should be A0 size in portrait orientation (approximately 84 cm wide x 119 cm high). Posters will be allocated a number (in the abstract booklet)—please place your poster on the appropriate board. Posters will be located in the Main Foyer of Irchel Campus ("Lichthof") (Floor G) and Upper Gallery (Floor H). Posters can be set up any time starting on Tuesday 16th July 2024. Poster attachments will be provided on the boards.

Niko Tinbergen Award: Every other year, the Ethologische Gesellschaft e.V. (EthoGes) awards the Niko Tinbergen Award to an outstanding early career researcher. Dr. Zegni Triki from the University of Bern is this year's Tinbergen Awardee and she will present her research in a plenary talk on Friday 19th July.

Poster award: PeerJ will sponsor an Early Career Researcher Award for best poster at the conference. The winner will receive a free publication in any PeerJ journal subject to peer review ($1,795 value), as well as a feature on PeerJ's blog site to discuss their research. The winner will be selected by the ECBB committee and volunteers, and announced on the final day of the conference.

Attendance confirmation: If you require a document confirming your attendance at ECBB 2024, please contact Christina Früh at christina.frueh@uzh.ch.

Transportation

Travelling within the inner zone 110 of Zurich:
What type of ticket to purchase? If you use public transport to move around Zurich, we recommend purchasing 24-hour tickets as these are valid for 24 hours from the time of purchase and allow you to travel anywhere within the according Zones as often and in any direction you wish. Also, 24 hour tickets cost the same as two single tickets, which are only valid for 1 hour.
What is my ticket valid on? Note that tickets are valid on trains (e.g. between Oerlikon and Zurich HB), trams, and buses travelling within the specified zone.
How to find my route? Google Maps has accurate schedules of public transport within Switzerland—just ensure that you have the correct zones on your ticket. Timetables can also be found on zvv and sbb websites.

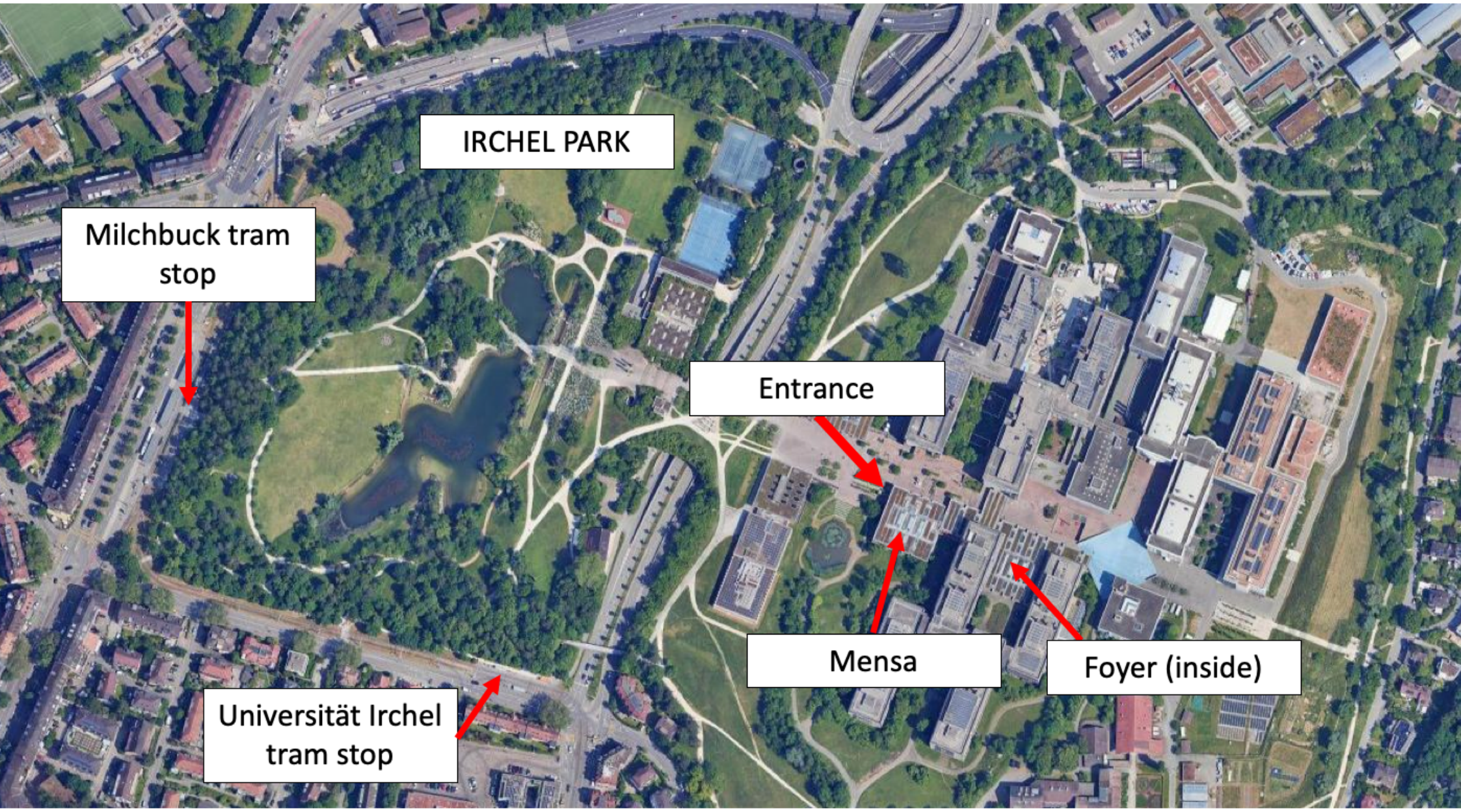
Travelling from the airport: When travelling from the airport, you need to purchase a ticket for Zones 121 and 110. Trains are frequent from the airport to Oerlikon or Zurich HB (central station). Tram 10 also services the airport (every 15-30 minutes).

Where to purchase tickets: You can purchase tickets at most tram/train stops using the machines provided with either card or coins (often not with notes), using an app (ZVV or SBB app), or online (https://ticketshop.zvv.ch/).

Travelling to Campus Irchel: Irchel is serviced by Tram 10 (to the stops Universität Irchel or Milchbuck), Tram 14 (Milchbuck), Tram 9 (Universität Irchel or Milchbuck) and Tram 7 (Milchbuck). In addition, several buses stop at Milchbuck.

Prices: Within zone 110, 24 hour tickets cost CHF 9.20 (single tickets CHF 4.60). From the airport to zone 110, tickets cost CHF 7.00 one way (CHF 14.00 return, or 24 hours).

Travelling by car: There is a parkhouse onsite ("Parkhaus Irchel"), charging CHF 3 per hour. It is possible to buy a weekly ticket for the garage/Parkhaus Irchel at the information desk at Irchel (Y-25-H-53) against cash-/card payment. The opening hours of the information desk are Monday to Thursday 07:30 to 16.00, and Friday 07:30 - 15.00. The weekly parking ticket costs CHF 55.00 for external renters.


IRCHEL PARK
Milchbuck tram stop
Entrance
Mensa
Foyer (inside)
Universität Irchel tram stop

Student social

A tradition of ECBB is for students to organise a social event on the first evening where student participants can meet one-another and socialise. Here are details of this year's student social:

Location: The social will be held in the main foyer of the university (where the poster session is being held).

Food: There are several food options nearby where participants can order food from. Details will be provided. Participants are also welcome to bring their own food.

Drinks: Drinks will be available (beer, non-alcoholic beer, apple juice, and radler), or you can bring your own.

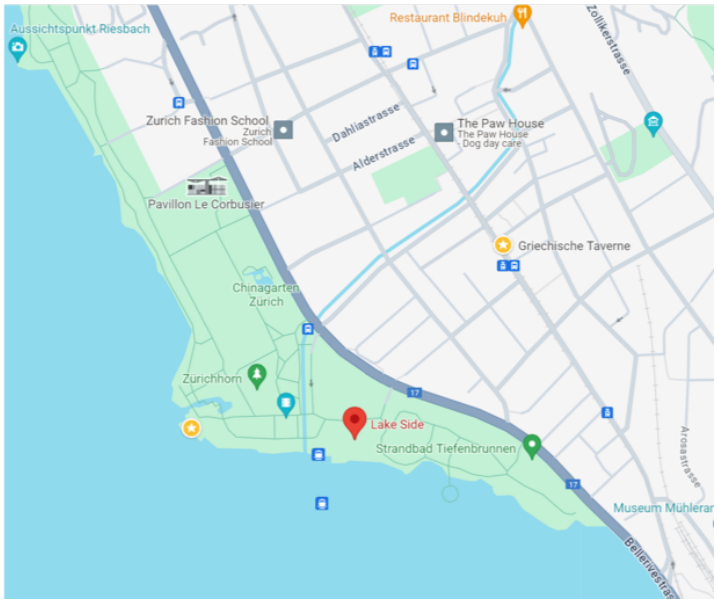
Activities: Activities will include a pub quiz and powerpoint karaoke.

Conference Dinner

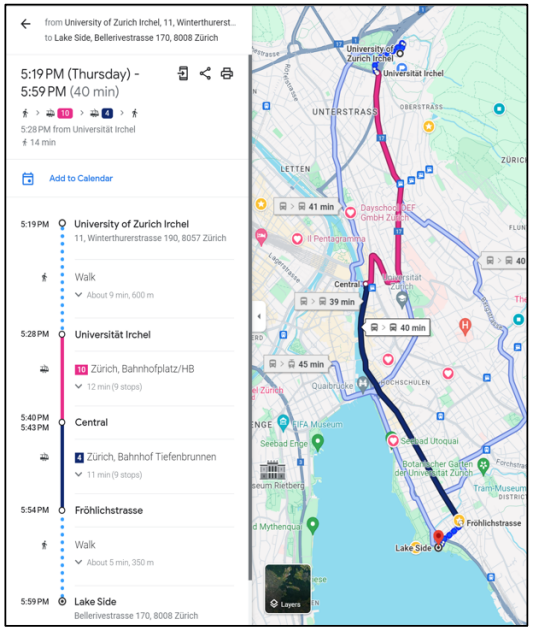
Location: The conference dinner will be held at Restaurant 'Lake Side', Bellerivestrasse 170, 8008 Zürich. The cost of the dinner is included with your registration, and includes drinks and food.

Time: An apéro will start at 18h00, with dinner service commencing at 19h00 followed by dancing for those so inclined. The dinner will finish at 23h30.

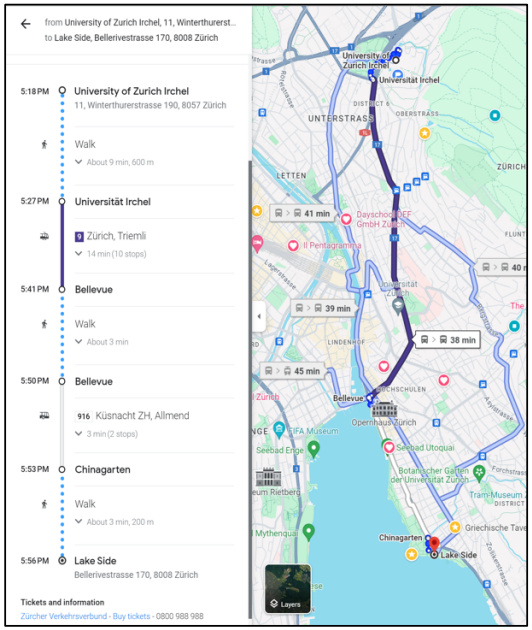
Transport: From the University of Zurich Irchel campus, the Lake Side can be reached via a variety of public transit routes, such as (non-exclusive list):
Tram 10 (from Milchbuck or Universität Irchel tram stop, direction Bahnhofplatz/HB), then TRANSFER at Central or Bahnhofplatz/HB to Tram 4 (direction Tiefenbrunnen) to Fröhlichstrasse stop, then walk 5 min
Tram 14 (from Milchbuck tram stop, direction Triemli), then TRANSFER at Bahnhofquai/HB to Tram 4 (direction Tiefenbrunnen) to Fröhlichstrasse stop, then walk 5 min
Tram 9 (from Milchbuck or Universität Irchel tram stop, direction Triemli or Heuried), then TRANSFER at Bellevue stop to Bus 916 (direction Küsnacht) to Chinagarten stop, then walk 3 min.



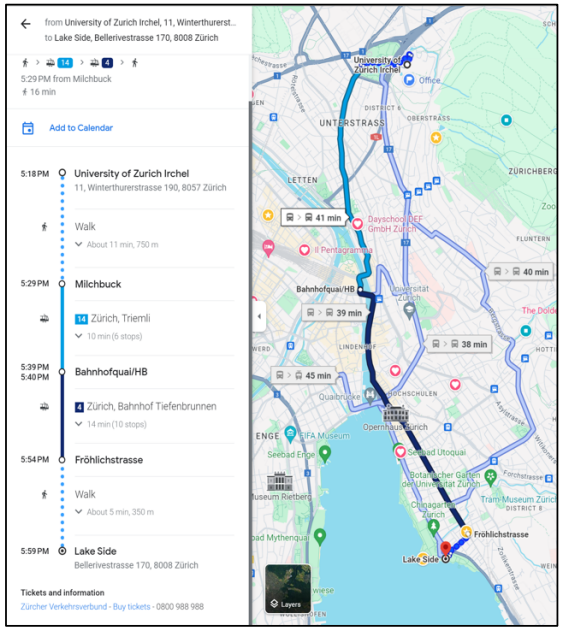
Option 1:
Tram 10 / Tram 4 route



Option 2:
Tram 9 / Bus 916 route



Option 3:
Tram 14 / Tram 4 route



Zoo Zurich

Zoo Zurich is a premier zoo facility housing over 380 species of animals in nature-like habitats such as the Kaeng Krachan Elephant Park, Lewa Savanna, and Masoala Rainforest. It is highly committed to education and research focused on preserving species and their natural habitats. The zoo supports national and international conservation programs and promotes scientific research by working closely with an international network of universities, in particular the University of Zurich.

Entry: The zoo is offering free entry from 12h30 on Friday 19th of July to participants upon showing your conference name tag and identification (children under 6 also have free entry). Please note that free entrance will not be provided for other times or dates.

Location: Zürichbergstrasse 221, 8044 Zürich.

Transport: From the University of Zurich Irchel campus, the Zoo Zurich can be reached via a variety of public transit routes, including bus 39 (direction Zoo) from Universität Irchel bus stop, trams 9 (direction Heuried) or 10 (direction Bahnhofplatz/HB) from Universität Irchel tram stop to ETH/Universitätsspital stop, then TRANSFER to Tram 6 (direction Zoo) to Zoo tram stop.

Plenary Speakers

Barbara König

Why behaviour is fun and more

Almost everybody enjoys watching animals. As scientists, we are well aware that it is important to tell apart between knowing animals, based on observations of wild, companion or domestic animals, and studying their behaviour with scientific methodology, based on hypothesis testing and raising research questions. Although the latter is fundamentally important to gain scientific insights, we nevertheless should be curious and keep our eyes open when studying behaviour. I will illustrate with a few examples from our long-term study of a population of wild house mice the complementary insights we can gain on our scientific understanding of behaviour when not ignoring naturalistic approaches.

Christina Riehl

Beyond the family: Cooperation and communication in a social bird

Cuckoos are famous for their parasitic laying habits, but not all cuckoos are parasites. Some species, including the Neotropical anis, are communal breeders, nesting in social groups with several unrelated co-breeders. Although this breeding system is unusual among birds, the study of communal nesting illuminates fundamental life-history trade-offs that shape the evolution of social behaviors across animals. How do these trade-offs influence the evolution of cooperation, and why are such breeding systems more common in the tropics than in the temperate zone? This talk will present data from a long-term field project on Greater Anis in Panama, focusing on the selective pressures favoring (and constraining) sociality, including effects of group size on reproductive fitness, mating and parental care patterns, and alternative reproductive strategies.

Tim Clutton-Brock

A short history of long term studies

Much of our current understanding of the life histories of wild mammals is based on the results of a relatively small number of long term, individual-based field studies. In this talk, I discuss the origins and achievements of long term field studies of mammals and the challenges they face. Quantitative, individual-based studies of vertebrates originated in the 1930's when the invention of durable leg rings made it possible to band large numbers of individual birds and to monitor their lives and movements. Similar studies of wild mammals faced greater challenges since catching and marking large numbers of individuals presented greater problems and they were uncommon before the 1960's. Many early field studies of mammals were of primates, followed by studies of rodents, carnivores, ungulates, elephants and whales. Several current field studies that started in the 1960's and early 1970's have now been running for more than 50 years, providing many fundamental insights into the behaviour, evolution and ecology of mammals. They have demonstrated the prevalence of age-related changes in condition, behaviour, survival and breeding success and the extent to which these trade-off against each other, emphasizing the need for estimates of individual fitness to be based on lifetime breeding success rather than on measures of performance within years. They have provided new insights into the kinship structure, dynamics and persistence of groups. They have shown how social conditions experienced by infants and juveniles and social connections between adults often have important effects on their growth, survival, behaviour and breeding success of individuals throughout the rest of the lives. They have demonstrated that many aspects of development and breeding success are heritable and that inbreeding usually has detrimental effects on fitness and is commonly avoided by individuals living in stable mixed sex goups. Their contributions to our understanding of mammalian ecology have been equally important. They have shown how contrasts in breeding systems affect the consequences of rising population density, generating positive density-dependence in some species and negative density-dependence in others. In addition, they have shown how the effects of rising population density differ between age and sex categories, with important consequences for the structure of populations as well as for their stability. And they have provided insights into the demographic consequences both of short term fluctuations and longer term directional trends in rainfall and temperature that can be used to predict the effects of future climate change on population persistence and biodiversity. Although, long term individual-based studies have produced many important insights and have supported many successful careers, they also face important challenges and the final part of this talk discusses some of these. I emphasize the need to choose species that are well suited to the particular questions that will be asked; the importance of selecting secure sites; and the benefits of involving multiple PIs so that projects are supported by more than one research grant at a time. I also suggest that we need a more realistic approach to sharing and maintaining long term data and argue that there is an urgent need for a central platform where data collected by long-term studies can be stored, curated and used by current and future generations.

Zegni Triki

Empirical Evidence from Fishes on the Relationship between Ecology, Cognition and the Brain

The topic of animal "intelligence" is currently a subject of extensive research. Animals, including invertebrates, demonstrate remarkable cognitive abilities, ranging from simple associative learning to complex strategies. Understanding the variations in brain complexity, including morphology and functionality, and how they contribute to cognitive abilities is crucial for comprehending cognitive development and evolution in animals. Fish, with their highly plastic brains, are an ideal clade for asking these questions. By studying different populations of various fish species, including those raised in labs and those caught in the wild, we were able to explore and experimentally test the brain-cognition link under different ecological conditions. In doing so, we employed an array of interdisciplinary methods and techniques to reach an integrative answer to such a broad question. The findings, so far, indicate that ecological pressures play a significant role in driving brain growth, organization, and cognitive abilities even at a relatively short ecological timescale. This suggests that these changes are a result of adaptation to the current ecological conditions, similar to how a species would evolve to adjust to its average ecology.

Conference Overview

	Tuesday 16th July, 2024	
Time	Session	Location
17h00 – 17h10	Welcome	Main lecture hall (Y24-G-45)
17h10 – 18h10	Opening Plenary (Barbara König)	Main lecture hall (Y24-G-45)
18h10 – 19h00	Apéro (sponsored by Wiley Ethology)	Foyer
19h00 –	Student social	TBA

	Wednesday 17th July 2024	
Time	Session	Location
08h50 – 09h00	Morning announcements	Main lecture hall (Y24-G-45)
09h00 – 09h15	Parallel sessions	
09h15 – 09h30		
09h30 – 09h45		
09h45 – 10h00		
10h00 – 10h15		
10h15 – 10h30		
10h30 – 11h15	Morning tea	Foyer
11h15 – 11h30	Parallel sessions	
11h30 – 11h45		
11h45 – 12h00		
12h00 – 12h15		
12h15 – 12h30		
12h30 – 12h45		
12h45 – 14h00	Lunch	Mensa
14h00 – 15h00	Plenary 2 (Christina Riehl)	Main lecture hall (Y24-G-45)
15h00 – 15h15	Parallel sessions	
15h15 – 15h30		
15h30 – 16h15	Afternoon tea	Foyer
16h15 – 16h30	Parallel sessions	
16h30 – 16h45		
16h45 – 17h00		
17h00 – 17h15		
17h15 – 17h30		
17h30 – 17h45		
17h45 – 19h15	Poster session	Foyer and galleries

	Thursday 18th July 2024	
Time	Session	Location
08h50 – 09h00	Morning announcements	Main lecture hall (Y24-G-45)
09h00 – 09h15	Parallel sessions	
09h15 – 09h30		
09h30 – 09h45		
09h45 – 10h00		
10h00 – 10h15		
10h15 – 10h30		
10h30 – 11h15	Morning tea	Foyer
11h15 – 11h30	Parallel sessions	
11h30 – 11h45		
11h45 – 12h00		
12h00 – 12h15		
12h15 – 12h30		
12h30 – 12h45		
12h45 – 14h00	Lunch	Mensa
14h00 – 14h15	Parallel sessions	
14h15 – 14h30		
14h30 – 14h45		
14h45 – 15h00		
15h00 – 15h15		
15h15 – 15h30		
15h30 – 16h15	Afternoon tea	Foyer
16h15 – 17h15	Plenary 3 (Tim Clutton-Brock)	Main lecture hall (Y24-G-45)
18h00 – 23h30	Conference dinner	Lake-side (https://lake-side.ch/en/)

	Friday 19th July 2024	
Time	Session	Location
09h30 – 9h45	Parallel sessions	
09h45 – 10h00		
10h00 – 10h15		
10h15 – 10h30		
10h30 – 11h00	Morning tea	Foyer
11h00 - 11h45	Plenary 4 (Zegni Triki, Tinbergen Award)	Main lecture hall (Y24-G-45)
11h45 - 12h00	Closing remarks	Main lecture hall (Y24-G-45)
12h30 – onwards	Free entry to the Zoo	Zoo Zurich

Speaker Timetable

Wednesday 17th July

Room:	**Meerkat** (Y24-G-55)	**Guineafowl** (Y15-G-40)	**Cockatoo** (Y15-G-20)	**House mouse** (Y15-G-19)
	Long-term studies	**Anthropogenic effects**	**Social behaviour**	**Movement and Learning**
	Chair: **Jennifer Morinay**	Chair: **Birgit Szabo**	Chair: **Elodie Briefer**	Chair: **Nishant Kumar**
09h00 – 09h15	Investigating the role of kin selection in social behaviour using genomic estimates of realized relatedness **Annika Freudiger**	An unexpected shift in resource quality affects reproduction and female condition in house mice (Mus musculus) **Anja Guenther**	Social play in common marmosets (Callithrix jacchus): function of signals to initiate and modify play **Jessie E.C. Adriaense**	Behavioral model of red deer based on a highly sensitive accelerometer and its applicability in telemetry studies **Anna Pilská**
09h15 – 09h30	Microbial Strain-Sharing as a Window into Animal Social Interactions and Population Connectivity **Amiyaal Ilany**	Wildlife response to war in Ukraine **Svitlana Kudrenko**	Sociality influences bacterial community ecology among wild Kalahari meerkats (Suricatta suricata) **Krishna Balasubramaniam**	Imprinted habitat selection varies across dispersal phases in a raptor species **Florian Orgeret**
09h30 – 09h45	Respect your elders: does age influence social partner preferences in male savannah elephants? **Helen K Mylne**	Agricultural landscapes shape roe deer behavior and their response to global warming **Noa Rigoudy**	Better together: fitness benefits of multi-level societies under harsh environmental conditions **Charlotte Christensen**	How do birds learn to cope with wind gusts during flight? **Emma Borsier**
09h45 – 10h00	Investigating the link between sociality and female reproductive success in Assamese macaques **Shivani**	All noise is not the same! The influence of traffic noise on the behaviour and stress in the greater white-toothed shrew **Sophie von Merten**	Division of labour and task specialization in cooperatively breeding vertebrates **Christoph Netz**	The importance of environmental variability for the use of social learning strategies in a passerine bird **Michael Chimento**
10h00 – 10h15	Living apart together – The social adaption of semi-free ranging Japanese macaques (Macaca fuscata) post fission **Roy Hammer**	Does artificial light at night affect early maternal investment? **Katharina Mahr**	Let's play? Family size affect object-direct behaviors in ravens, Corvus corax **Thomas Bugnyar**	Movement patterns and magnetic orientation in a glassfrog with parental care **Marina Garrido-Priego**

10h15 – 10h30	A long-term perspective revealed a highly fluid social system but also its limitations to prevent population extinction. **Luis Ebensperger**	Habitat selection of a keystone rodent species in a multiuse agro-pastoral landscape **Arnab Chatterjee**	Social ageing reduces late-life disease risk in a group-living primate **Erin R. Siracusa**	Parental early social experiences have neurodevelopmental effects on the mesolimbic reward system in offspring **Diogo F. Antunes**

	Long-term studies	**Cognition**	**Environmental change**	**Physiology and Behaviour**
	Chair: **Mina Ogino**	Chair: **Thomas Bugnyar**	Chair: **Charlotte Christensen**	Chair: **Friederike Zenth**
11h15 – 11h30	Social predictors of fitness in mountain gorillas: links between individual and group-level traits **Robin Morrison**	Primate cognition in an anthropogenic landscape: how do semi-urban vervet monkeys use their problem-solving skills? **Paige Barnes**	Birds' traits shape the phenological response to increasing temperature **Paul Cuchot**	Forty years of intra- and inter-cave temperatures and locations: implications for bat conservation **Darwin C. Brack**
11h30 – 11h45	Long-term studies of theory in animal behavior and their application to emerging questions **Grace H. Davis**	Parents matter! Early social life effects on cognition in the Tokay gecko **Birgit Szabo**	Behavioural and Ecological Dynamics of a Raptor Community over Time **Kai-Philipp Gladow**	Natural variation in the gut microbiota is associated with behavioural differences in wild mice. But does it cause them? **Alexandre Figueiredo**
11h45 – 12h00	The development of feeding behavior and information acquisition from mothers in wild Javan gibbons (Hylobates moloch) **Saein Lee**	Prior experience affects Asian elephants (Elephas maximus) response to ambiguous cues: Evidence for cognitive bias. **Sagarika Phalke**	The role of parasites in shaping foraging social networks in great tits **Salamatu Abdu**	Antibiotics in water: A potential modulator for zebrafish (Danio rerio) locomotion **Mihieka Bose**
12h00 – 12h15	Social and ecological determinants of offspring survival in Propithecus verreauxi **Peter Kappeler**	Scrambled Threat: The Role of Configuration in Predator Recognition by Untrained Birds **Ondřej Fišer**	Insights into wild boar's thermoregulatory strategies using biologging data **Justine Güldenpfennig**	Male service variation in vervet monkeys cannot be predicted by testosterone-immunity trade-offs. **Maria Granell-Ruiz**

12h15 – 12h30	Navigating independence: The development of food searching efficiency in immature Sumatran Orangutans (Pongo abelii) **Emma Lokuciejewski**	Cichlid fish pass a cross-modal recognition task with unfamiliar conspecifics **Barbara Taborsky**	Coping with changing environments: Arabian babbler reproductive response to anthropogenic change and climate variability **Alejandro Alaman**	Wild Wood Mice in Captivity: Effects on Behaviour, Physiology and Post-Release Success **Maílis Carrilho**
12h30 – 12h45	Development, inheritance, and selection shape bottlenose dolphin social structure **David N. Fisher**	Why Didn't The Chicken Cross The Road? Inhibitory Control and Learning are Influenced by Early-Life Social Stability **Kathryn Willcox**	Understanding the Impact of Arsenic on Zebrafish (Danio rerio) Fin Strokes: Insights from an Interdisciplinary Study **Tithi Paul**	Do seasonal and sex-specific variations in stress affect the nutritional ecology of a wild tropical lizard? **Avik Banerjee**

	Long-term studies	**Human-Animal interactions**	**Migration**	**Physiology and communication**
	Chair: **Andreas Berghänel**	Chair: **Sagarika Phalke**	Chair: **Hanja Brandl**	Chair: **Mathilde Martin**
15h00 – 15h15	Early adversity effects on growth in wild Assamese macaques **Andreas Berghänel**	Cuddling pigs: Disentangling wanting and liking in positive human-animal interactions **Suzanne Truong**	Understanding the development of migration patterns and flight skills in white storks **Andrea Flack**	Absence of Menzerath's Law in the submissive vocalisations of meerkats **Stuart K Watson**
15h15 – 15h30	Consequences of divergent selection for sociability on vocal communication of emotions in sheep **Avelyne S. Villain**	Cuddling pigs: brain response to being stroked after establishing a positive human-animal relationship **Océane Schmitt**	Bats migrate by surfing warm fronts ahead of bad weather **Edward Hurme**	Do you feel what I feel? A cross-institute approach to assess emotions in pigs **Liza R. Moscovice**

	Long-term studies	**Predator-prey interactions**	**Communication**	**Cognition and Cooperation**
	Chair: **Grace Davis**	Chair: **Alex Chan**	Chair: **Sophie von Merten**	Chair: **Michael Taborsky**
16h15 – 16h30	Fitness consequences of intergroup conflict **Amy Morris-Drake**	Group-Hunting in Striped Marlin (Kajikia audax) **Korbinian Pacher**	The imperceptible melody of Geogap: unravelling the acoustic network of the African striped mouse **Léo Perrier**	Animal Tool Use Origins and the Propensity for Object Combinations **Jennifer Colbourne**

16h30 – 16h45	Reproductive consequences of sexual coercion in chacma baboons **Julia A. Kunz**	Sailfish, terns and their prey: understanding associations in the open ocean **Max Licht**	Common marmosets express both emotional arousal and valence through their calls **Elodie F. Briefer**	Flirting with problems: The problem-solving skills of females affect how they choose their mates **Alexandros Vezyrakis**
16h45 – 17h00	Conflicts of interest in renewing scent recognition labels in wild cooperatively breeding banded mongoose groups **Graham Birch**	The protective value of different components of prey deimatic behaviour **Liisa Hämäläinen**	You sound familiar! Leopards discriminate between familiar and unfamiliar long-distance calls. **Rosaria Santoro**	Social Context's Role in Shaping Empathy and Decision-Making in Non-Human Primates **Shahaboddin Zarei**
17h00 – 17h15	Power in Numbers: Impact of Relative Group Size between Neighbors on Capuchin Ranging Patterns **Odd Jacobson**	Blue Tits adjust take-off performance after a simulated predation event **Kyu Min Huh**	The comparative anatomy of the mammalian larynx - implications for the evolution of vocal communication and speech **Jacob Dunn**	Individual cognitive abilities helping in path minimization and task improvement in the Gypsy ant, Aphaenogaster senilis **Snigdha Mukhopadhyay**
17h15 – 17h30	Who let the frogs out? Insights from an experimental island population **Eva Ringler**	Seasonal variation in spatiotemporal interactions among carnivores revealed by year-round camera trapping **Luca Petroni**	Does behavior predict acoustic space use across mongoose species? **Nikola Falk**	Coevolution of female fidelity and male help in populations with alternative reproductive tactics **Xiang-Yi Li Richter**
17h30 – 17h45	Sperm characteristics and testosterone levels reveal rock hyrax mating tactics **Lee Koren**	How bats keep prey in sight: integrated deployment of echolocation and flight tactics **Nozomi Nishiumi**	Hierarchy of human-generated signals in free-ranging dogs' approach decision **Rohan Sarkar**	Cost of reproduction in the clonal ant Platythyrea punctata **Piuli Shit**

Thursday 18th July

Room:	**Meerkat** (Y24-G-55)	**Guineafowl** (Y15-G-40)	**Cockatoo** (Y15-G-20)	**House mouse** (Y15-G-19)
	Long-term studies	**Animal Personality**	**Social behaviour**	**Physiology and Behaviour**
	Chair: **Benedetta Catitti**	Chair: **Tithi Paul**	Chair: **Amiyaal Ilany**	Chair: **Liza Moscovice**
09h00 – 09h15	Habitat features and social information cues influence natal dispersal decisions in a cooperative breeder **Jennifer Morinay**	The environmental and developmental drivers of consistent individual differences in behaviour in Xenopus Tropicalis. **Josie McPherson**	The role of the bill colour in signaling status: A field experiment with White-winged Snowfinches **Rolf Kessler**	Decision-making rules in food hoarding Paridae **Vera Vinken**
09h15 – 09h30	Epigenetic potential and dispersal propensity in free-living birds: a spatial and temporal approach **Blanca Jimeno**	Effects of birth timing within the breeding season on personality in a small mammal **Jingyu Qiu**	Social behaviour and the evolution of menopause in toothed whales **Sam Ellis**	Heart rate modulation and synchrony in response to cooperation and competition in human fishers hunting with dolphins **Hanja Brandl**
09h30 – 09h45	Sexual selection in a sexually monogamous species **Nicolas J. Silva**	Personality matters - the interplay between consistent individual differences and mouse welfare **Marlene Sroka**	Pollinators determine resource allocation in plant–pollinator interactions in a context-dependent manner **Manasa Kulkarni**	Role of context vs emotional state in wild meerkat alarm call production **Isabel Driscoll**
09h45 – 10h00	Integrating long-term studies of individuals: Improved generalisability in animal ecology and evolution **Friederike Hillemann**	Individual responses to capture are not predicted by among-individual risk-taking in response to predation threat **Xia Zhan**	Integration of direct and indirect genetic effects in social foraging behaviour in wild house sparrows **Corné de Groot**	Facial displays are related to affective states in domestic fowl **Delphine Soulet**
10h00 – 10h15	Genetic, Developmental and Environmental Drivers of Social Network Traits in Wild Great Tits **Devi Satarkar**	Fitness consequences of stochastic behavioral individuality in a clonal fish **Ulrike Scherer**	Task allocation in cooperatively breeding cichlids: does early life matter? **Océane Ferreira**	Understanding the alteration in zebrafish locomotion due to essential ion-overload **Srinwanti Bandyopadhyay**

10h15 – 10h30	Social information in nest-site choice of a colonial passerine **Laura Noguer Pérez**	Do personality and cognitive traits predict trapability in grey mouse lemurs? **Claudia Fichtel**	Does early life experience shape task allocation in a highly social fish? **Amélie Cocchiara**	Multi-generational effects of maternal androgen variation on vocal ontogeny in meerkats **Britta Walkenhorst**

	Long-term studies	**Cooperation**	**Conservation and behaviour**	**Foraging**
	Chair: **David Fisher**	Chair: **Océane Ferreira**	Chair: **Annika Freudiger**	Chair: **Anja Guenther**
11h15 – 11h30	The development of social attention in wild and zoo-housed orangutans: assessed via cross-sectional, longitudinal data **Paulina Kukofka**	Sibling number matters: differential social interactions during early life affect social competence later in life **Bruno Camargo dos Santos**	The influence of hunting ban areas on red deer behaviour **Thomas Rempfler**	The interlink between socio-ecological factors and cognitive development on foraging competence in wild meerkats **Tommaso Saccà**
11h30 – 11h45	Insights into the social system of wild Guinea baboons from long-term data **Julia Fischer**	Reciprocal altruism in Norway rats: a meta-analysis **Sacha C. Engelhardt**	Behaviour: The Key to Successful Management of the Little Vermilion Flycatcher on the Galapagos Islands **Sabine Tebbich**	Facial Facts: A novel and non-invasive method to study pinniped foraging behaviour **Svenja Stoehr**
11h45 – 12h00	Long-term patterns of primate food resource availability and behavior in Kibale, Uganda **Urs Kalbitzer**	Distress signal triggers individual helping response independent of social bond or familiarity in a group-living bird **Andrea Meltzer**	Outdoor recreation and hunting modulate susceptibility to human disturbance in Alpine marmot Marmota marmota **Friederike Zenth**	Foraging ecology and prey sharing among leopards – ecological and conservation implications **Teresa Oliveira**
12h00 – 12h15	Heterogeneous survival selection on spot patterns of wild Masai giraffes **Alexia Mouchet**	Division of labour in cooperatively breeding vertebrates **Michael Taborsky**	Candidate gene for humane control of invasive house mice Mus musculus alters male sperm physiology. **Salomé Friry**	Bird foraging behavior in the Anthropocene **Shana M. Caro**

12h15 – 12h30	The role of the environment in shaping extra-pair paternity rates in a small female mammal, Mus musculus domesticus **Fragkiskos Darmis**	Fitness drivers of division of labor in vertebrates **Irene García-Ruiz**	Urban raptor birdstrike mitigation gains from long-term studies on avian behavior and socio-cultural interplays in Delhi **Nishant Kumar**	How to cope with thermal stochasticity? Foraging strategies and underlying energetic requirements of thermal stress. **Chloé Souques**
12h30 – 12h45	Hibernation phenology shifts in opposite directions in two sympatric bat species in response to climate change **Jaap van Schaik**	The role of relatedness and social associations in structuring a multi-level society of a cooperatively breeding bird **Babette Fourie**	Multidimensional plasticity of phenology: Effects of density on plastic responses of breeding time to temperature **Vaishnavi Purushotham**	Studying the variability of urban vervet monkeys' (Chlorocebus pygerythrus) diet by DNA metabarcoding of faecal samples **Joey Felsch**

	Long-term studies	**Movement ecology**	**Social behaviour**	**Sex and reproduction**
	Chair: **Julia Fischer**	Chair: **Ariana Strandburg-Peshkin**	Chair: **Michael Chimento**	Chair: **Eva Ringler**
14h00 – 14h15	A natural disaster reduces relatedness among helpers and breeders in a cooperatively breeding bird **Rita Covas**	Movement responses of Alpine chamois to inclement environmental conditions **Pia Anderwald**	Social relationships shape foraging interactions and promote access to food and information in a wild corvid **Luca Hahn**	Male starlings breed in areas previously visited as floaters **Roger Fusté**
14h15 – 14h30	Behavioural basis of early-life effects on survival in a long-lived raptor **Benedetta Catitti**	Kin based spatial structure and social tolerance in a solitary mammal **Lindelani Makuya**	Social competence – what are we measuring? **Aparajitha Ramesh**	Who's daddy? Do female chacma baboons choose their male friend to mitigate female-female competition over paternal care? **Axelle Delaunay**
14h30 – 14h45	Helping beyond kinship: Social associations are related with helping interactions in a cooperatively breeding bird **André C. Ferreira**	A killer whale metapopulation in prey-induced migration-drift equilibrium? **Chérine D. Baumgartner**	Consolation behaviour in pigs: First steps towards an experimental paradigm **Alvaro López Caicoya**	Genetic evidence of mating system in diamond squid as opposed to the general beliefs **Kamrun Naher Azad**

14h45 – 15h00	Infection dynamics predicted by host sex and early reproductive decisions: a longitudinal study in the European shag **Francisco Ruiz-Raya**	Spatial Memory Strategies of a Highly Social Bird: Collective Navigation in a Complex Environment **Antonia Hürlimann**	The fractal and multilevel structure of zebra finch social networks **Yixuan Zhang**	An invertebrate establishes size hierarchies by strategically modulating its body growth **Maria Cristina Lorenzi**
15h00 – 15h15	Linking immunogenetics to tuberculosis susceptibility, progression and mortality in wild meerkats **Nadine Müller-Klein**	The role of the sun in shaping wild western gorilla movements **Benjamin Robira**	Social instability correlates with assortment by phenotypic traits in a communal-rearing rodent, Octodon degus. **Antonia Aspillaga**	Advantage females! Reversed sex roles result in positive Bateman gradients for females, males are losing out **Wolfgang Goymann**
15h15 – 15h30	Female masculinization as an adaptive trait in free-ranging house mice **Esther H.D. Carlitz**	Individuality from the lab to the wild: risk-taking ravens stay near tourist sites in a changing desert **Miguel de Guinea**	Are species-typical traits a myth? Heterogeneity within and across allogrooming networks of adult female bonnet macaques **Zakhiya PC**	**Cancelled**

Friday 19th July

Room:	**Meerkat** (Y24-G-55)	**Guineafowl** (Y15-G-40)	**Cockatoo** (Y15-G-20)	**House mouse** (Y15-G-19)
	Long-term studies	**Parental care**	**Communication**	**Collective behaviour**
	Chair: **Miguel de Guinea**	Chair: **Kamrun Naher Azad**	Chair: **Alex Kirschel**	Chair: **Lindelani Makuya**
09h30 – 09h45	Archives of Animal Movement: Historical Data Provides Insights into Behavioral Responses to Global and Demographic Change **Brendan Barrett**	Detailed insights on parental behaviour of wild jackdaws using continuous recording and computer-vision techniques **Marçal Pou-Rossell**	Good rhythm genes, vocal stability and assortative mating in birds **Alexander Kirschel**	Fine-scale tracking reveals visual field use for predator detection and escape in flocks of pigeon **Mathilde Delacoux**
09h45 – 10h00	Can we resolve the financial struggle to run long-term field sites? **Roman Wittig**	To eat or to care? Factors shaping parental or infanticidal behaviour in male poison frogs during territory takeover. **Leïla Perroulaz**	Communication and social organization of zebra finches in the wild **Marc Naguib**	ALAN (Artificial Light At Night): A possible anthropogenic hazard to alter grooming activity in prawns **Chayan Munshi**
10h00 – 10h15	YOLO-Behaviour: A simple, flexible framework to automatically quantify animal behaviours from videos **Alex H H Chan**	Two is too many: does being a single parent really reduce the risk of nest predation? **Julien Bouvet**	Social mechanisms underlying group-level vocal signatures in captive cockatiels **Stephen A. Tyndel**	Examining the drivers of fission-fusion dynamics in white-nosed coatis (Nasua narica) **Emily Grout**
10h15 – 10h30	Developing A Pose Estimation Model to Evaluate Positive Affect in Domestic Dogs during Human Interactions **Kelsey Wood**	Early onset of postnatal individual vocal recognition in a highly colonial mammal species **Mathilde Martin**	What can reptiles say about the evolution of vocal communication? **Gabriel Jorgewich Cohen**	Inequality and group instability lead to suboptimal resource partitioning by collectives **Mina Ogino**

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Talk Abstracts

The role of parasites in shaping foraging social networks in great tits

Salamatu Abdu, Andre C. Ferreira, Damien R. Farine, Hanja B. Brandl

Max Planck Institute of Animal Behaviour, University of Konstanz, University of Zurich, Department of Evolutionary Biology and Environmental Studies

In host-parasite systems, parasites can have significant effects on host behaviours like food-intake, activity. In doing so, parasites could also have severe downstream consequences at both the individual- and group-level. However, the consequences of parasites on social behaviour—at both the individual level and how individuals shape the social environment of others—have yet to be well explored. To address this gap, we investigate the effects of parasitic infection on foraging social networks in a wild population of great tits (Parus major). We generated repeated networks from 380 PIT tagged birds visiting feeders, of which 148 great tits were tested for Isospora sp. infection. We found that Isospora sp. infection impacted flocking behaviour, with infected birds being more likely to forage in larger flocks, and more central in a group, meaning that infected individuals were more likely to be connected to other influential group members. Our novel findings highlight the potential importance of parasitic infections in shaping social interactions and the social structure of populations. These social consequences of parasite infection could have important evolutionary and ecological implications.
keywords: Host-parasite interactions; Group living / social behaviour; Foraging

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Social play in common marmosets (Callithrix jacchus): function of signals to initiate and modify play

Jessie E.C. Adriaense, Erik J. Ringen, Judith M. Burkart

University of Zurich , Dept. of Evolutionary Anthropology (Evolutionary Cognition Group)

Social play requires various mechanisms to ensure success, such as communicating playful intent to avoid costly misinterpretation. Primates use many bodily expressions to regulate their social life, but the precise function of these expressions as mechanisms for play is unknown. Common marmosets are cooperative breeders and thus an appealing model to investigate collaboration such as social play. We recorded play within three families, and we identified three distinct signals and six distinct play types. We used modern statistics to model the transitions between behavioural states: our multi-state (i.e. signal, play, rest) time-to-event model takes a data-driven approach to account for uncertainty of play bout duration, avoiding arbitrary bout intervals by using probabilistic classification. The resulting classified bouts allowed us to assess the social function of signals by comparing the resulting play to a resting state baseline. We find that the presence of a signal increases the probability to play and to play more intensely, extends a play bout duration, and affects bystanders, leading to more dyads playing. Our research contributes to understanding signals as important elements in the evolution of communication.
keywords: Group living / social behaviour; Communication; Signalling; social play

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Coping with changing environments: Arabian babbler reproductive response to anthropogenic change and climate variability

Alejandro Alaman, Martha Nelson-Flower, Amanda Ridley, Lee Koren, Oded Keynan
Bar Ilan University (Israel)

Behavioral plasticity plays an important role in the ability of species to adapt to anthropogenic impacts. In arid ecosystems, habitat modification -through increased water and nutrients- may result in short-term beneficial outcomes. However, from a long-term perspective, it might lead to maladaptive selection of breeding strategies. Our previous research revealed that Arabian babblers living in modified habitats had a faster pace-of-life, higher annual productivity, and lower survival than in natural habitats. However, the fitness benefits from a lifetime perspective were unclear. Here, we used 40 years of data from 88 social groups of Arabian babblers to assess the effects of habitat modification on the demography of a cooperatively breeding species. We confirmed the benefits of habitat modification on annual fitness: groups from areas with artificial water supplies had higher fledgling productivity, survival, and recruitment during drought years. However, from a lifetime fitness perspective, individuals with a slower pace-of-life had higher reproductive success. Our results showed that an apparent beneficial behavioral adaptation to anthropogenic modification resulted in a negative outcome from a lifetime fitness perspective.
keywords: Habitat change and behaviour; Life histories; Behavioural plasticity; Anthropogenic effects

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Movement responses of Alpine chamois to inclement environmental conditions

Pia Anderwald, Sven Buchmann, Thomas Rempfler, Flurin Filli
Swiss National Park

The fastest way for animals to respond to unfavourable environments is through behavioural adaptations. Individual movement responses to different weather conditions can thus give indications of possible refuges from climate change. Using integrated step selection functions, we analysed fine-scale changes in seasonal habitat use in response to weather and time of day for 55 GPS-collared Alpine chamois in summer and 42 individuals in winter in a strictly protected area. While chamois moved to lower elevations in response to increasing precipitation, they reacted to high summer temperatures by selecting forest cover and northerly slopes. Southerly slopes were preferred in winter regardless of temperature. Steep slopes were selected as safety habitat under conditions of poor visual detectability of predators, i.e. at night, in the forest, and during periods of heavy snowfall. Chamois thus adaptively adjust their habitat use consistent with protection from both predation risk and weather extemes, and with efficient thermoregulation. Forest cover appears important as a thermal refuge during summer, and movement responses to climate change are expected to be more complex than just altitudinal shifts in distribution.
keywords: Movement ecology; Climate (change) and behaviour; Behavioural plasticity

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Parental early social experiences have neurodevelopmental effects on the mesolimbic reward system in offspring

Diogo F. Antunes, Nadia Aubin-Hort, Barbara Taborsky
University of Bern

Early -life experiences often have long-term effects on the adult phenotype, but the degree to which these effects carry over to future generations is largely unknown. In the cooperatively breeding cichlid Neolamprologus pulcher, early social experiences determine the ability of offspring to adjust their responses to social information. The dopaminergic system is involved in regulating social interactions and can be shaped by early experience. Here we asked if parental and/or own experiences lead to changes in the expression of dopaminergic receptors in two regions of the social decision-making network. F0 pairs were reared either with (+) or without (-) parents. The F1 lines either experienced the same (+/+ and -/-) or opposite early environments as their parents (+/- and -/+). In adult F1 fish, we microdissected the putative fish homologues to the medial amygdala and the nucleus accumbens and quantified the expression of drd1 and drd2 receptors. Parental early social experience affected the constitutive expression of drd1 and drd2 in the nucleus accumbens. Our results highlight the importance of parental early social experience on the neurodevelopment of their offspring.
keywords: Transgenerational effects; Behavioural plasticity; Behavioural genetics / genomics

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Social instability correlates with assortment by phenotypic traits in a communal-rearing rodent, Octodon degus.

Antonia Aspillaga, Luis Ebensperger, Loreto Correa, Loren Hayes
Pontificia Universidad Católica de Chile (PUC)

Group membership changes (social instability) can disrupt social relationships and negatively affect the fitness of group members. However, social instability may also allow individuals to assort with other more socially compatible individuals. Specifically, females may change group membership to form homophilic groups based on phenotypic traits to cooperate more effectively during offspring care. To test this hypothesis, we performed social network analysis from a 10-year database of a Octodon degus population, a communal-rearing rodent. Previous degu studies support that social instability negatively affects alloparental care and reproductive success of females, and that females form homophilic social groups based on masculinization level during offspring-rearing season. Using daytime associations during mating season, we found that some females exhibit phenotypic assortment by masculinization level with other females outside their social group. Additionally, these associations correlate with group formation during the offspring-rearing season, an observation consistent with that social instability allows females to reorganise in homophilic groups to achieve higher reproductive success.
keywords: Group living / social behaviour; Parental care; Long-term studies

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Genetic evidence of mating system in diamond squid as opposed to the general beliefs

Kamrun Naher Azad, Yutaro Maeda, Yoshiki Kato, Nur-E-Alam Md, Noritaka Hirohashi

Graduate School of Natural Science and Technology, Shimane University, Shimane, Japan, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, Bangladesh

The diamond-shaped squids Thysanoteuthis major are large, muscular, oceanic oegopsids, widely distributed in the Northern parts of Pacific and Indian Ocean. They are often found in pairs of males and females, and pairing is thought to occur initially when they are young, and engagement continues until adulthood. When females are caught, males remain looking for a missing partner. Although this romantic story sounds anecdotal, it is believed to be monogamous. However, there is no compelling evidence for their strong pair-bonding, which allows us to study the genetic basis of partnerships. We developed polymorphic microsatellite markers to estimate the paternity level of female upon mating. In this species, female received and stored sperm in the seminal receptacles (sperm storage organ) located at the ventral side of their buccal membrane. The microsatellite-based genotyping of sperm from East China sea population of Okinawa in late fishing season revealed that each female mates with more than two males, indicating that they are not committed to one partner. Each seminal receptacle of the females also showed mixed paternity. Together, the genetic evidence and pairing appearance suggest mutual promiscuity in the ocean diamond.

keywords: Reproductive behaviour; Mate choice; Sexual selection; Mating system

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Sociality influences bacterial community ecology among wild Kalahari meerkats (Suricatta suricata)

Krishna Balasubramaniam, Nadine Mueller-Klein, Alice Risely, Helen Wilson, Tim Vink, Tim Clutton-Brock, Marta Manser, Simone Sommer

School of Life Sciences, Anglia Ruskin University, Cambridge UK, Department of Population Health and Reproduction, School of Veterinary Medicine, University of California at Davis, Davis, USA

Sociality may drive gut microbial transmission, yet our understanding of the relative importance of social, environmental, and microbial factors in influencing microbial community ecology remains limited. Thus, here we assessed the effects of sociality on gut bacterial communities among eight wild meerkat groups from across three two-year sampling-periods in the Kalahari. We implemented network approaches to assess bacterial communities, and macroecological species distributions models to evaluate the relative importance of social (group membership, kinship, dispersal, dominance), environmental (temperature, disease risk), and microbe-specific (phylogenetic) factors in predicting bacterial assemblages. Bacterial communities showed nested structures: differential sharing of bacterial taxa across meerkats. Communities were also more similar among individuals within the same compared to different groups, and among closely related compared to distantly related individuals. These findings established that aspects of meerkat sociality - group membership, kinship - strongly influence bacterial assemblages. They lay a foundation for ongoing/future work disentangling the complex links between animal socio-ecology and microbial ecology.

keywords: Group living / social behaviour; Dispersal; Host-parasite interactions

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Understanding the alteration in zebrafish locomotion due to essential ion-overload

Srinwanti Bandyopadhyay, Chayan Munshi
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Understanding fish locomotion profiling can help to analyse the underlying neurological physiology which might get altered by the exposure to several abiotic or biotic neuromodulators or environmental factors. Zebrafish (Danio rerio) is a promising model to study neuromodulation. Ca2+, K+ and Na+ ions in the body are known to be established ions in the neuronal signaling transduction. The aim of this study is to elucidate if excess amount of Ca2+, K+ and Na+ ion in the aquatic medium can induce alterations in the locomotory profiling in the freshwater organism, Danio rerio. We have evaluated the vital collective movement statistics of a zebrafish population exposed to non-lethal concentrations of Ca2+, K+ and Na+, where the time kinetic data demonstrated sharp decline in the average collective velocity and average acceleration over time. A distorted pattern of the collective mobility in terms of total distance was observed. It is clear from our observation that excess concentration of Ca2+, K+ and Na+ salts may induce behavioural alterations in zebrafish. The study encompassed behavioral plasticity, movement biology, to understand the possible neuroethological perspectives behind the essential ion-overload in zebrafish.
keywords: Movement ecology; Physiology and behaviour; Behavioural plasticity

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Do seasonal and sex-specific variations in stress affect the nutritional ecology of a wild tropical lizard?

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Indian Institute of Science, India

Animals face seasonal and spatial challenges that impose different physiological demands based on their life history. Environmental stressors inflict stress responses that increase glucose metabolism, leading to the depletion of stored carbohydrates (carbon-rich). Over time, energy resource depletion requires replenishment via the active foraging of carbon-rich resources, creating new nutritional demands. Also, proteins (nitrogen-rich) get reallocated to support energetic needs, and their excess should be eliminated via feces. Using the sexually dimorphic tropical lizard species P.dorsalis, we tested whether dietary and fecal nutrient composition differences complement stress responses. We sampled blood to quantify the stress response, used gut-flushing to identify diet composition and estimated dietary and fecal nutrient makeup (Carbon:Nitrogen). The results showed that stress levels varied across seasons and sexes, whereas diet varied between seasons and sites. Despite the high variation, stress levels did not explain the dietary or fecal nutritional composition for either sex. This study provides a comprehensive understanding of the interplay between stress physiology and nutritional ecology in free-ranging animals.
keywords: Physiology and behaviour; Foraging

Primate cognition in an anthropogenic landscape: how do semi-urban vervet monkeys use their problem-solving skills?

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Urbanization presents evolutionary novel challenges for many species, and we still know very little about how anthropogenic environments impact cognitive skills. Here we explored problem-solving skills of semi-urban vervet monkeys, Chlorocebus pygerythrus, to shed light on this species' cognitive flexibility in an anthropogenic environment. Using a two-option puzzle box design with increasing levels of difficulty, we conducted over 775 field experiments with two monkey troops (N=40) at the study site of Simbithi Eco-State, KZN in South Africa. First, we investigated whether semi-urban vervet monkeys differ in their physical problem-solving abilities compared to wild conspecifics (existing data from Inkawu Vervet Project) and to what extent they need social learning to solve the puzzle (Canteloup et al, 2020). Our second objective was to examine inter-individual variability in exploration consistency or flexibility of emerging solving strategy. Our findings suggest that previous experiences with anthropogenic artefacts affect monkeys' capabilities to solve novel challenges. As such, our study contributes to the understanding in how vervet monkeys use their cognitive capabilities in an anthropogenic environment.
keywords: Cognition; Anthropogenic effects

Archives of Animal Movement: Historical Data Provides Insights into Behavioral Responses to Global and Demographic Change

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Recent proliferation of GPS technology has transformed animal movement research. Yet, time-series data from this recent technology rarely span beyond a decade, constraining longitudinal research. Long-term field sites hold valuable historic animal location records, including hand-drawn maps and semantic descriptions. Here, we introduce a generalized workflow for converting such records into reliable location data to estimate home ranges, using 30 years of sleep-site data from 11 white-faced capuchin groups in Costa Rica. Our findings illustrate that historic sleep locations can reliably recover home range size and geometry. We showcase the opportunity our approach presents to resolve open questions that can only be addressed with very long-term data, examining how home ranges are affected by climate cycles, demographic change, and within- and between- group competition using longitudinal panel data. We urge researchers to translate historical records into usable movement data before this knowledge is lost; it is essential to understanding how animals are responding to our changing world.
keywords: Long-term studies; Movement ecology; Group living / social behaviour; Methods for Studying Behavior

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A killer whale metapopulation in prey-induced migration-drift equilibrium?

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Understanding the interplay of behavior, ecology, and evolution is crucial to identify drivers of population structure in wild populations. In this study, we integrated multi-decadal sighting and predatory records of 201 North Atlantic killer whales (Orcinus orca) to investigate the role of ecological and spatial factors in genetic structuring. Assessing genome-wide SNP genotypes for historic and contemporary gene flow, we test if differing prey sources drive genetic structure or, if overlap in the range of different prey stocks facilitates gene flow. We report a widespread North Atlantic metapopulation connected by sporadic gene flow. We identify spatio-temporal effects of varying prey distribution on mating patterns. Killer whales with differing dietary preferences did not genetically segregate. This is a significant deviation within a species renowned for its stringent social structure and genetic differentiation among sympatric prey specialists elsewhere. Our study highlights the crucial role of resource dynamics and foraging ecology in shaping population structure resulting in intraspecific variation and the importance of considering large-scale ecological factors in understanding population connectivity in marine predators.
keywords: Movement ecology; Habitat change and behaviour; Foraging; Population structure

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Early adversity effects on growth in wild Assamese macaques

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Early adversity causes long-term effects on health and behaviour throughout lifetime in a wide range of animals including humans. Fuelled by partially opposing results, there remains a debate about whether early adversity merely causes deficits and developmental constraints or also programming effects, and whether such programming effects would be adaptive. Concepts of adaptive developmental plasticity are embedded in life history theory and predict a faster pace of life and thus faster growth and development under adverse conditions, with stronger effects in females than in males. We used a long-term dataset on 70 wild Assamese macaques (Macaca assamensis) covering growth, hormonal and food availability data. This allowed us to investigate pre- and postnatal adversity effects on growth at different developmental stages in high detail. We found accelerated growth following early adversity and that this effect was stronger in females than in males, suggesting adaptive developmental plasticity. However, this effect was found for prenatal adversity only, whereas postnatal adversity was only associated with developmental constraints in terms of reduced growth, which likely explains a large portion of the current ambiguity.
keywords: Life histories; Transgenerational effects; Long-term studies

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Conflicts of interest in renewing scent recognition labels in wild cooperatively breeding banded mongoose groups

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Scent is widely used in social groups to recognise cooperators, but to function the group scent must be maintained the social dynamics of which have received little attention. We instigated allomarking behaviour in 3 wild banded mongoose groups by removing and returning group members. We hypothesised allomarking by the group should prioritise high public good returning focals, and hypothesised conflicts of interest between group members to allomark depending on variation in their perceived value of the returning focal. Prioritisation of public good was supported by biasing of allomarking towards returning reproducing females and carers who are critical to the groups future. The instigators of allomarking also reflected variation in the perceived value of returning focals with higher allomarking probabilities by the main reproducers, the oldest, who's offspring's survival depends on repatriating cooperators. Females also biased allomarking towards males, their potential future mates. Lastly, there was less allomarking during times of heightened within-group conflict, suggesting costly transfer of alien scent back to the allomarker. Two-way transfer of scent has consequences for adaption of allomarking that deserve exploration.
keywords: Long-term studies; Signalling; Cooperation

How do birds learn to cope with wind gusts during flight?

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Flight is the most complex form of locomotion found in the animal kingdom, as it requires considerable motor control and energy expenditure. Many birds are highly agile and skilled flyers but, despite recent technology advances allowing high-resolution tracking of birds during flight, how they acquire complex flight behaviours remains poorly understood. In particular, few studies have investigated how birds learn to cope with wind gusts and avoid collisions in high-risk scenarios. We investigate the effect of early life experience in juvenile zebra finches on their ability to cope with a sudden tail wind during a perching task. Using a motion capture system, a fan to generate controlled wind conditions, and a target perch fit with a force balance sensor, we captured landing flights in 40-days-old zebra finches which were either naive to wind or had been reared in windy conditions. We find that, after repeated attempts, all birds converged towards a stereotypical sideways manoeuvre to land safely in the presence of wind, but naive birds had a lower initial success rate than birds which had prior experience coping with wind.
keywords: Learning; Movement ecology

Antibiotics in water: A potential modulator for zebrafish (Danio rerio) locomotion

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Locomotion is the most robust behaviour in zebrafish (Danio rerio), which can potentially signal biochemical alterations in aquatic environments. Currently, water bodies are facing the hazard of antibiotic pollution which is responsible for causing diverse pathophysiological outcomes and aquatic organisms are facing the direct brunt. We aim to investigate the alteration in zebrafish locomotion under ciprofloxacin treatment (widely utilised antibiotic for treating enteric fever) in a time kinetic manner. The overall collective locomotory statistics exhibited inconsistent patterns. Average cumulative velocity increased initially and declined afterwards, while the average cumulative acceleration displayed an erratic up-down pattern with sudden decline. The rate of mobility remained fairly persistent followed by a sharp upsurge. However, the distance traversed by the organisms was extremely irregular, declining abruptly. This study signifies the role of behavioural (locomotory) changes instigated by antibiotic exposure. Though locomotion is robustly regulated by neuronal control, yet as enteric antibiotics like ciprofloxacin may manipulate the gut microbiome-brain axis, thus regulating the behavioural manifestations.
keywords: Movement ecology; Pollution and behaviour; Physiology and behaviour

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Two is too many: does being a single parent really reduce the risk of nest predation?

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Offspring predation is one of the main drivers of reproductive failure in species using nest, burrow or den, thus promoting the evolution of inconspicuous parental care strategies. The frequently cited Skutch's hypothesis (1949) predicts that nest activity should decrease as a response to an increased predation risk. This has since been repeatedly invoked to explain the evolution of uniparental care strategy, since biparental species are expected to be more conspicuous due to regular change-overs between the parents. Surprisingly, this verbal model has never been rigorously tested. To assess its validity, we built an analytical model estimating survival probability of both strategies. In a wide range of parameters, despite higher instantaneous risk of nest detection, biparental care is a sensible strategy to mitigate predation risk because it allows for longer recess and less frequent movement at nest. Even extraordinarily conspicuous nest activity in the biparental strategy is not sufficient to explain the evolution of the uniparental strategy. Without completely dismissing this hypothesis in some ecological contexts, we advocate greater caution when invoking predation to justify the evolution of uniparental over biparental care.
keywords: Parental care; Predator-prey interactions

Forty years of intra- and inter-cave temperatures and locations: implications for bat conservation

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Early studies characterized hibernacula microclimates for the endangered Indiana bat (Myotis sodalis), as cold locations (2–5°C) close to cave entrances, inferring colder temperatures are better and most used. We completed 40 years of intracave hibernacula surveys, encompassing time before and after advent of the disease white-nose syndrome (WNS). We documented locations and temperatures used by hibernating bats. Bats hibernated in long and short caves, with a small vertical increase to large vertical decreases, using a continuum of temperatures (0–11°C), but commonly 5–9°C. Intercave changes were large over time: hibernacula went from the largest to smallest and small to largest. Pre- and post-WNS populations varied by latitude. Cave conservation is integral to species recovery. While the notion of an optimal hibernaculum temperature is attractive, these data indicate that much of our initial understanding of microhabitat use came from stressed populations, many in refugia. Updating our understanding of physiological ecology of hibernation is central to conservation. Learning to regulate thermal regimes of large voids (e.g., mines) to create hibernacula, while avoiding creating ecological traps, will be an iterative process.
keywords: Physiology and behaviour; Conservation and behaviour; Behavioural plasticity; Hibernation ecology

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Heart rate modulation and synchrony in response to cooperation and competition in human fishers hunting with dolphins

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In southern Brazil, artisanal net-casting fishers are cooperating with wild bottlenose dolphins to catch migratory mullets. In this interaction, dolphins herd fish schools towards fishers and perform a cue that signals the right moment for fishers to cast their nets, which helps both fishers and dolphins to catch more fish. This unique system provides us with an unprecedented opportunity to study the ecophysiology of predators in a complex predator-prey system. We have deployed heart rate loggers to simultaneously collect high-resolution ECG data from up to 20 fishers to understand the links between predator experience, foraging performance, and cooperative and competitive interactions, and how this is modulated by the group. We show that experience helps fishers maintain lower heart rates in the anticipation phase before casting their nets. Less experienced fishers show signatures of stress when many fishers are present, increasing the level of competition. Lastly, the heart rates of groups of fishers becomes more synchronised when they are together for longer and further increases with the presence of dolphins, which may be linked to creating shared anticipation in the group.
keywords: Group living / social behaviour; Physiology and behaviour; Human behavioural ecology

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Common marmosets express both emotional arousal and valence through their calls

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Vocal expression of emotional arousal (bodily activation) and valence (pleasant vs unpleasant) has been highlighted in many non-human species with limited control over vocal production. Whether emotion-related changes are also widespread in species with more vocal control remains unknown. Common marmosets are cooperative breeders with voluntary vocal control abilities. Here, we capitalise on a previous experiment, where marmosets were placed in various contexts of positive, neutral and negative valence. We investigated the effect of arousal (nasal temperature change), valence (positive, negative or neutral), and context (5 contexts) on the structure of phee (long-distance contact) and egg calls (vigilance). Overall, phee parameters were affected by all three factors (arousal, valence and context), while egg parameters were only affected by the arousal and context, with strong differences between sexes. In addition, support vector machines could more accurately classify phees based on valence than arousal, while the opposite was true for eggs. Overall, this suggest that information on both arousal and valence are contained within phees, while eggs mostly communicate about arousal.
keywords: Acoustic communication; Signalling; Cooperative breeding; Emotions

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Let's play? Family size affect object-direct behaviors in ravens, Corvus corax

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Life in structured social groups requires differentiated responses to individuals, depending on their identity, sex, age, or social network position. Ravens engage in variety of social behaviors, including third-party interventions. We often see consistency within but considerable variation between individuals in the expression of these behaviors, indicating differences in social competence. We here investigate experimentally whether the early social environment is a critical period for developing such competence. We manipulated the offspring number of captive raven pairs (n=10) across 4 years and tracked the development of the young (n=66) when growing up in small or large families. One of our foci was on object play. We exposed raven families to standardized playgrounds, testing the prediction that family size positively affects the offsprings' object play. We find that ravens from small families engage more in individual and joint object play, whereas ravens from large families tend to be interested in others' play. Overall, our results confirm that offspring number affects the individuals' social experiences when growing up. How those experiences relate to socio-cognitive skills expressed later in life is under investigation.
keywords: Group living / social behaviour; Behavioural plasticity; Learning

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Consolation behaviour in pigs: First steps towards an experimental paradigm

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Understanding how animals respond to stress within their social groups offers valuable insights into the evolutionary development of emotional capacities. In animal models, consolation is typically defined by increases in affiliative interactions towards a stressed conspecific that help to mitigate their stress. In a study involving 75 pigs housed in social groups, we explored social interactions during two experimental conditions: Reunion and Release. In Reunion, each pig experienced a 10-minute isolation in a separate room before being returned to their group. In Release, each pig was temporarily confined in an adjacent compartment where they had visual and auditory contact with group members, who could release them by opening a door. There were no differences in latencies or in total amount of affiliative contact given and received post-isolation in Reunion, where group members had not observed the past distress of the isolated pig. However, in Release, where the group members could observe the separated pig, Released pigs were quicker to receive affiliative social contact than to give it, and also received more affiliative contact than they gave. These patterns suggest the potential for consolation behaviour in domestic pigs.
keywords: Group living / social behaviour; Communication; Signalling

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Female masculinization as an adaptive trait in free-ranging house mice

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Female masculinization refers to the development of male-typical behavior or physiology, described for humans and other mammals. It is expressed in elongated anogenital distance (AGD) and was considered a maladaptive byproduct when laboratory studies found that female masculinization is driven by excess maternal stress, corticosterone, testosterone, and by developing in male biased litters. To analyze its potential adaptive function, we studied a population of free-ranging house mice (Mus musculus domesticus) exposed to natural seasonality and fluctuating population density over 13 years. We first analyzed in >4000 females whether and how parental or environmental factors (population density, season of birth) drive female masculinization, measured as AGD at weaning. We then investigated the impact of varying AGD on life-history traits (weaning weight, hormonal status as adult, survival) and reproductive output (reproductive success). We found that environmental factors drive AGD in unpredicted ways and that elongated AGD is beneficial for a female's growth and reproductive performance during high population density, signaling high reproductive competition. We therefore suggest that masculinization of female house mice is adaptive.
keywords: Long-term studies; Life histories

Bird foraging behavior in the Anthropocene

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Humans have significantly impacted birds' habitats, inducing changes across many aspects of behavior including foraging. Urban and suburban birds now forage on human-derived foods, including bird seed at feeders and ultra-processed foods from the garbage. In humans, ultra-processed foods can be addictive. It is unknown whether birds show a similar predilection for ultra-processed foods, nor how exposure to human-derived processed foods impacts avian dietary preferences. We compared birds' foraging at a suburban college campus, with higher exposure to processed foods, and a bird sanctuary, with lower exposure to processed foods. We experimentally provided unprocessed food (bird seed), minimally processed food (dry-roasted peanuts), and ultra-processed food (peanut butter protein bars). We found that birds, primarily Passer domesticus, at both sites preferred unprocessed food. Yet, birds at the campus site did show a stronger preference for the processed foods than sanctuary birds. These results suggest that while birds prefer natural foods, they are flexible and will exploit processed foods. This snap-shot study suggests several possibilities for long-term field studies on changes in birds' diets across an urbanization continuum.
keywords: Urban ecology; Foraging; Anthropogenic effects

Wild Wood Mice in Captivity: Effects on Behaviour, Physiology and Post-Release Success

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Wild mice are often brought to captivity for research. The exposure to new stimuli in a laboratory environment may affect the behaviour and physiology of wild animals, and possibly, their post-release success. Our aim was to analyse the adjustment to captivity of wild-caught wood mice (Apodemus sylvaticus) and evaluate its effects on post-release success. For two studies, animals were trapped in the wild and kept in an animal facility for 30 days. For the first study, mice were kept under standard conditions and tested weekly, to assess changes in behaviour and hormonal stress response over time. For the second study, two groups of mice were kept under two different caging conditions (standard vs. more natural) and tested weekly for differences in risk assessment behaviour, stereotypies and body condition. After release, animals were followed during four recapture sessions over one month. We found that captivity decreased animals' stress levels and increased their stereotypies over time. Moreover, more natural caging conditions delayed the adjustment to laboratory but did not prevent it. Caging conditions did not influence post-release success. We conclude that for short-term captivity, a more natural caging can be advisable.
keywords: Physiology and behaviour; Movement ecology; Animal personality

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Behavioural basis of early-life effects on survival in a long-lived raptor

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Early-life conditions significantly shape later social behavior, but the fitness consequences of such behavioral early-life legacies are unclear. We analyzed the fate of 187 juvenile red kites Milvus milvus with known early-life legacies in social behavior by using multi-year GPS-tracking to clarify the mechanism by which early life conditions affect survival. Increased social encounters in individuals reared in favorable conditions correlated to increased proximity to roads, resulting in elevated collision risks and lower annual survival rates. This suggests that social individuals of this facultative scavenging species show an increased preference for scavenging—a risky but cost-effective form of foraging. Our results indicate that behavioral phenotypes arising from early-life conditions can negatively affect survival. However, the expected chain of "silver spoon" effects can be reversed as a result of anthropogenic changes and thus, generating an ecological trap. Our work contributes to the understanding of the multiple downstream effects of early-life conditions and identifies an anthropogenic disruption of the functional chain, both with important consequences at the population level.

keywords: Long-term studies; Behavioural plasticity; Anthropogenic effects; Foraging

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YOLO-Behaviour: A simple, flexible framework to automatically quantify animal behaviours from videos

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Coding behaviors from videos has become essential in animal behaviour studies, yet it is often labour-intensive, especially when monitoring long-term populations. Recent development of computer vision tools has provided opportunities to automatically quantify behaviours, either supplementing or replacing manual efforts. However, widespread adoption of these methods is still limited, largely due to the lack of annotated training datasets and the domain-specific knowledge required to optimize these models for animal research. Here, we present YOLO-Behaviour, a flexible framework for identifying visually distinct behaviours from video recordings. The framework is robust, easy-to-train, and requires minimal manual annotations as training data. We will first outline the pipeline, followed by case studies in quantifying ethograms and activity budgets in pigeons, zebras, and giraffes, as well as in event detection in house sparrow provisioning, siberian jay feeding, and human eating behaviours. These case studies illustrate the method's flexibility in objectively quantifying behaviours across diverse species and behavioural contexts, highlighting its potential in enhancing the automation of video coding in animal behaviour research.

keywords: Methods for studying behaviour; Long-term studies; Computer Vision

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Habitat selection of a keystone rodent species in a multiuse agro-pastoral landscape

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The Thar desert in India, one of the most densely human-populated desert with largest human footprint, experiencing immense land use and cover changes due to unrestrained livestock grazing and intensive unsustainable agriculture. We surveyed 650 sq.km habitat of Indian desert gerbil Meriones hurrianae to assess the impact of anthropogenic threats on the ecology of this important native prey species. The survey revealed that this keystone rodent prefers 'agricultural lands with native vegetation' and 'grass-shrub mixed natural landscape' over 'previously cultivated lands'. Presence of predators and food-shelter producing plats like Capparis decidua, Citrullus colocynthis, Haloxylon salicornicum act as the positively correlated habitat variables for the gerbil presence. Though grazing by livestock on the grasslands dominated by perennial tussock grass helps gerbils to thrive, acts as a negative covariate in the shrub dominated lands. This diurnal species prefers open habitats with sparsely distributed shrubs and avoids dense perennial grasslands. Open habitats help this species to vigil the predators, construct burrows to avoid heat and an unimpeded retreat to its burrows after detection of a predator.
keywords: Anthropogenic effects; Habitat change and behaviour; Plant-animal interactions; Impacts of land use and cover changes

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The importance of environmental variability for the use of social learning strategies in a passerine bird

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Cultural behaviors spread through direct social contact. Processes like immigration change contact patterns, and therefore might either slow or hasten the spread of cultural behavior, or even change the evolutionary direction of culture. Furthermore, immigrants may choose to rely on social information when faced with environmental uncertainty. We present the results of two large-scale captive experiments that explore how immigration impacts cultural foraging behavior in great tits (Parus major). In the first experiment, we simulated turnover, or the regular replacement of individuals in a social group. Naive birds drove the adoption of a more efficient foraging behavior, hastening adaptive cultural change. We then conducted a second experiment that simulated immigration between populations of birds that had learned opposing foraging strategies. We found evidence that an increased sensitivity to social information, and payoff-biased social learning could account for immigrant birds' adoption of resident preferences when faced with spatially variable cues and rewards. Taken together, these two studies emphasize the important, yet understudied role that immigration plays for animal culture.
keywords: Animal culture; Migration; Behavioural plasticity

Better together: fitness benefits of multi-level societies under harsh environmental conditions

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Multi-level societies (MLSs) are social systems in which stable groups preferentially associate with other stable groups. It has been proposed that MLSs are linked to harsh environments, where the benefits of forming higher tiers include sharing resources, pooling information, and protection from predators or conspecifics competitors. While these benefits should lead to improved survival, this ultimate link has not been demonstrated in MLSs. Here we use a long-term dataset of movement from GPS, behaviour detected via accelerometers, and survival quantified from daily censuses in a wild population of vulturine guineafowl (Acryllium vulturinum) in Kenya to show that the expression of higher tiers under extended dry seasons translates to improved survival chances. Dry seasons are characterized by lower food availability, driving the birds to increase foraging efforts and search for food in unfamiliar areas, exposing them to higher predation risk and temperatures. This is reflected in body-mass loss and a fourfold increase in predation rate. We find that individuals that aggregate in larger groups are more likely to survive these challenges, demonstrating that forming higher tiers buffers individuals from harsh conditions.
keywords: Habitat change and behaviour; Collective animal behaviour; Behavioural plasticity

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Does early life experience shape task allocation in a highly social fish?

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During early development, many species learn behaviours shaping their future phenotype and fitness. In social species, individuals benefit from learning appropriate behaviours in the group to reduce aggression. Neolamprologus pulcher is a cooperatively breeding cichlid in which helpers aid the dominant breeders to rear offspring by performing duties such as defending against predators and maintenance. Despite the size-based division of labour among helpers, they can generally perform all tasks, and thus task specialisation remains unclear. Early-life experience modulates the development of helping phenotypes, which suggests it should influence task allocation in later life. We investigated task allocation of helpers raised under two early-life conditions: either by letting them engage in defence against an egg predator; or by exposing them to the need for maintenance. We tested task sharing at the age of 1 year by exposing two helpers, one of each treatment, to both stimuli simultaneously. We tested whether helpers will divide the work according to their early life experiences. We discuss how our results provide insights into behavioural development and social organisation in cooperatively breeding cichlids.
keywords: Behavioural plasticity; Cooperation; Cooperative breeding

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What can reptiles say about the evolution of vocal communication?

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A broad perspective on the phylogenetic distribution of sophisticated communicative abilities has been limited to studies primarily focusing on species that have similar behaviours and vocal abilities to the ones found in humans (i.e., mammals and birds), ignoring relevant groups such as non-avian reptiles. Many species with different ecological specializations are often treated as "non-social"/"less complex", unable to produce behaviours commonly conceived to be special to a handful of mammals and birds. Most of the species commonly treated as having less complex vocal communication skills (e.g., vocal flexibility and learning) were, in fact, never studied, and are treated so based on misconceptions that rely on a scala naturae view of diversity and evolution. In fact, studies that focused on comparative approaches with a more inclusive taxonomic sampling have provided tantalising evidence that various traits associated to acoustic communication might indeed be homologous. Therefore, in order to better understand the evolutionary origins and emergence of vocal flexibility, studies on poorly understood groups of animals are fundamental to forward this field of research. Here, we focus on the vocal abilities of a turtle species.
keywords: Acoustic communication; Behavioural plasticity; Learning

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Animal Tool Use Origins and the Propensity for Object Combinations

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It has long been clear that there is something fundamentally different between a digger wasp pounding a burrow closed with a stone in a stereotyped fashion, and a chimpanzee making and using a set of tools to fish for termites. However, strong dichotomies that have divided tool using as "learned/instinctive", "intelligent/context-specific," or "flexible/stereotyped" have limitations for understanding the evolutionary origins or making meaningful comparisons between species, as evidence accumulates that few species fit neatly into either category. Rather, we propose that tool use is a spectrum, and that the onset of that tool use is determined by a species' propensity for making object combinations. How specialized these combinations are determines where on the spectrum these species fall.
keywords: Tool use; Cognition

A natural disaster reduces relatedness among helpers and breeders in a cooperatively breeding bird

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Climate change is increasing the frequency of natural disasters, and understanding the social consequences of these events, and whether animals might present flexible strategies to cope with them, is therefore increasingly important. In 2021, a devastating fire destroyed 15 out of 24 sociable weaver colonies that were part of a long-term study in South Africa. These weavers are colonial cooperative breeders and the fire created massive immigration and increased competition at the surviving colonies. We used this event to investigate the effects of forced immigration on social strategies by comparing breeding group composition and genetic relatedness before and after the fire. We found that pre-fire groups were strongly family-based, but there was a significant decrease in relatedness between helpers and breeders and among colony members post-fire. Our results suggest a mechanism where outside individuals become helpers in exchange of direct benefits of group membership and, overall, indicate that flexibility in forming bonds with foreign individuals plays a central role in successful immigration.

keywords: Long-term studies; Cooperative breeding; Climate (change) and behaviour

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Birds' traits shape the phenological response to increasing temperature

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Rising temperatures are a major cause of phenological advancement. Phenological plasticity, the ability to adjust breeding timing in response to increasing temperature, varies significantly between species. The origins and consequences of such variations are still poorly understood. Unraveling the origins of these variations could help us predict species' vulnerability to climate change and provide insights into the evolution of plasticity. Based on a two-decade-long, Europe-wide, capture-based monitoring of the reproduction of common songbirds, we investigated the influence of species traits (migration distance, northern breeding latitude, number of broods per season, body mass and trophic level) on phenological plasticity in 50 species. For this, we performed a two steps analysis by 1) building a hierarchical model estimating fledging phenology and its response to spring temperatures for each species (i.e., phenological plasticity), and 2) examining the impact of evolutionary history and life history traits on species specific plasticity. This approach provides valuable insights into the adaptive responses of bird populations to climate change and sheds light on the factors shaping phenological variability among species.

keywords: Climate (change) and behaviour; Behavioural plasticity; Long-term studies; Phenological plasticity

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The role of the environment in shaping extra-pair paternity rates in a small female mammal, Mus musculus domesticus

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While multiple mating has been considered positively associated only with male fitness, polyandry and extra-pair paternity are taxonomically widespread, with research revealing their functional benefits for females, e.g., when confusing paternity reduces infanticide. However, evidence of fitness benefits of extra-pair paternity remains equivocal, and one reason may be that environmental heterogeneity, which can mask the covariance between life-history and fitness, is neglected. For example, a transition from high-quality to poor environments could increase extra-pair paternity rates as a bet-hedging strategy. To address this caveat, we tested how a difference in environmental quality affects the occurrence of extra-pair paternity. We detected that the environment plays a crucial role in extra-pair paternity patterns and that, across environments, females with extra-pair paternity had higher overall fitness. Our results reveal the (neglected) role of environmental heterogeneity in the proximate and ultimate causes of multi-mating behaviour.
keywords: Long-term studies; Climate (change) and behaviour; Mate choice

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Long-term studies of theory in animal behavior and their application to emerging questions

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The field of animal behavior is founded on classical theories. As these theories have been applied across many contexts and questions, they have become long-term studies in their own right. One such long-term theory is optimal foraging, which provides useful predictions of how animals exploit resources in their environment. The clear and measurable currencies in optimal foraging theory–energy and time–facilitate comparisons across organisms and different environmental conditions. We discuss how concepts derived from optimal foraging theory can be applied to new questions in the field of animal behavior—specifically how groups make collective decisions and who initiates group movements. We then combine these social optimal foraging models with long-term field studies to explore predictions associated with within-group conflicts about who leads. We show how optimal foraging theory models (like the marginal value theorem) can predict the emergence of larger groups even when environmental conditions would otherwise suggest groups should experience high within-group competition. By formally linking optimal foraging theory to collective behavior, we generate theoretical insights and predictions that are readily testable in the field.
keywords: Long-term studies; Collective animal behaviour; Group living / social behaviour; Foraging

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Fine-scale tracking reveals visual field use for predator detection and escape in flocks of pigeon

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During collective vigilance, animals are believed to compromise feeding time to be vigilant against predators, subsequently benefiting the group. However, a key issue is how vigilant individuals use their vision to perceive predator cues in their environment, more particularly with regards of their high-acuity regions (such as the fovea) and how it eventually leads to individual and collective escape. We tracked the head and body movements of pigeons using motion capture technology during simulated predator attacks, enabling the reconstruction of their visual field and foveal projections. Pigeons used their fovea to inspect predator cues, with earlier foveation linked to vigilance and feeding related behaviors before the predation event. Early foveation also predicted quicker evasion flights, both individually and collectively. However, a relatively long delay between foveation and escape responses obscured this relationship within individuals. While our findings largely support assumptions about vigilance, they highlight the importance of considering vision and addressing the gap between detection and escape responses in future studies.
keywords: Collective animal behaviour; Predator-prey interactions; Cognition; Sensory ecology

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Who's daddy? Do female chacma baboons choose their male friend to mitigate female-female competition over paternal care?

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Paternal effort is common in pair-bonded mammals where males have high paternity certainty, and thus direct fitness benefits. In promiscuous primates, despite lower paternity certainty, friendships between males and lactating females may also represent paternal effort, by protecting from aggression by conspecifics. Yet, mismatches between male friends (i.e., behavioural fathers) and genetic fathers are frequent, likely due to errors in paternal kin recognition. Here, we test if mismatches may result from female-female competition over paternal care using 18 years of long-term behavioural and genetic data from a wild population of chacma baboons (Papio ursinus) in Namibia. We assigned paternities using 16 microsatellite loci, and friendships using patterns of grooming and association. We identified mismatches between genetic and behavioural fathers in 28 out of 63 cases (44%). Using GLMMs, we test if (i) mismatches are more frequent when genetic fathers have other higher-ranking female friends simultaneously, (ii) lower-ranking females consequently associate with non-genetic behavioural fathers that have fewer other female friends, and (iii) mismatches between genetic and behavioural father impacts infant survival and development.
keywords: Reproductive tactics; Parental care; Long-term studies

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Role of context vs emotional state in wild meerkat alarm call production

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How animals process the world around them and the influence this has on their emotional states and vocal responses remains somewhat of a black-box. Much of the research into animals' perception and emotional reactions relies on assumptions regarding emotional states. Here, we aimed to take a more objective measure of emotions, namely heart rate, as a correlate of arousal, to investigate how emotions relate to external contexts and subsequent vocalisations. Meerkat, Suricata suricatta, alarm calls vary based on predator type (aerial/terrestrial) and urgency (low/high). Whether urgency encoding communicates features related to external context or the producers emotional state remains unclear. We used predator presentations to investigate variation in meerkats' alarm call acoustic structure. Testing whether alarm calls varied only with external context through predator distance; or to the emotional arousal state of the producer, indicated by heart rate, which can be related to but not solely dependent on external context.
keywords: Acoustic communication; Physiology and behaviour; Communication

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The comparative anatomy of the mammalian larynx - implications for the evolution of vocal communication and speech

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Understanding the evolution and ecology of vocal communication requires detailed knowledge of sound production mechanisms. However, the anatomy and physiology of animal vocal production remains little-studied compared to that of the human voice, partly due to the challenges of acquiring specimens. Here, we present a novel database of micro-CT scanned larynges from >100 different mammalian species, representing a wide range of body sizes. Using phylogenetic comparative methods, we demonstrate that the primate larynx has evolved particularly rapidly, resulting in a pattern of larger size and increased deviation from expected allometry with body size. These results imply fundamental differences among mammalian orders in the balance of selective forces that constrain larynx size and highlight an evolutionary flexibility in primates that may help explain why we have developed complex and diverse uses of the vocal organ for communication. Amongst primates, we also show that humans are unique in having lost their laryngeal air sacs and vocal membranes, which are critical features for vocal production in other species. Thus, paradoxically, the increased complexity of human spoken language followed simplification of our laryngeal anatomy.
keywords: Acoustic communication; Communication; Signalling

A long-term perspective revealed a highly fluid social system but also its limitations to prevent population extinction.

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P. Universidad Católica de Chile

Long-term examinations of animal socioecology have the potential to highlight variation and flexibility in multiple components of social systems. Thus, long-term studies on social birds and mammals from Africa, Australia, and North America have revealed insights into how spatiotemporal variation in ecology shapes intraspecific variation in social systems and associated fitness consequences. Critically, this long-time perspective may similarly inform us about how variation in social systems influences extinction risk in these species. Our 15-yearlong study of the communally breeding rodent, Octodon degus, has revealed complex relationships between multiple social system components and fitness, including sex-linked and ecological setting-dependent fitness effects of flexible social organization and variable mating interactions. Intriguingly, our long-term study also revealed that having a highly flexible social organization and mating system may not prevent population extinction during a prolonged drought.
keywords: Long-term studies; Group living / social behaviour

Social behaviour and the evolution of menopause in toothed whales

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Understanding how and why menopause – prolonged female post-reproductive life- has evolved is a long-standing challenge across disciplines. Females can typically maximise their reproductive success by reproducing for the whole of their adult life. But in a handful of mammal species, including humans, females cease reproduction several decades before the end of their natural lifespan. Toothed whales are the only mammal taxon where menopause has evolved multiple times, providing a unique opportunity to test the theories of how and why menopause evolves in a comparative context. I will present an analysis of a newly assembled comparative life history database to investigate how and why menopause evolves in toothed whales. In particular, using comparative demographic analysis I will show that there is a key role for two social factors – intergenerational help and intergenerational reproductive competition – in driving selection for extended female post-reproductive lifespans. I will discuss this result in the context of social behaviour as a driver of life history evolution across species.
keywords: Life histories; Group living / social behaviour; Cost of reproduction

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Reciprocal altruism in Norway rats: a meta-analysis

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Reciprocal altruism can generate evolutionarily stable levels of cooperation, but empirical evidence in non-human animals is contentious. A series of experimental studies on wild-type Norway rats revealed that they reciprocate received help by using decision rules characterising direct and generalized reciprocity. The direct reciprocity decision rule states that individuals help someone who previously helped them. The generalized reciprocity decision rule implies that individuals help anyone after having received help from someone. We ran meta-analyses to assess if Norway rats help partners according to the direct and generalized reciprocity decision rules. Female and male rats help partners according to direct reciprocity. Female, but not male, rats help partners according to generalized reciprocity. There was no difference in the help given by females to partners between direct and generalized reciprocity. These results i) demonstrate the cooperation of Norway rats by use of decision rules denoting direct and generalized reciprocity, and ii) suggest that rats may frequently apply the cognitively less demanding decision rule of generalized reciprocity, unless they need to distinguish between individuals differing in helpfulness.
keywords: Cooperation; Group living / social behaviour; Cognition

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Does behavior predict acoustic space use across mongoose species?

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While the size and structure of vocal repertoires greatly vary between species, it remains relatively poorly understood which factors drive or limit the evolution of signal forms. Signals produced in similar behavioural contexts across species may be subject to similar evolutionary pressures, resulting in shared acoustic features. Here, we explore this possibility in four mongoose species: meerkats (Suricata suricatta), banded mongooses (Mungos mungo), dwarf mongooses (Helogale parvula) and yellow mongooses (Cynictis penicillata). Specifically, we examine calls produced in four behavioral contexts (aggression, alarm, foraging, sentinel) and how these vary in their acoustic features both within and across species. We applied a novel analytical approach typically used in community ecology to explore acoustic data in terms of 'richness', 'divergence' and 'dissimilarity'. Results suggest that calls produced in an aggressive context share high overlap of acoustic features across all four species, whereas there is more variation of acoustic signals in other behavioural contexts. These methods will provide high-resolution insights into the selective pressures acting on the evolution of signal forms across behavioral contexts.
keywords: Acoustic communication; Communication; Signalling

Studying the variability of urban vervet monkeys' (Chlorocebus pygerythrus) diet by DNA metabarcoding of faecal samples

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Due to increasing habitat fragmentation and conversion, the range of vervet monkeys in urban areas has widened considerably, potentially leading to the presence of anthropogenic food in their diet. Due to their generalist feeding behaviour, studying urban vervet monkeys' diet is important to help understanding the impact of urban ecosystems on their foraging behaviours. However, accurately determining the variety of food types consumed by omnivorous species may in cases be complicated by mere observations. Consequently, environmental DNA based techniques provide complementary study options that can result in more complete assessments. In this study, we determined urban vervet monkeys' dietary components using DNA metabarcoding of faecal samples. Finally, 448 samples were analysed from 2 monkey groups, collected during a 4-month period in an eco-estate in South Africa. We aim to define the amount of natural food versus human food ingested, and to compare diet variability between the groups of monkeys, as well as between different sex-age classes, especially between mother and offspring. We also assess if dietary patterns have been socially transmitted, and whether this is distinguishable at matrilineal and intergroup levels.

keywords: Urban ecology; Foraging; Methods for studying behaviour

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Task allocation in cooperatively breeding cichlids: does early life matter?

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Division of labour may be seen as a major transition in social evolution. Specialisation of group members into duties increases task efficiency in cooperative breeders. Yet, environmental unpredictability can select for the ability to flexibly adjust one's behaviour, giving rise to generalist individuals that perform different tasks according to current need of a group. To clarify when and how individuals may develop specialist or generalist roles is important when aiming to understand ecological influences on the evolution of complex societies. It is unknown whether in social species early life experiences of cooperative behaviours influence task allocation later in life. Here we report on the task allocation of subordinate group members in the cooperatively breeding cichlid Neolamprologus pulcher, which had previously received experimentally varied helping demands. Our results show that neither high demands of antipredator defence nor high territory maintenance demands during early life influenced future task allocation. Yet, current needs clearly influenced the task allocation of helpers. Future work may clarify whether such differences are determined by intrinsic differences or by other social and environmental effects.

keywords: Cooperative breeding; Group living / social behaviour

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Helping beyond kinship: Social associations are related with helping interactions in a cooperatively breeding bird

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In cooperatively breeding birds, kin selection is considered to be the primary driver of helping behaviour, which is based on the observation that helpers tend to help genetically related chicks. Nevertheless, apparent kin-biased help can conceal direct fitness benefits-based mechanisms, such as benefits stemming from strengthening social relationships through cooperative interactions. Here we disentangle the role of kinship and social association in predicting helping behaviour using long-term data on helping and foraging associations of a bird species where helping is biased towards kin. We show that social bonds before, during and after reproduction correlate with helping interactions. Helpers and breeders shared stronger bonds compared to breeders and non-helping, but genetically related individuals. Furthermore, individuals tend to help breeders with whom they share the strongest social ties in the population. Finally, individuals that helped more intensively either had stronger associations with the breeding pair or increased their ties with them after reproduction. These results reveal that a kin-biased helping system can be shaped by social relationships that are potentially influenced by, or influence helping decisions.

keywords: Long-term studies; Cooperation; Cooperative breeding

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Do personality and cognitive traits predict trapability in grey mouse lemurs?

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Trapability, the tendency to be trap-happy or trap-shy, can vary consistently among individuals. This variation has been suggested to co-vary with certain personality and cognitive traits, forming behavioral syndromes. However, the nature of this relationship remains unclear. We therefore investigated whether trapability co-varies with individual traits, such as age, exploration and neophilia as well as performance in four cognitive tests by controlling for environmental factors and spatial location of traps in wild grey lemurs (Microcebus murinus) in Kirindy Forest, Western Madagascar. We examined 5703 capture events of 438 gray mouse lemurs over a period of five years, when information on personality and cognitive performance was known for 198 individuals. Overall, age significantly predicted recapture rates, with older individuals being more trap-shy. Environmental factors, such as rainfall and food availability influenced recapture rates negatively. However, personality traits and cognitive performance did not co-vary with recapture rates. Hence, these traits do not form behavioral syndromes in grey mouse lemurs, and their recapture rates were best predicted by age and environmental factors.

keywords: Animal personality; Cognition; Behavioural plasticity

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Natural variation in the gut microbiota is associated with behavioural differences in wild mice. But does it cause them?

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All animals host microbial communities, the microbiota, but every individual within a population hosts a varying microbiota. The gut microbiota in particular is key for animal hosts, by modulating immunity or aiding digestion. Recent studies suggest the gut microbiota also directly affects host behaviour, but almost all research to date has focused on lab animals and used highly artificial microbiota manipulations. It is thus unknown if natural microbiota variation can impact host behaviour in wild populations. Here, we address this knowledge gap by studying microbiota-behaviour links in a natural system, the wild house mouse population of Skokholm Island. Over 3 years, we quantified anxiety-like and exploratory behaviours of 225 mice, and characterised their gut microbiota. No intrinsic (sex, morphometrics) or extrinsic (season, ambient temperature or light) factor explains the large variation in mouse behaviour. Conversely, we found that microbiota similarity between mice is associated with differences in some behavioural traits. To uncover the causal direction of this novel microbiota-behaviour link in wild animals, we are now conducting fecal matter transplant experiments from tested wild mice donors into germ-free lab mice.

keywords: Physiology and behaviour; Behavioural plasticity; Long-term studies; Host-symbiont interactions; microbiome.

Insights into the social system of wild Guinea baboons from long-term data

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While several long-term studies have provided fundamental insights into the social systems of different baboon species, much less was known about the West African Guinea baboon Papio papio. We therefore established the field station "CRP Simenti" in the Niokolo Koba National Park in Senegal in 2007. Guinea baboons live in a multi-level society. Units consisting of one reproductively active male and one to seven females with their offspring comprise the base of the society. Around four units make up a party, and two parties make up a gang. Males maintain friendly relationships with one another and have shallow rank relationships, while females establish clear rank hierarchies and compete for access to the male. Primary males sire the majority of offspring. Females may transfer between males, sometimes when pregnant, and may leave their offspring behind when transferring. While parties are relatively stable ecological and social entities, gangs are less stable, indicating a high fluidity in the social organization which only became apparent via our long-term perspective. We discuss these findings in the context of baboon evolution specifically and social evolution more generally.

keywords: Long-term studies; Life histories; Group living / social behaviour

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Scrambled Threat: The Role of Configuration in Predator Recognition by Untrained Birds

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Holistic object perception simultaneously evaluates the presence and configuration of individual object properties. This type of perception has been repeatedly demonstrated in human face recognition. Holistic perception has also been demonstrated in a number of other animals but has not yet been sufficiently tested in birds. Moreover, it has not been tested at all in predator-prey relationships. In aviary experiments, untrained wild great tits were presented with modified European sparrowhawk dummies. The predator's face and body key features configurations were modified. We observed the behaviour of the tits before and during the presentation of the tested dummies (modified dummies and unmodified controls) to compare their reactions. We recorded the reactions of 420 tits. We can conclude that the tits perceived not only the presence of key features but also their configuration. Changes in face or body configuration significantly altered their behaviour and ability to recognize the predator. This study is the first to demonstrate that the spatial configuration of key predator features significantly affects the perception of this lethal threat and extends knowledge of comparative cognitive ethology in birds.
keywords: Cognition; Predator-prey interactions; Learning; Perception

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Development, inheritance, and selection shape bottlenose dolphin social structure

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Many mammals live in groups with complex social structure. Here we investigate the factors that shape the social structure of bottlenose dolphins (Tursiops truncatus) from Scotland's east coast. We find sex difference during development, with female calves living longer if they are more connected and males switching from being in more dense local clusters to having more dispersed networks. However, none of our analyses, including linear regressions, randomisations, and dynamic network analysis suggest males form "alliances" as seen in other dolphin populations. We find no change in social network position between 10 and 33. Both sons and daughters appear to inherit both their social tendencies from their mother, and particular associations with other dolphins. Finally, we see stabalising selection at both individual and higher levels of selection, and directional selection only at higher levels, suggesting fitness costs and benefits of both an individual's social behaviour and the social behaviour of others in the population. In summary, bottlenose dolphin social structure is maintained by sex-specific patterns of development, inheritance of social behaviour, and multilevel stabalising selection.
keywords: Group living / social behaviour; Long-term studies; Behavioural plasticity; social network

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Understanding the development of migration patterns and flight skills in white storks

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How the migratory behaviour of birds develops over their lifetime is a longstanding question with important implications for predicting the adaptive capacity of migrants in a changing world. However, our inability to follow the movements of individuals from early life has limited our understanding of the ontogeny of migration. Our research examines the development of migratory behaviour in a long-distance bird migrant, the white stork (Ciconia Ciconia). First, we study large-scale changes in route choice and selection over long periods of time, investigating the factors that influence shifts in migratory pathways. Secondly, we examine small-scale improvements in flight behaviour, focusing on the intricate adjustments birds make to optimise flight efficiency, and adapt to challenging environmental conditions. Our research combines innovative tracking technology with advanced data analysis to provide a comprehensive understanding of bird migration patterns.
keywords: Migration; Movement ecology; Long-term studies

The role of relatedness and social associations in structuring a multi-level society of a cooperatively breeding bird

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CIBIO, University of Porto

Complex social organisation can emerge to balance the benefits and costs of sociality by allowing individuals to adapt group size and composition depending on environmental and social needs. In this study, we analysed seven years of foraging associations from sociable weavers across five different colonies. We used social network analyses to describe a potential four-tier multi-level society, with (i) the core group being represented by breeding groups (breeders and helpers); (ii) the neighbourhoods that are formed by preferential interactions between related breeding groups and iii) preferred association between members of the same colony than with members of other colonies. Additionally, we describe a potential fourth level composed of colonies that aggregate to form large multi-colony foraging flocks. We then tested the stability of the different social levels across years and describe when these social units emerge over the year, and how their emergence relates with breeding activity and genetic relatedness among individuals. The findings of our study allow for further work on the apparent close link between cooperative breeding and the emergence of complex multi-level societies.
keywords: Cooperation; Cooperative breeding; Foraging

Investigating the role of kin selection in social behaviour using genomic estimates of realized relatedness

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Genetic relatedness plays a central role in the evolution of sociality through kin selection. Traditionally, pedigrees have been used to estimate relatedness, though they only provide mean expectations of relatedness among a given kin class. Due to stochastic recombination processes, the actual amount of DNA that is identical by descent between individuals (i.e. their realized relatedness) varies substantially within kin classes, leading to overlapping distributions of relatedness between kin classes. Here, we test whether, and to what degree, realized relatedness influences kin discrimination and kin bias in free-ranging rhesus macaques (Macaca mulatta). To this end, we recently established a method to precisely measure the realized relatedness based on whole genome sequencing data. This technique allows us to identify hidden familial connections that were previously undetected. We apply this method to 850 rhesus macaques for whom long-term behavioural data on social preferences and kin discrimination are available. Combining the behavioural data with these new measurements of relatedness pioneers a novel way of understanding the mechanisms through which animals identify kin, gaining insight into how kin-biased animals truly are.

keywords: Long-term studies; Group living / social behaviour; Behavioural genetics / genomics

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Candidate gene for humane control of invasive house mice Mus musculus alters male sperm physiology.

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House mice Mus musculus are an invasive species contributing to biodiversity loss, especially on islands. Worldwide, poison dissemination remains the main means of controlling mice populations. Currently, we investigate whether the t haplotype, a naturally-occurring meiotic driver in house mice, could be used as a more sustainable alternative for mouse control. In heterozygous males, the t haplotype gains a transmission advantage by "sabotaging" wildtype sperm, while homozygous males are subject to sterility. Control might be achieved by elevating the frequency of sterile males via the reproduction of heterozygotes. To assess whether the t haplotype could successfully reproduce within target populations, we compared the quantity and quality of sperm produced by wildtypes and t haplotype carriers. Although fertile, heterozygotes had lower concentrations of motile sperm, while homozygotes had mostly static sperm. Given that the t haplotype alters the male's reproductive physiology, behaviour of the males or their social partners is likely to be affected. If females prefer to mate with males of high sperm quality, t transmission could be hindered as they may avoid mating with t carriers. We will test this hypothesis in future work.

keywords: Conservation and behaviour; Sexual selection; Physiology and behaviour; Meiotic drive

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Male starlings breed in areas previously visited as floaters

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Floaters (sexually mature but non-breeding individuals) are frequently observed visiting the territories of other conspecifics prior to obtaining their own site to breed. These visits have been proposed to work as a means of gathering public information on territory owners' reproductive performance, which would help floaters choose a breeding site. However, this behaviour could also allow them to acquire increased site familiarity or dominance over other floaters. We conducted a long-termed study on a nest box population of spotless starlings (Sturnus unicolor), investigating how male visits were related to their nest choice. Our results showed male floaters bred in proximity to the area where they had been detected prospecting during the previous season, as well as in nest boxes whose former owner was not recorded again. Neither reproductive success nor phenotype of the previous owner influenced the nest choice. This suggests male floater's visits may be linked to gaining familiarity and detecting new vacancies. The high occupancy of nest-boxes in the population implies a limited possibility of choice, and therefore, public information is most likely relevant as a way to detect vacancies and direct successful settlement decisions
keywords: Reproductive behaviour; Movement ecology; Long-term studies

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Fitness drivers of division of labor in vertebrates

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Although division of labour as means to increase productivity is a common feature in animal social groups, most previous work has focused almost exclusively on eusocial insect with extreme task partitioning. Empirical evidence of division of labour in vertebrates is scarce, largely because we lack a theoretical framework to explore the conditions under which division of labour is likely to evolve. Here, we model how individual decisions on task specialization may select for the emergence of division of labour under both direct and indirect fitness benefits. We explicitly consider helping tasks with varying fitness costs when evaluating division of labour between different tasks. We find that: (1) direct survival fitness benefits of living in larger groups are the primary driving force of cooperation to enhance group productivity; (2) indirect fitness benefits derived from related group members are a non-essential facilitator for more stable forms of division of labour; and (3) division of labour is favoured by moderate to harsh environments. Ultimately, our model not only makes key predictions that are consistent with existing empirical data, it also proposes novel avenues for new empirical work.
keywords: Cooperation; Cost of reproduction; Cooperative breeding

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Movement patterns and magnetic orientation in a glassfrog with parental care

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Movement motivation is shaped by reproductive strategies, which can lead to different movement patterns. Species with extensive care have been hypothesized to be constrained to their reproductive site, resulting in comparatively small home ranges. They might exhibit stronger motivation for costly movements like homing and orientation skills in those species in which offspring survival depends on attendance. We tested these hypotheses in a glassfrog species with paternal care, Hyalinobatrachium valerioi. For two seasons, we followed their movement patterns using field observations, and GIS data. To test males' homing behavior, we translocated frogs and monitored if they successfully returned to their original location. Contrary to expected, males showed strong site fidelity, but only if they had recent mating success. Those without clutches traveled long distances and had low motivation to return home. We also tested if males with clutches could use the geomagnetic field to orient back to their clutches. Males were tested in a geomagnetic field and in a reversed magnetic field. They exhibited significant orientation in the homeward direction, demonstrating that they are able to orient using the magnetic compass.
keywords: Movement ecology; Parental care

Behavioural and Ecological Dynamics of a Raptor Community over Time

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The presence of apex predators has been shown to influence community structure drastically. An important part of this is the shift in behaviour of other species. The understanding of such changes is scarce because recordings of (behavioural) reactions towards lost species are rarely done. This is especially important for predators experiencing predation pressure themselves, known as intraguild predation. Re-colonizations offer the unique possibility to fill this knowledge gap. In our long-term study area, we monitor the populations of different birds of prey for more than 30 years now. Since 2002, Eurasian eagle owls are re-colonizing the area as apex predators, leading to changes in behaviour and reproductive strategies of common buzzards and northern goshawks. Furthermore, increase in the number of breeding red kites is potentially facilitated by the spread of eagle owls. Buzzards were tested at three time points (2002, 2012, 2022) how they react to eagle owls during chick-rearing, 2022 in comparison to goshawks as dominant mesopredators. We show that eagle owl presence has a great influence on the aggression level of buzzards. We also present how buzzards and red kites change in their breeding habitat preferences over time.
keywords: Predator-prey interactions; Habitat change and behaviour; Long-term studies

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Advantage females! Reversed sex roles result in positive Bateman gradients for females, males are losing out

Guadalupe Lopez-Nava, Ignas Safari, Clemens Kuepper, **Wolfgang Goymann**
Max Planck Institute Seewiesen, Ludwig Maximilian University Munich

In species with Darwininan sex roles, males are more competitive and more eager to mate, whereas females are the choosier sex. Bateman suggested anisogamy as a reason for this bias with males having higher variance in mating and reproductive success, and reproductive success depending more strongly on mating success than in females. Comparative studies support these Bateman principles but in some species sex roles are reversed, with females being more competitive and males being choosier. We asked if sex role reversal affects bias and variance in mating and reproductive success of females and males. We tested this by using long-term data from two sympatric bird species, the classically polyandrous black coucal and the socially monogamous white-browed coucal. Females of both species had steep Bateman gradients, and especially in female black coucals reproductive success increased with mating success. In contrast, Bateman gradients for males of both species were shallow. In conclusion, sexual selection may be stronger in female than male coucals, but since every female had offspring, selection pressure might still be lower than in systems with Darwinian sex roles, where some males may not sire any offspring at all.
keywords: Sexual selection; Reproductive behaviour; Long-term studies; sex roles

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Male service variation in vervet monkeys cannot be predicted by testosterone-immunity trade-offs.

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Male primates might showcase themselves to females by providing services, i.e., cooperative behaviours that benefit the rest of the group, such as vigilance, territorial defence, and leading group progressions. The immunocompetence handicap hypothesis (ICHH) offers a framework to understand this phenomenon, suggesting that testosterone, while potentially enhancing reproductive success through such behavioural displays, simultaneously compromises the immune system. We investigated this trade-off by studying the relationship between behavioural displays, hair hormonal levels using HPLC technology, and leukocyte profiles in blood smears in wild vervet monkeys. Contrary to the expectations of the ICHH, our findings reveal no correlation between testosterone levels, male service provision and leukocyte counts. These results suggest that the variation in male service provisioning is not governed by testosterone's immunocompetence trade-off in this case. The absence of the relationships indicates that other life-history traits, such as potential paternity (implying male services as paternal care) or the maintenance of social rank, are more influential in shaping these service displays.
keywords: Physiology and behaviour; Cost of reproduction; Contests and competition

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Integration of direct and indirect genetic effects in social foraging behaviour in wild house sparrows

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The behaviors that mediate social interactions are underpinned by genetic variation, leading to direct genetic effects (DGEs) and indirect genetic effects (IGEs) on individual phenotypes. IGEs affect the expressed variation on which selection can act, especially when correlated with DGEs, providing an appealing explanation for slower or faster evolution than predicted by classic theory. However, little is known about the integration of DGEs and IGEs in multiple traits, and the associated evolutionary consequences of this multivariate trait architecture. We tested game theoretical predictions of producer-scrounger tactic use during social foraging games within a DGE-IGE framework in wild house sparrows. We use automated high-throughput phenotyping, where we assayed individuals repeatedly against different social partners. We found individual variation in DGEs and IGEs in producing and scrounging behavior, and show high cross-year repeatability. We found that birds that scrounge more tend to produce less, elicit more producing and suppress scrounging in their social partners, and vice versa for birds that produce more. This tight correlation structure is expected to impose strong constraints on the evolution of these social traits.
keywords: Behavioural plasticity; Group living / social behaviour; Foraging; Indirect genetic effects

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Examining the drivers of fission-fusion dynamics in white-nosed coatis (Nasua narica)

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Fission-fusion dynamics, observed in many group living species, involve the regular breakup (fission) and subsequent regrouping (fusion) of individuals. These dynamics are thought to be an important strategy to balance the costs and benefits of sociality. However, for many species, it remains unclear how social and physiological factors affect these processes. To investigate this, we recorded the vocalizations and GPS positions of three groups of wild white-nosed coatis (Nasua narica) with differing demographic profiles. Analysing group movements and subgrouping patterns, we found two of three groups exhibited fission-fusion behaviours, while the third remained cohesive. In groups with fission-fusion behaviours, subgroup membership correlated with genetic relatedness, suggesting subgrouping mitigates aggression risks. Despite this, the subgroup leaving the main group was inconsistent over time, indicating flexible, context-dependent splitting dynamics. Our approach unveils factors driving fission-fusion dynamics, shedding light on decision-making processes in this social species.
keywords: Collective animal behaviour; Group living / social behaviour; Movement ecology

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An unexpected shift in resource quality affects reproduction and female condition in house mice (Mus musculus)

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Unprecedented global climate change exposes organisms to much higher rates of unpredictable, fast changing environmental conditions than what evolution has shaped them for. Unpredictable change is therefore becoming an increasing concern for the well-being and survival of many species. We here test how reproduction and body condition of female house mice reacts to an unexpected shift in resource availability (from better to worse quality food and vice versa). A shift from worse to better quality food increases litter size and offspring growth slowly across five months without negative effects for breeding females. A shift from better to worse however, stops reproduction immediately and female temporarily favour self-maintenance over reproduction, thereby affecting population growth and stability. Resuming reproduction takes several months. Our study shows that even a species that is well-known for it's fast adaptation potential is vulnerable to unexpected environmental change. It emphasises the need to incorporate environmental conditions, especially resource availability, into future studies investigating species responses to environmental change.
keywords: Anthropogenic effects; Behavioural plasticity; Cost of reproduction

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Individuality from the lab to the wild: risk-taking ravens stay near tourist sites in a changing desert

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The expansion of human activities worldwide exposes wild animals to novel, potentially threatening conditions. While some individuals consistently avoid danger more than others, a generalization of fear across contexts leads to over-avoidance of risk, which comes at the cost of foraging opportunities. Over avoiding risk could be particularly detrimental for wildlife in resource scarce ecosystems undergoing rapid expansion of human activities, which typically increases food availability yet unfamiliar and close to human presence. Here, we examine consistent individual variation in reaction to risk in wild Fan-tailed ravens (Corvus rhipidurus) inhabiting the Dead Sea coastline of Israel, a desert rapidly changing due to tourism expansion. We confirmed consistent individual differences under controlled laboratory settings through experiments (i.e., reaction to novel objects, food items, foraging near humans, and novel environments) and in the wild via examination of GPS-derived metrics from the same individuals. Risk-taking ravens remained close to tourist sites and limiting their movement, while risk-avoiding ravens travelled long distances to forage at the edge of their home range.
keywords: Movement ecology; Animal personality; Anthropogenic effects

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Insights into wild boar's thermoregulatory strategies using biologging data

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Climate change poses threats to both livestock and wildlife species, negatively affecting the behaviour and well-being. While domestic pigs react to heat through altered behaviour, reduced food intake, and decreased reproduction, little is known about the reaction of their wild ancestors. We used multisensory collars on wild boars in the Czech Repuplic to monitor their activity during high temperatures in summer. Data from 23 individuals over three years revealed that they mitigate higher temperatures by reducing overall activity. Other important factors affecting activity are duration of heat, maximum temperature, and precipitation. We also found evidence that habitat type plays an important role in coping behaviour. This research shows the potential of remote-sensing technologies to monitor wildlife behaviour, particularly in challenging observational scenarios, offering valuable insights into the adaptive strategies of wildlife in the face of a changing climate. With growing concerns about climate change, understanding how wildlife copes with environmental shifts and their impact on fitness is vital.
keywords: Climate (change) and behaviour; Methods for studying behaviour; Behavioural plasticity

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Social relationships shape foraging interactions and promote access to food and information in a wild corvid

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Many social animals form differentiated relationships that have been linked to long-term fitness correlates, but it is less evident how these effects come about. Therefore, research needs to establish how social relationships govern short-term decisions and outcomes in fitness-relevant contexts, such as foraging. We investigated social interactions during foraging in wild jackdaws (Corvus monedula), a highly social corvid. We arranged RFID feeding stations to create situations of queueing in which only one individual could feed, allowing us to quantify social tolerance and food intake under different social conditions. Social interactions were more likely and more synchronous between close partners, such as mated pairs and kin, than in other dyads. These close relationships, characterised by higher levels of social tolerance, enabled longer feeding bouts and promoted social learning about food patches by juveniles. Ongoing work using the same experimental setup, in conjunction with infrared thermography, will also shed light on affective states during social foraging. Our research emphasises that social relationships can shape short-term decisions and outcomes in fitness-related foraging interactions.
keywords: Group living / social behaviour; Foraging

The protective value of different components of prey deimatic behaviour

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Deimatic behaviour is an antipredator defence where prey perform behaviours such as sudden movements and sounds when perceiving a threat from predators. This often causes predators to slow or stop their attack, but how different components of deimatic behaviour influence predator responses remains untested. We investigated this using wild Australian magpies (Cracticus tibicen) as predators. The birds were presented with a robotic moth displaying deimatic behaviour that included i) movement only when the moth was small, ii) movement only when the moth was large, or iii) a combination of movement and the moth increasing in size. We found that all displays were equally effective stopping the first attack, but the increase in size seemed to be important to prevent predator habituation. The robotic moth did not include warning colours or chemical defences, and our results indicate that movement alone has protective value without further defences. This provides support for the idea that the behavioural component of deimatic displays can evolve before other defences ('startle-first hypothesis'). Overall, our results increase our understanding of predator selection on different components of prey deimatic behaviour.
keywords: Predator-prey interactions; Sensory ecology

Living apart together – The social adaption of semi-free ranging Japanese macaques (Macaca fuscata) post fission

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Fission, which is the self-initiated separation of a socially coherent group into two independent groups, is well documented in Japanese macaques (Macaca fuscata). Studies concluded that fissions are finished when one of the newly formed groups leaves the habitat. The possibility to depart thus seems to be a requirement for Japanese macaques to complete fissions, which suggests that captive populations lack the opportunity to fully separate due to their confined living space. This might cause Japanese macaques that undergo fission in captivity to display unique social adaptation mechanisms in order for two independent groups to co-exist in the same habitat. In this ongoing study, we aim to describe such adaptations by studying a semi-free-ranging population of 180 Japanese macaques. This population has been under constant observation since 2018, which includes the occurrence of fission in 2020. Currently, five years of data are being analysed. Our preliminary results show that this population indeed socially adapted as the previously separated groups partially merged to form interconnected, yet independent social clusters. This study thereby describes previously undocumented long-term group dynamics of Japanese macaques.
keywords: Group living / social behaviour; Long-term studies

Integrating long-term studies of individuals: Improved generalisability in animal ecology and evolution

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Recent years have seen an increased awareness for sampling biases limiting the generalisability of findings in animal behaviour research, and for the value of increasing and diversifying the pool of study animals by combining data from multiple research groups. Integrating data from long-term individual-based studies is particularly relevant for addressing questions in ecology and evolution because it facilitates testing hypotheses on diverse sets of populations, or even species, and across different contexts (e.g., varied environments). However, cross-study analyses are often challenging and require data standards. SPI-Birds (Studies of Populations of Individual Birds) aims at increasing data sharing and reuse through the harmonisation of independently assembled datasets on long-term population studies of birds. We summarise how the SPI-Birds Network and Database facilitates research collaborations and contributes to data preservation by applying community-defined data standards, and standardised code pipelines for data processing and analysis. We provide an overview of large-scale studies on birds and showcase the versatility of data hosted by SPI-Birds for addressing key questions in avian behaviour, ecology, and evolution.
keywords: Methods for studying behaviour; Long-term studies; Climate (change) and behaviour

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Blue Tits adjust take-off performance after a simulated predation event

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Identifying trade-offs between competing selection pressures is crucial in understanding animal behaviour. Birds may face a trade-off between starvation and predation risk, as carrying extra body mass in reserve reduces acceleration during predator escape. Weight loss observed after mist-netting has therefore been viewed as a strategy to improve escape flight. However, little empirical evidence documents such change in response to predation risk. To address this, we used custom-built infrared flight speed tunnels with Radio-Frequency Identification (RFID) feeders, recording 1434 flights of 60 parid individuals with take-off flight velocity and acceleration in Wytham Woods, Oxford. Overall, we found interspecific and diurnal variations. Most importantly, we identified an effect of capture on individual flight performance in 186 flights of 7 blue tits that visited on the day of mist-netting and the day after. On the day after capture, blue tits increased their initial velocity by 8% and decreased their in-flight acceleration by 44%. The results suggest that blue tits may respond to mist-netting as an attempted predation event, utilising limited physical and behavioural adjustments to improve their escape performance accordingly.
keywords: Predator-prey interactions; Behavioural plasticity; Sensory ecology; Biomechanics

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Spatial Memory Strategies of a Highly Social Bird: Collective Navigation in a Complex Environment

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Spatial memory confers crucial fitness advantages. It enables tracking of fluctuating resources in heterogeneous habitats, enhancing resource accessibility. This is especially notable in group-living animals, as collective intelligence can improve navigational accuracy. However, our understanding of how they utilize spatial memory in dynamic environments is limited. We studied repeated long-distance movements in a highly social terrestrial bird inhabiting a semi-arid habitat. Using step-selection analysis, we quantified the role of spatial memory in navigational decisions. We found that groups make goal-directed movements, indicating the ability to form cognitive maps, while also using substrates that facilitate efficient locomotion. They exhibited fidelity to both recently and frequently traversed routes, suggesting the simultaneous integration of short- and long-term memory. Importantly, we find evidence that groups adjusted their navigational strategies to the prevailing environmental conditions and ecological significance of target areas. Our results give insights into drivers of spatiotemporal dynamics of movement patterns, the collective use of spatial memory, and behavioral adaptations to harsh and changing environments.
keywords: Movement ecology; Learning; Climate (change) and behaviour; group living

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Bats migrate by surfing warm fronts ahead of bad weather

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Long-distance migration, common in passerine birds, is rare and poorly studied in bats. Piloting a novel 1.2 g IoT (Internet of Things) tag with onboard intelligence, we tracked the daily location, temperature, and activity of female common noctules (Nyctalus noctula) during spring migration across central Europe up to 1000 km. Most bats migrated over hundreds of kilometers per night with incoming warm fronts, providing them with wind support and lower energetic costs. Bats also showed surprising flexibility in their ability to migrate across a wide range of conditions if needed. However, females leaving towards the end of the season suffered energetic costs for their flexible migration timing. Heterothermy may help them adjust migratory decisions under ongoing climate change.
keywords: Migration; Movement ecology

Microbial Strain-Sharing as a Window into Animal Social Interactions and Population Connectivity

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Understanding the intricacies of animal social interactions and population connectivity is crucial for the study of many aspects of social behavior, yet direct observation and genetic analyses often present logistical challenges. We introduce an approach leveraging the strain-sharing of microbes as indirect indicators of social behavior and connectivity among animal populations. By analyzing the microbiomes of individual rock hyraxes from several groups in a population using shotgun metagenomics, we identify shared microbial strains that suggest historical or ongoing social interactions. This microbial fingerprinting allows us to infer patterns of social association and movement across landscapes that are otherwise difficult to document. This approach offers a unique lens through which to view the social and ecological dynamics of animal populations, providing insights into the unseen connections that bind individuals and populations. Our approach has implications for understanding disease transmission dynamics, conservation strategies, and the evolution of social behavior in wildlife.
keywords: Group living / social behaviour; Long-term studies; Microbiome

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Power in Numbers: Impact of Relative Group Size between Neighbors on Capuchin Ranging Patterns

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An animal's home range is shaped by various factors, including metabolic needs, social interactions, and resource availability. For species living in groups, space-use patterns are shaped by both individual and collective behaviors, yet the impact of demographic factors such as group size and composition is not fully understood. These factors influence not just within-group competition for resources but also interactions with neighboring groups. Our study, leveraging 30 years of data from 12 groups of white-faced capuchins (Cebus imitator) at the Lomas Barbudal Monkey Project, investigates how relative group size affects range expansion and overlap between neighbors. We discovered that capuchin home ranges grow with group size longitudinally, but how much they expand into adjacent ranges also hinges on the size comparison with neighboring groups. This indicates that home range patterns depend not just on internal needs but also on the balance of power between groups. Our study reveals the intricate relationship between group demographics and access to resources, underscoring the necessity of considering both internal group characteristics and intergroup relations in understanding ranging behavior.
keywords: Contests and competition; Long-term studies; Group living / social behaviour; Movement Ecology

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Epigenetic potential and dispersal propensity in free-living birds: a spatial and temporal approach

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Natal dispersal determines fitness and influences population dynamics, genetic structure and species distributions, but its mechanistic underpinnings remain unknown. Moving into new environments requires phenotypic plasticity that may be achieved via epigenetic processes, occurring in specific genomic regions (e.g. DNA methylation on CpGs). Thus, genomes differ in their capacity to be modified epigenetically, and this Epigenetic Potential (EP) may represent the range of phenotypic plasticity attainable by individuals and a key requirement of successful settlement. We tested the association between EP (CpGs throughout the genome) and dispersal propensity in a long-term study population of Pied flycatchers. We compared EP in a) individuals dispersing between habitat patches vs. those staying in one patch; b) Immigrants vs. residents; and c) first vs. later generations. We found a significant, positive association between EP and dispersal propensity in a) and c) but not b), the latter possibly reflecting our limited capacity to tell apart immigrants and individuals from natural nests. Our results point to EP playing a role in dispersal propensity, suggesting that epigenetically-driven phenotypic plasticity facilitates bird dispersal.

keywords: Behavioural genetics / genomics; Long-term studies; Dispersal; Epigenetics

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Long-term patterns of primate food resource availability and behavior in Kibale, Uganda

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Food resource distribution is considered a major factor affecting animal behavior. Since many animals live in habitats where resources are highly variable over space and time, this temporal and spatial distribution, and its impact on behavior, is challenging to assess and often requires long-term ecological and behavioral data. Based on data collected over several decades in Kibale, Uganda, an area inhabited by 13 primate species, we here provide insights about differences in the distribution of two resources eaten by many primates, fruit and leaves. We contrast intra- and inter-annual temporal patterns and spatial distribution of young leaves (eaten by folivores) with ripe fruit (eaten by frugivores/omnivores). Then, we show how temporal patterns of young leaf availability over 10 years is linked to home range use, formation of polyspecific associations, and food selection by the group-living, leaf-eating red colobus (Piliocolobus tephrosceles). Our results illustrate how distinctions between animals foraging on different diets are more ambiguous when using quantitative assessments vs. simple categories, which is highly relevant for developing and refining theories about animal behavioral evolution.

keywords: Long-term studies; Foraging; Habitat change and behaviour

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Social and ecological determinants of offspring survival in Propithecus verreauxi

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Darwinian fitness is determined by variation in survival and reproduction. In iteroparous mammals with slow life histories, a single offspring represents a relatively large proportion of a female's lifetime reproductive success. Because mortality is typically biased towards young individuals, we investigated ecological and social sources of offspring survival in wild Verreaux's sifaka, which have one of the slowest life histories of all primates. Since 1995, we recorded every birth, death, emigration and disappearance, determined female social status and collected climatic data continuously. We used survival analyses to investigate the potential effects of group size, maternal dominance status, size of the birth cohort, offspring sex and total rainfall during the rainy on first-year survival of a total of 165 infants. We found that neither offspring sex nor the number of offspring/group/year had significant effects on offspring survival. However, subordinate females suffered from significantly reduced offspring survival, compared to the dominant female, especially in years with little rainfall and in smaller groups. Thus, factors that are presumably related to female competition had the strongest effects on offspring survival.
keywords: Parental care; Long-term studies; Life histories

The role of the bill colour in signaling status: A field experiment with White-winged Snowfinches

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Many bird species living in temperate regions benefit from social foraging in winter. However, when there is competition for food within foraging groups, social signals can allow individuals to assess the status of their competitors without getting involved in costly fights. White-winged Snowfinches (Montifringilla nivalis) change their bill colour seasonally from yellow at the beginning of winter to black before the breeding season. We hypothesise that more dominant, aggressive individuals signal their status with a darker bill. In a winter field experiment in the Swiss Alps, we tested how free-living snowfinches react to conspecific decoys with manipulated bill colour. We set up two food patches, one with a yellow-billed decoy and one with a black-billed decoy and observed which patch was chosen first by the snowfinches. Our initial results suggest, that snowfinches slightly prefer to forage at the food patch with the yellow-billed decoy. These findings could indicate, that black bills are a signal of dominance or aggressiveness and are avoided by conspecifics with lighter bill colours when foraging in winter.
keywords: Signalling; Group living / social behaviour; Foraging

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Good rhythm genes, vocal stability and assortative mating in birds

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Rhythm is omnipresent in animal communication and plays a fundamental role in mate choice and species recognition in birds. The genetic basis of vocal rhythm is little known because of the confounding effect of vocal learning in model systems. Uncovering its genomic underpinnings would facilitate identifying genes potentially important in speciation. We investigated the genomic basis of rhythm in vocal non-learning Pogoniulus tinkerbirds using whole genomes of 135 individuals sampled across a Southern African hybrid zone. We found that rhythm speed is associated with two genes linked to speech impairment in humans. Models leveraging ancestry reveal these two candidate loci also impact the stability of vocal rhythm, a trait linked with motor performance, an indicator of quality. Character displacement in rhythmic stability suggests possible reinforcement against hybridisation, a hypothesis supported by evidence of assortative mating. Assortative mating is asymmetric, however, occurring only in the species producing faster, more stable rhythms. Our findings suggest a mating preference for faster, more stable songs, underpinned by genes known to impact speech in humans, may play a role in maintaining reproductive isolation.
keywords: Acoustic communication; Speciation and hybridisation; Behavioural genetics / genomics

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Sperm characteristics and testosterone levels reveal rock hyrax mating tactics

Hunter Warick, Tal Raz, Amiyaal Ilany, **Lee Koren**
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Reproduction in males has been linked to testosterone levels, which are related to morphological, physiological, and behavioral features, including social status and roles. However, variance in reproductive parameters such as sperm characteristics and testosterone, also plays a pivotal role in shaping mating tactics, including the development of alternative reproductive tactics and sperm competition, leading to diverging life-histories. In the polygynandrous rock hyrax (Procavia capensis), there are three male classes: residents, bachelors, and late-dispersers. Across three field seasons we obtained sperm and hair samples pre and post the breeding season from males and found that although there were no differences in copulation success between bachelor and resident males, sperm motility decreased and structural mutations increased post breeding only in residents. We also found that whereas residents with higher testosterone levels had lower sperm quality, in bachelors it was the opposite. Our findings shed light on the diverse mechanisms and trade-offs that are available for male rock hyrax adopting different reproductive tactics and enhance our understanding of the evolutionary forces that drive sperm competition.
keywords: Long-term studies; Reproductive tactics; Cost of reproduction

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Wildlife response to war in Ukraine

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Armed conflicts have devastating effects on the biosphere across various scales. Socio-economic changes caused by armed conflicts remain a main focus of research and policy, overshadowing their environmental effects. War zones are inaccessible for researchers, which results in a knowledge gap about the immediate effects of armed conflicts on the environment, including wildlife. We used remote camera trap images to investigate the direct effects of war in on the spatial and temporal activity patterns of wildlife in relation to armed conflict intensity levels before, during and after the Russian occupation in the Chornobyl Exclusion Zone, Ukraine. We found that ungulate activity decreased and mesocarnivore activity increased when the conflict intensified. Activity of mesocarnivores and large carnivores was higher during the night independent of armed conflict intensity and increased for large carnivores with increasing distance from roads. In comparison, ungulates were more active during the daytime, especially during occupation when conflict intensity was the highest. Our results provide first insights into the immediate responses of wildlife to armed conflicts and represents a unique contribution to this topic.
keywords: Anthropogenic effects; Conservation and behaviour; Habitat change and behaviour; warfare ecology

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The development of social attention in wild and zoo-housed orangutans: assessed via cross-sectional, longitudinal data

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Social learning is a cornerstone of all cultural processes and plays a pivotal role during the evolution of cognition. We compared peering behavior (i.e., close-range and sustained observation of the activities of conspecifics) in wild and zoo-housed immature Sumatran orangutans (Pongo abelii) to investigate the effect of social and ecological conditions on the tendency to attend to social information. We used a unique comparative longitudinal dataset including 3101 peering events collected at the Suaq Balimbing research site in Indonesia and at 4 European zoos on 35 individuals. Using GAMMs, we tested for age-specific patterns in peering frequency, target, and context selection. We found similar age trajectories of peering in both settings, but higher mean frequencies of peering in the zoos. Wild immatures preferably peered at their mothers but zoo-housed immatures at non-mother individuals. In both settings, immatures preferred to peer at older individuals, and in learning-intense contexts. Our findings suggest a hard-wired component in the tendency to attend to social information and a considerable degree of behavioral plasticity – a combination that was likely foundational for the evolution of complex cultures and cognition.
keywords: Long-term studies; Learning; Animal culture

Pollinators determine resource allocation in plant–pollinator interactions in a context-dependent manner

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In plant–pollinator mutualisms, plants provide food resources to pollinators in exchange for pollination. Often host plants are said to control the trade by regulating resource flow into pollinators. In our study, using brood-site pollination mutualism between fig trees and their wasp pollinators, we tried to determine the role of pollinators in accessing the resources. Seeds of the host fig tree and galled pollinator offspring develop within closed inflorescences called syconia. We introduced varying number of manipulated pollinators (foundress wasps) to produce syconia containing only seeds (S), only pollinator galls (G) or both seeds and galls (SG). We determined if presence of pollinator galls impacted biomass allocation to a syconium and to the individual occupants. While SG syconia had highest biomass at low foundress numbers, G and SG syconia were heaviest at high foundress numbers. Results indicate that at high foundress numbers, pollinator wasps influence allocation to syconium. Dry mass of individual wasp offspring remained constant indicating that wasps regulate resource flow into them. Our study highlights the importance of pollinators as active participants in mutualisms, regulating their trade with host plants.
keywords: Plant-animal interactions; Cooperation; Mutualism

Urban raptor birdstrike mitigation gains from long-term studies on avian behavior and socio-cultural interplays in Delhi

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Aeroecology and aviation safety intersect in urban areas. The aviation industry incurs losses of billions from >21,000 birdstrikes/yr, attributable to rapid urbanisation and birds responding to anthropogenic food subsidies or habitats. We mitigated birdstrike threats by resident and migratory kites during fly-past on Republic Day in Delhi. We managed kites' access to waste and temporarily displaced flocks by co-opting their congregations in response to a regional ritual of meat-tossing. Data on kites' home range, movement and demography enabled strategically matched meat-induced flocking away from flight formations. Feeble flocking during smog/overcast weather constrained our outcomes. Intervention misalignment with Muslims, who traditionally feed kites (90% of breeders), resulted in already well-fed kites that demonstrated diminished responses. Conflicts associated with synurbic species that target food subsidies are sensitive to cultural nuances and vary seasonally, based on taxa-specific links in life-history choices and social processes within human-altered environments. This paper addresses strategic limitations in wildlife management related to social-ecological linkages associated with frequent inter-stakeholder conflicts.
keywords: Interspecific interactions; Anthropogenic effects; Urban ecology; Innovative conflict mitigation

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Reproductive consequences of sexual coercion in chacma baboons

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Sexual coercion is a widespread phenomenon in animals. While its occurrence and various expressions are increasingly well documented, its reproductive consequences remain little investigated in slow lived mammals, as long-term data are paramount. In chacma baboons, male aggression decoupled from the female receptive period increases his mate guarding success in the future. Here, we tested if this form of sexual intimidation increases male siring success. We analysed 18 years of long-term behavioural and genetic data of individually recognised baboons at Tsaobis, Namibia. We assigned paternities for 116 individuals using 16 polymorphic, autosomal microsatellite loci obtained from tissue samples. For 51 of these siring events behavioural data on cycling females and candidate sires could be matched (588 dyads). We find that higher levels of aggression towards specific cycling females during their non-fertile periods increase males' chances to sire the female's next offspring (ß $\pm$ SE=3.060 $\pm$ 1.189, P=0.01), while controlling for male rank, operational sex ratio and mate guarding days. Evaluating reproductive consequences of sexual coercion is crucial to understanding its evolution and its implications for intersexual conflict dynamics.

keywords: Reproductive tactics; Long-term studies; Sexual selection

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The development of feeding behavior and information acquisition from mothers in wild Javan gibbons (Hylobates moloch)

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Immature primates learn from experienced individuals while co-feeding, developing their feeding competency during prolonged juvenile periods. Despite facing prolonged juvenility, the feeding development and social learning of immature gibbons is understudied. We recorded mother and immature feeding behavior in three groups of wild Javan gibbons in Gunung Halimun-Salak National Park, Indonesia (2019 - 2022). We analyzed the effect of immature age and foraging difficulty levels (FDL) on immature dietary breadth and diet similarity with mothers, immature's daily feeding and co-feeding time with mothers, and the Hinde index. Immature dietary breadth increased, but diet similarity with mothers decreased with their age in their early juvenility. Daily feeding time increased with immature age and partially decreased with FDL. Co-feeding time with mothers decreased as immature age increased, although FDL had no impact. Immatures became less responsible for maintaining close proximity to their mothers in feeding contexts as they grew older, but they stayed near their mothers when feeding more difficult food compared to easier food. Our results show developmental changes in feeding behavior with potential maternal influences in gibbons.

keywords: Foraging; Long-term studies; Learning; Development

Sailfish, terns and their prey: understanding associations in the open ocean

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Various marine predators form associations, the most commonly studied, however, are those between subsurface predators and seabirds. Yet the mechanisms underlying these associations remain poorly understood. Three hypotheses have been proposed to explain the prevalence of these associations: (1) subsurface predators herd prey to the surface and make prey accessible to birds, (2) subsurface predators damage prey and thereby provide food scraps to birds by feeding at the surface, and (3) attacks of underwater predators lower the cohesion of prey groups and thereby their collective defences making the prey easier to catch for birds. Utilizing drone footage, we investigate the interaction between Indo-Pacific sailfish (Istiophorus platypterus) and terns (Onychoprion sp.) preying on schooling fish. Through spatio-temporal analysis of the hunting behaviour of the two predatory species and direct measures of prey cohesion we show that terns attacked when school cohesion was low, and that this decrease in cohesion was frequently caused by sailfish attacks. We discuss our results in the context of predator-predator interaction in the open ocean, investigating the possibility of mutualism, commensalism and kleptoparasitism.
keywords: Predator-prey interactions; Group living / social behaviour; Foraging

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Navigating independence: The development of food searching efficiency in immature Sumatran Orangutans (Pongo abelii)

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Orangutans are the only apes with a semi-solitary lifestyle. They also have a remarkably long dependency phase, creating a pivotal transition from 8 years of maternal reliance to independent survival. Little is known about what drives immatures to spatially transition from shadowing their mother, to knowledge-led independent movement. This study investigates the development of navigational efficiency among immature orangutans at the Suaq Balimbing Research Site, Gunung Leuser National Park, Sumatra. Spatial and behavioural data were collected from 24 individuals over 17 years, revealing that the daily travel paths of immatures are longer than those of adults (n=871), with conspecific presence also increasing path length. Interestingly, the length of travel paths to key food resources remains comparable across age groups (n=1525). However, the sinuosity of paths to feeding hotspots straightens across the immatures' age (n=415), particularly when alone, suggesting a shift from exploratory paths to knowledge-led directed navigation. Social interactions likely play a significant role in this learning process. Overall, this study enhances understanding of orangutan cognition the drivers of their unique life history traits.
keywords: Long-term studies; Movement ecology; Cognition

An invertebrate establishes size hierarchies by strategically modulating its body growth

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In group living species with reproductive skew, few individuals reproduce and the others attain little, if any, reproduction. In some such societies, members organise in size hierarchies they achieve by opportunistically regulating their body growth relatively to other group members' size - and where the largest individuals have priority access to reproduction. Here we bring experimental evidence for strategic growth in the marine polychaete worm Ophryotrocha puerilis. Size-matched juveniles kept in Pairs or in Triplets regulated their body growth and quickly established size differences between each other until the largest individuals changed sex from male to female, as they are male-first sex changers. Control treatments showed that isolated individuals grew faster than the fast-growing individuals in Pairs, but slower than the fastest individuals in Triplets; juveniles kept with adults grew slower than slow-growing individuals in Pairs and Triplets. Growth curve analysis showed how individuals regulated their growth by modulating speed and duration of their growth spurt. This work is the first evidence of strategic body growth in an invertebrate and the first to investigate the underlying mechanism of growth regulation.
keywords: Group living / social behaviour; Reproductive behaviour; Sexual selection

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Does artificial light at night affect early maternal investment?

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Light is an essential Zeitgeber for reproductive decisions and overexposure to artificial light at night (ALAN) has negative consequences. Many organisms are particularly sensitive to environmental influences during prenatal development and early postnatal life. During this time early maternal investment (EMI) is essential to regulate offspring development. In an experiment under semi-natural conditions, we explored the impact of maternal light exposure on EMI and offspring development by exposing house sparrows (Passer domesticus) to three light regimes: i) an ALAN group with dim light throughout the night, ii) an increased day-length group (IL) mimicking a later stage of the breeding season, iii) a control group resembling natural light conditions. We monitored breeding phenology and physiological parameters that reflect changes in EMI and offspring performance over 8 months. Our results reveal a potential effect of ALAN on female investment because birds of the ALAN group produced smaller eggs and lighter offspring. ALAN might further affect day length perception as the onset of laying in the ALAN group resembled the IL group. However, an effect on the sex-ratio of the young only became apparent in the IL group.
keywords: Anthropogenic effects; Physiology and behaviour; Parental care

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Kin based spatial structure and social tolerance in a solitary mammal

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Kin selection theory is important to understand the evolution of social behaviour in group living species. Yet, the influence of kinship in solitary species has received little attention. Solitary living in mammals is assumed to be primitive and due to social intolerance leading to high levels of aggression. We studied how kinship influences spatial structure and aggression in a solitary species, the South African bush Karoo rat (Otomys unisulcatus). Over three years, we performed trapping, focal animal observations and dyadic encounter tests. We also fitted mini-GPS dataloggers on neighbouring females. Bush Karoo rats were not dispersed randomly, but showed kin based spatial structure with close kin living close to each other. Their home ranges overlapped more with each other more than with strangers. Females were not aggressive towards their offspring, not even adult offspring that had already dispersed. This makes it unlikely that aggression and social intolerance leads to dispersal and solitary living. However, females were more aggressive towards non-kin than kin neighbours. Thus, kinship is important in this solitary rodent and its social system is not driven by aggression and intolerance, but rather a lack of attraction.
keywords: Movement ecology; Methods for studying behaviour; Group living / social behaviour; solitary living

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Early onset of postnatal individual vocal recognition in a highly colonial mammal species

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Mother–young individual vocal recognition is widespread in mammals and is known to be shaped by the ecological constraints faced by species. However, knowledge of the precise features of the recognition system, especially the timing of the onset in the first hours after birth is often lacking. In the Cape fur seal, a highly colonial pinniped species, mother and pup are often separated during the maternal attendance period ashore as females regularly undertake multi-day foraging trip at sea. The first separation occurs as early as 6 days after parturition. We used playback experiments to investigate the timing of the onset of mother-pup vocal recognition in this species. We showed that females can recognize their pup's voice 2–4 h after parturition and that pups develop this aptitude 4–6 h after birth. This study is the first to investigate this mechanism in a wild and free-ranging mammal from only 2 h after birth. We reported the fastest establishment of mother–young vocal recognition for any mammalian species, including humans, described to date. These findings highlight the synergistic role of environmental constraints and biological traits in optimizing the timing of individual vocal recognition onset in vertebrates.
keywords: Acoustic communication; Communication; Parental care

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The environmental and developmental drivers of consistent individual differences in behaviour in Xenopus Tropicalis.

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Understanding the drivers of consistent individual differences in behaviour is crucial to understanding their evolution. In order to investigate the development drivers, I recorded 200 Xenopus tropicalis individuals in three behavioural assays (activity, exploration, and startle response) eight times per life stage, at three life stages (tadpole, post-metamorphosis frog and sexually mature frog). This enables a thorough examination of how both within-individual and among-individual differences in behaviour change across metamorphosis and into adulthood. Diet has been suggested as a key environmental driver of consistent individual behavioural variation. To explore this, we utilised a cross-factorial design with approximately 50 individuals in each group: low food for tadpoles/frogs, high food for tadpoles/frogs, low for tadpoles/high for frogs, and high for tadpoles/low for frogs. This enables evaluating the individual and interactive effects of diet and life stage on behavior. I am finishing up video analysis and beginning on statistical analysis. Overall, this project promises exciting and detailed insights into the interplay of developmental and environmental factors shaping consistent individual behavioural variation.
keywords: Animal personality; Behavioural plasticity; Long-term studies

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Distress signal triggers individual helping response independent of social bond or familiarity in a group-living bird

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Helping evolves when it confers direct or indirect fitness benefits to the helper. In potentially costly situations, individuals are predicted to engage only when the benefits outweigh the costs. Research in animals shows that the willingness to help can be modulated by the degree of interdependence. A strong bond between helper and recipient, where the recipient is a valuable resource to the helper, is assumed to increase the likelihood of helping. Here we test this hypothesis via a playback experiment in wild Siberian jays. Previous research indicated that Siberian jays can distinguish individuals by their vocalizations. Utilizing this, we investigated whether help was preferentially given to social partners. In a pairwise design, we exposed breeders to distress calls from a group member and an unfamiliar individual, alongside control treatments. We found a high degree of inter-individual variability in the willingness to help. Contrary to our expectations, jays responded similarly to distress calls from unfamiliar birds and group members, suggesting a universal profile in distress calls. This implies that helping provides strong direct benefits to actors, making it beneficial regardless of the identity of the bird in distress.
keywords: Cooperation; Group living / social behaviour

All noise is not the same! The influence of traffic noise on the behaviour and stress in the greater white-toothed shrew

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The growth of the human population poses many challenges for wildlife, among them an increase of anthropogenic noise. Noise pollution can disturb animal communication and cause acute or chronic stress. Shrews, small insectivorous mammals, are very vocal animals. We aimed to understand if noise pollution has a short- or long-term impact on shrews' twittering calls and stress response. We predicted that shrews inhabiting places with high absolute noise levels have elevated stress levels and possibly alter temporal or spectral parameters of their calls. We trapped greater white-toothed shrews (Crocidura russula) in sites of different levels of traffic noise and assessed their natural stress response in the field via faecal corticosterone metabolites. We then analysed their stress levels, activity and vocalization repeatedly over a period of five days in captivity. Absolute noise levels did not affect the behavioural or physiological responses of shrews. Instead, shrews showed elevated levels of stress and reduced levels of activity in places with variable noise profiles. This reaction be caused by the unpredictability of variable as opposed to constant noise and opens a new perspective on the impact of noise on wildlife.
keywords: Anthropogenic effects; Physiology and behaviour; Sensory ecology

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Habitat features and social information cues influence natal dispersal decisions in a cooperative breeder

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Choosing where to breed is an important decision in an individual's life, so selection should promote the use of cues to refine it. Many studies investigated factors affecting either departure from the natal site or arrival at the breeding site, but less frequently so the change of habitats between these two. We used 27 years of data from a long-tailed tit population (307 recruits) and a vegetation census over a 3km2 study area (9 metrics on 233 sampling points) to study the habitat features affecting natal dispersal. Tree density, the presence of hedgerows and a dense understorey habitat positively correlated with nest density, i.e. habitat preference. Yet, nest density did not predict breeding success, presumably because nests of long-tailed tits suffer high predation pressure across the whole study area, irrespective of habitat type. Finally, using an integrated step selection analysis, we showed that recruits dispersed to habitats with higher tree density and diversity and more understorey vegetation than their natal site, thus favouring a combination of foraging- and nesting-related cues. They also dispersed to more densely populated areas, suggesting a role of conspecific attraction in this facultative cooperative breeder.
keywords: Dispersal; Long-term studies; Cooperative breeding; Habitat change

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Fitness consequences of intergroup conflict

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Outgroup conflict is a powerful selective force in all social taxa. While the direct and indirect fitness consequences of individual outgroup contests are well documented, the cumulative pressure of outgroup threats could also potentially impact reproductive success. We use long-term life-history data from wild dwarf mongooses to investigate how intergroup interaction (IGI) rate influences breeding and offspring survival. IGI rate did not predict the number of litters produced or the inter-litter interval. Unexpectedly, IGI rate was positively associated with the number of pups alive three months after emergence from the breeding burrow. This was not due to fewer pups emerging but because those in groups experiencing more IGIs had a higher survival likelihood post-emergence. Natural observations revealed that both IGIs and the threat of intergroup conflict led to more sentinel behaviour by adults, likely reducing the predation risk to young. Our results contrast the previously documented negative effects of outgroup interactions on reproductive success and highlight the need to assess cumulative threat, rather than just the impact of physical contests, when considering outgroup conflict as a social driver of fitness.
keywords: Contests and competition; Long-term studies

Social predictors of fitness in mountain gorillas: links between individual and group-level traits

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There is strong evidence linking aspects of sociality with fitness across a wide range of species. An individual's fitness can be influenced by the social environment they experience at the group-level e.g. group size, as well as at the individual-level e.g their integration within that group. However, aspects of individual and group-level sociality have rarely been studied in combination. We are using two decades of social, health and demographic data on >150 mountain gorillas in 15 groups, to examine how individual and group-level social traits influence health, reproduction and survival. We hypothesize that the fitness consequences of individual-level traits will vary based on traits of the wider group. For example, strong, reliable relationships may have greater reproductive benefit in groups with lower range exclusivity, where infants face higher infanticide risk. By examining multiple aspects of the social environment and fitness, we aim to better understand the mechanisms by which sociality impacts fitness and the possible trade-offs individuals face in developing optimal social environments. These findings may shed light on how the wide variety of social phenotypes observed within species have evolved and are maintained.
keywords: Group living / social behaviour; Long-term studies; Life histories

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Do you feel what I feel? A cross-institute approach to assess emotions in pigs

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Emotions can be viewed as coordinated changes in behavior, physiology and cognition that help individuals to avoid harm and to seek out rewards. We initiated a cross-institute collaboration to identify robust biomarkers of emotion in n = 128 female pigs tested in potentially-positive (social or physical enrichment) and negative (social stressors or removal of enrichment) contexts. We developed a common ethogram for behavioral recording and standard operating procedures for collecting saliva samples, which were analyzed in the same lab to measure cortisol, as an indicator of arousal, and oxytocin, as a putative indicator of valence. Across institutes locomotor play increased in positive contexts (GLMM, $p = 0.001$), and escape attempts increased in negative contexts (GLMM, $p < 0.001$). Increases in cortisol were greater in response to negative compared to positive contexts (LMM, $p < 0.001$). Oxytocin did not vary consistently across contexts, but pigs exhibited decreases in oxytocin when an expected positive outcome was replaced by a negative one (LMM, $p = 0.01$). Other putative biomarkers did not differ between contexts. Multi-lab approaches can help to identify robust biomarkers of animal emotion that can be useful in practice.

keywords: Physiology and behaviour; Methods for studying behaviour; Neuroendocrinology; emotions

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Heterogeneous survival selection on spot patterns of wild Masai giraffes

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Phenotypic variation may be maintained by spatiotemporally varying selection pressures, which imply phenotype-dependent demography. Mammalian coat patterns show large individual variation, which suggest they may be adaptive through their potential role in communication, thermoregulation, parasitism avoidance or camouflage. Patterns may also play different roles among life-stages or sex. We investigated survival effects of coat spot patterns in a wild metapopulation of Masai giraffes monitored since 2011. Individuals were recaptured and identified with photographic surveys following a robust design. We quantified various spot traits and reconstructed encounter history of 814 individuals. Survival analyses show that individual survival primarily differs with traits related to spot size, but also partly to spot shape. Spot-dependent survival also differs among sex and age classes. Heterogeneous selection on spot patterns indicates that spot variation is important to consider in conservation management plans and to understand how population may adapt to changing environments.

keywords: Long-term studies; Life histories

Individual cognitive abilities helping in path minimization and task improvement in the Gypsy ant, Aphaenogaster senilis

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Path optimization is the ability to find the shortest path to a target site leading to increased transportation efficiency. This phenomenon has been studied in the foraging context in many species, from insects like bees and ants, to vertebrates like birds. Studies in ants concerned species that lay chemical trails and showed that the shortest path was chosen by the differential concentration gradient of the trail laid without any major involvement of cognitive ability. Here, we examined path minimization related to individual cognitive abilities, in the ant Aphaenogaster senilis. By using a bridge consisting of a combination of 3 different path lengths, we studied path minimization while ants forage individually, not involving chemical-trails. Studying 9 colonies and 64 individual transporters, we found that individual ants actively avoided the longest path for transportation. They showed improved foraging performance by faster the food discovery and food-transportation rate at the level of the colony and of the individual transporters. Our findings show that ants can minimize their path depending on the decision of individual foragers and instigate experiments to explore the mechanisms allowing ants to achieve this optimization.
keywords: Cognition; Foraging

Linking immunogenetics to tuberculosis susceptibility, progression and mortality in wild meerkats

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Despite strong theoretical frameworks predicting pathogen-mediated selection, particularly when infection costs on host fitness is high, evidence for it is scarce from natural systems. Mycobacterium pathogens, causing tuberculosis (TB), contribute markedly to morbidity and mortality of affected species from humans to wildlife, making them suitable candidate pathogens to investigate these host-pathogen dynamics. Host-TB interactions are complex and predictors of TB dynamics are still poorly understood in non-model species. Over the last two decades, TB has affected wild meerkats (Suricata suricatta) intensely studied within the Kalahari Meerkat Project, causing >10% of overall mortality since the late 1990s, with remarkable variation in TB susceptibility and progression. Capitalizing on the exceptional long-term life-history and health record dataset, we investigate the immune-genetic basis of this variation in individual TB dynamics. MHC II DRB-exon 2 genotyping of more than 1500 individuals alive between 1999 and 2023 allowed us to investigate the temporal dynamics between meerkat MHC allele frequency and their link to TB over time, providing first evidence of negative frequency-dependent pathogen-driven selection in wildlife.
keywords: Long-term studies; Host-parasite interactions; Behavioural genetics / genomics

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ALAN (Artificial Light At Night): A possible anthropogenic hazard to alter grooming activity in prawns

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ALAN (Artificial Light At Night) is a crucial anthropogenic hazard which can disrupt the circadian rhythm in animals. In order to determine if ALAN can affect the grooming habit of a freshwater prawn, we used Macrobrachium lamarrei as the model organism. Grooming is known to be a biomarker of neuro-behavioural alterations in animals. This study, is a population-based study, where the prawn population's collective grooming pattern was considered as the behavioural marker to assess the effect of ALAN on the brain-behaviour circuit. Our main target is to evaluate how collective grooming sessions are changing in respect to ALAN over time. Results indicated that ALAN can induce a decrease in the collective grooming activity at 6th hour, followed by an increase in the 12th hour, compared to their usual or natural dark/light environment. Over a period of time, the data on collective grooming in prawns under normal conditions is nearly constant. On the other hand, during ALAN, grooming activity dramatically increased after at 24th hours. We predict an upliftment in the collective grooming behaviour in prawns exposed to ALAN. This study establishes a possible relation between circadian rhythm and behavioural alterations.
keywords: Collective animal behaviour; Behavioural plasticity; Anthropogenic effects; ALAN (Artificial Light at Night)

Respect your elders: does age influence social partner preferences in male savannah elephants?

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How do male savannah elephants decide who to associate with? Bull groups are transient and lack strong kinship bonds, but they may still display specific preferences regarding social partners. Studies of different populations suggest varying association strengths and proposed causes of social patterns between male elephants, indicating that they are more likely to crop-forage if their close associates do too, and that young bulls learn from older ones. Identifying the association patterns that facilitate social learning can therefore help conservation planning to simultaneously protect elephants and local communities. In this study, we ask: i) Are older males more likely to hold central social network positions? ii) Do male elephants prefer to associate with males of similar age? iii) Are these trends similar across three independent populations? With almost 50 years of data per population, we used social network models to assess if age affects male association strength and network position. Contrary to previous studies, our preliminary results suggest no effect of age on male social position, and that this is similar across populations. It also has little to no effect on association strength, but age matching may sometimes occur.
keywords: Group living / social behaviour; Conservation and behaviour; Long-term studies

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Communication and social organization of zebra finches in the wild

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Birdsong is an important model system for animal communication and typically functions in mate attraction and territory defense. The zebra finch Taeniopygia guttata is the most studied songbird under controlled laboratory conditions where they are commonly kept in pairs or same sex groups. Yet, in the wild zebra finches live in multi level societies where males are not territorial, and pairs form long-term monogamous faithful bonds early in life, raising question on how they are socially and spatially spatial organized and which role their song plays. To uncover their social organization and male singing we here integrated various bioacoustic measures with automated solar powered radio-tracking. We will present results on their singing behaviour and on their movements and social organization. These findings on communication and social organization provide novel insights in the social life of birds and specifically the prime laboratory species in avian acoustics, the zebra finch.
keywords: Acoustic communication; Movement ecology; Communication

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Division of labour and task specialization in cooperatively breeding vertebrates

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Division of labour is most prominently observed in eusocial insects, but also occurs in much smaller groups of cooperatively breeding vertebrates. In such groups, where all individuals can typically perform any task, specialization is primarily acquired through learning, and the interests between group members may not always be aligned. The cichlid Neolamprologus pulcher may serve as one such example. However, our understanding of division of labour in groups of vertebrates is much less advanced. Through a theoretical modelling approach, we investigate the learning dynamics in groups of different sizes and with different constraints on how to balance tasks. We found that behavioral flexibility is selected for much stronger in small groups than in large groups. Further, if all tasks need to be performed in proximately equal amounts, individuals switch frequently between tasks and need to be able to learn new tasks quickly. These effects are enhanced when groups divide the labour between a large number of tasks. Altogether, living in small groups that share many tasks to be strictly balanced is the most cognitively demanding scenario, with possible implications for the coevolution of cognitive abilities and division of labour.
keywords: Group living / social behaviour; Cooperation; Learning; Division of Labour

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How bats keep prey in sight: integrated deployment of echolocation and flight tactics

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Target tracking involves complex motion prediction and correction, in which several tactics are orchestrated to keep moving objects in sight. The long history of studies on animal behavior has provided evidence for contribution of those tactics, though not reaching a systematic understanding of how individual tactics are combined into a strategy. Using an active-sensing bat to measure their sensing state while chasing the real prey, we found that bats simultaneously deploy three different tactics to enhance sighting accuracy (predictive control of sensing direction, adjustment of sensing rate and range), meanwhile their sensing is assisted by their distinct flight maneuvers that stabilize relative direction of prey. Our simulation results demonstrate that these combined tactics robustly improve the tracking accuracy over wide range of the delay constraint. In addition, we also showed that control of those tactics can be explained by a concise rule based on prey's angular velocity, which suggests that bats successfully reduce the burden of multitask management. Overall, we have clarified a framework for how multiple tactics can be integrated to achieve accurate tracking of erratically fleeing targets.
keywords: Predator-prey interactions; Cognition; Sensory ecology

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Inequality and group instability lead to suboptimal resource partitioning by collectives

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Indirect competition alters individual foraging success and thus decisions of where to forage next. Negative frequency-dependent learning and collective intelligence can allow group-living animals to avoid indirect competition and achieve effective resource partitioning (i.e. consistent differences in patch preferences among the groups in a population). What remains unknown is whether within-group heterogeneity can affect the emergent patterns of resource partitioning at the population level. Here, we test whether (i) inequality in decision-making power, (ii) unequal access to resources, and (iii) unstable group membership can affect the ability for groups to establish preferences for where to forage and avoid where other groups forage. In our simulations, individuals select a preference for where to forage next based on where they were recently successful, and groups choose where to go using a majority rule. Our results show that inequality in decision-making power, biased access to food, and unstable group membership reduce the ability for groups to establish preferences that avoid other groups, thereby suggesting a benefit of living in stable, more egalitarian groups.
keywords: Collective animal behaviour; Group living / social behaviour; Foraging

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Foraging ecology and prey sharing among leopards – ecological and conservation implications

Teresa Oliveira, Miha Krofel, Ruben Portas, Nik Šabeder, Ortwin Aschenborn, Bettina Wachter, Jörg Melzheimer

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Recent research has shown that prey sharing, i.e. simultaneous or sequential use of the same kill by several individuals of the same species, is more prevalent among felids than previously thought. However, these interactions are rarely reported and poorly understood for leopards. We used telemetry data from 37 GPS-collared leopards in two study areas in Namibia and generated GPS location clusters (GLCs). We used field-checked GLCs (n= 435) to develop an algorithm for distinguishing GLCs reflecting kill sites from non-kill sites. We then estimated leopard kill rates and handling times, and evaluated the simultaneous use of kill sites among different individuals. We also estimated the frequency of prey sharing based on sex and the sequence of sexes feeding on the kill. In addition to improving our understanding of leopard behavioural ecology and foraging success, we suggest that prey sharing could have important implications for conservation, particularly in populations in farmlands. Livestock farmers often eliminate leopards that return to the killed livestock with the aim of removing the predator that killed the livestock. Our data of frequent prey sharing suggest that this often results in the removal of a non-target leopard.

keywords: Foraging; Conservation and behaviour; Movement ecology

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Imprinted habitat selection varies across dispersal phases in a raptor species

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Natal Habitat Preference Induction (NHPI) is crucial for shaping settlement decisions in dispersive animals, yet its variability during natal dispersal and across different natal habitats remains underexplored. This study investigates NHPI in 77 GPS-tagged juvenile red kites (Milvus milvus) across an elevational gradient in Switzerland, monitored up to 6 years. Using individual-based step selection analysis, we analysed habitat selection from independence to settlement, uncovering a preference for natal-like habitats during the prospecting phase. This preference shifted during settlement, with high-elevation individuals avoiding, and low-elevation individuals preferring, similar habitats. The strength, direction, and individual variation in NHPI were significantly influenced by the dispersal phase and natal habitat type. Our findings highlight the critical role of long-term series in movement data for elucidating natal dispersal and NHPI complexities, suggesting potential impacts on species distribution dynamics.

keywords: Dispersal; Movement ecology; Behavioural plasticity

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Group-Hunting in Striped Marlin (Kajikia audax)

Korbinian Pacher , Krause, J., Bartashevich, P., Romanczuk, P., Bideau, P., Pham, D., Burns, A. L., Deffner, D., Dhellemmes, F., Binder, B., Boswell, K. M., Galván-Magaña, F., Domenici, P., Hansen, M. J.

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Striped marlin hunt schools of prey fish off the coast of Baja Mexico each year. A multi-disciplinary approach combining microCT, multi-object tracking from underwater and aerial video, hydro acoustics and computer simulation allows for the recording of predator and prey behaviour at multiple spatial scales throughout the predation event, and therefore the testing of hypotheses related to the mechanisms and functions of group-hunting. In this presentation I will provide an overview of the results from a multi-year project (2021-2024). The content covered includes: (i) how does weapon morphology (the bill) relate to group-hunting; (ii) how does a group of selfishly motivated epipelagic predators overcome the collective evasive behaviour of schooling prey, and divide this shared resource between themselves; (iii) how does the attack rate, capture success and spatial positioning of predators relate to the movement of prey schools as they are chased and herded across the ocean. Data that can test hypotheses related to group-hunting is rarer in open-ocean species than in terrestrial. I will discuss my results with respect to the physical constraints imposed upon open-ocean group-hunters by their environment.

keywords: Predator-prey interactions; Group living / social behaviour

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Understanding the Impact of Arsenic on Zebrafish (Danio rerio) Fin Strokes: Insights from an Interdisciplinary Study

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Understanding how fish move is crucial for comprehending their role in ecosystems, especially in predator-prey dynamics and hunting behaviours. Fish mainly use their fins to swim, a process that involves complex interactions between their fin structure, swimming mechanisms, and the physics of water. These coordinated movements allow fish to perform various activities such as escaping predators, hunting for prey, and navigating their environment. This research focuses on analyzing how zebrafish (Danio rerio) move their fins and investigates any changes caused by exposure to arsenic trioxide, a common environmental pollutant. Specifically, the study looks at how non-lethal levels of arsenic trioxide affect the swimming behaviour of zebrafish, particularly the frequency of their fin movements. The results show a significant increase in all observed fin movement patterns when the fishes are exposed to arsenic, suggesting that this contaminant can stress the nervous and muscular systems responsible for fin movements. This interdisciplinary study combines the fields of behavioural ecotoxicology, neurotoxicology, and biomechanics, highlighting how environmental factors can lead to abnormal swimming behaviours in fish.

keywords: Pollution and behaviour; Movement ecology; Behavioural plasticity

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Are species-typical traits a myth? Heterogeneity within and across allogrooming networks of adult female bonnet macaques

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Macaca radiata societies typically consist of stable, female-bonded cores. Usually philopatric adult females form independent, occasionally related, matrilines and occupy unique positions within a strongly linear, transitive dominance hierarchy. Coalitionary support appears to be a major force in determining the social structures of groups. Allogrooming is a behavioral mechanism, which may be employed by individual females to strengthen their affiliative bonds. We construct allogrooming networks, from structured observations of 3 years of their dyadic interactions, in 6 groups from a population in southern India that has been monitored for 20 years. We derive centrality metrices from these networks, explore their biological significance and assess their disparity. The variation and the lack thereof of it, observed within and across these long-term grooming networks in different troops of the same species, shed new light on the generality of previously concluded—apparently species-typical—allogrooming patterns derived from often rudimentary studies of few cercopithecine primates, usually in captivity. We also investigate the influence of dominance rank, individual age and group composition on the observed patterns of allogrooming.
keywords: Group living / social behaviour; Cooperation; Long-term studies

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Social information in nest-site choice of a colonial passerine

Laura Noguer Pérez, Daniel Sol Rueda
CREAF, UAB

Animals often use social information to make decisions on where to feed or what risks to avoid. However, the relevance of social information for breeding habitat choice remains controversial. Here, we address this gap by using data on nest occupancy and breeding performance of jackdaws (Corvus monedula) along a 9 year-period, modelling the probabilities of occupying an empty nest-box and re-using it as a function on the social context. We found evidence that individuals use the presence of conspecifics and their breeding performance to decide where to breed. These results challenge previous analyses and highlight the importance of integrating different sources of social information. Thus, the social context should be considered crucial in conservation biology and evolutionary ecology.
keywords: Reproductive behaviour; Long-term studies

The imperceptible melody of Geogap: unravelling the acoustic network of the African striped mouse

Léo Perrier, Lény Lego, Tristan Cladière, Martin Blanchard, Wiebke Berns, Aurélie Pradeau, Carsten Schradin, Michael Greenfield, Nicolas Mathevon , Florence Levréro
ENES Bioacoustics Research Laboratory, CNRS, Inserm, University of Saint-Etienne, Saint-Etienne, France

In social species, acoustic communication is crucial for interactions within and between groups. In the Murinae family, animals mainly produce ultrasonic vocalisations (USVs), which seem to modulate their social relationships. However, USVs are mostly studied in laboratories, in relatively poor social environments. We aimed to study the vocal communication of a social rodent species in the wild, the African striped mouse, to unravel its acoustic network. Behavioural and ultrasonic communication studies are rare in wild rodents due to the lack of well-monitored populations, and the difficulty of recording and playing back USVs. In this study in the Geogap Nature Reserve, we tested individuals' responses to the vocalizations of mice from their own group, neighbouring groups and strangers. We found a group vocal signature using deep learning, and showed that individuals extracted information about the identity of conspecifics from vocal cues. Mice showed heightened vigilance in response to the USVs of neighbours and strangers, along with a vocal response, while they tended to ignore groupmates' calls. This suggests that the African striped mouse may have a mind map of its acoustic network, aiding navigation during its daily foraging.
keywords: Acoustic communication; Group living / social behaviour; Methods for studying behaviour; Rodents ultrasonic vocalizations

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To eat or to care? Factors shaping parental or infanticidal behaviour in male poison frogs during territory takeover.

Leila Perroulaz, Lauriane Bégué, Eva Ringler
Université de Neuchâtel, Universität Bern

Parental care benefits the recipient but is costly to the caregiver. It is even more costly when kin recognition mechanisms are ineffective, resulting in care for unrelated offspring. Infanticide occurs in many taxa and has been shown to increase mating possibilities, ensure dominance, or reduce competitors' fitness. Previous studies have shown that males Allobates femoralis, a territorial poison frog with paternal care, do not discriminate between their own and conspecific clutches. Males transport all tadpoles present in their territory to waterbodies. However, during territory takeover males become highly cannibalistic and will prey on clutches from the previous territory holder. This study aims to investigate the factors enabling a transition from cannibalism to care in male A. femoralis after they take over a new territory. We manipulated territorial state and mating activity of the males to see if we find differences in their propensity to transport or cannibalise newly encountered clutches. We found that both factors influenced the male's behavioural response. Our results suggest that mating activity as well as time spent in a territory shape male parental decisions in poison frogs.
keywords: Parental care; Reproductive behaviour; Cannibalism

Seasonal variation in spatiotemporal interactions among carnivores revealed by year-round camera trapping

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Carnivores can coexist within diverse guilds by adjusting their ecological requirements to minimize niche overlaps. Spatial and temporal dimensions can display flexibility mediated by various factors, such as guild composition and seasonality in species life cycles. We conducted year-round systematic camera trapping in a mountainous area of Central Italy to assess whether and how wolf presence affected spatiotemporal interactions of smaller carnivores, and whether the influence of the top predator differed among seasons. Besides the wolf, the carnivore guild was mainly represented by red foxes, European badgers, stone martens, and pine martens. We found different patterns of spatiotemporal association among them, along with variable effects of wolves on their interactions across seasons. The relationships we found partially support the effect of top predators on the coexistence of smaller carnivores in space and time. Moreover, our results underscore the need to conduct long-term studies throughout the year to capture seasonal variations in intraguild interactions and the factors affecting them.
keywords: Interspecific interactions; Long-term studies

Prior experience affects Asian elephants (Elephas maximus) response to ambiguous cues: Evidence for cognitive bias.

Sagarika Phalke, Cécile Sarabian, Alice C.Hughes and Hannah S. Mumby
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Animals use sensory information to make critical decisions for survival. Sensory information is often ambiguous causing challenges for decision-making. Evidence suggests animals use sensory cues and previous experiences to generate expectations about ambiguity. To test this, we used cognitive-bias tests modified for captive Asian elephants. We investigated their responses to ambiguous cues after previously experiencing positive (rewarded) and negative (unrewarded) events. We manipulated sensory cues (spatial position and color) to create degrees of ambiguity which were closely (less ambiguous) or intermediately (true ambiguous) associated to previous positive and negative experiences. Elephants showed a positivity bias by selecting the less ambiguous positive cue three times more than the negative cue (GLMM; $z=-7.63$, $p<0.001$). They showed no difference in selecting the true ambiguous compared to the negative cue, but when selected, it was 20 seconds faster. This indicates that animals use category-based response rules based on sensory cues and valence of previous experiences when responding to ambiguity. Understanding animals decision-making strategies has implications for welfare and long-term responses to changing environments.
keywords: Cognition; Sensory ecology

Behavioral model of red deer based on a highly sensitive accelerometer and its applicability in telemetry studies

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Advancements in animal monitoring technology provide crucial insights into wildlife behavior, impacting ecosystems. Large ruminants, crucial for forest regeneration, face challenges from human activities and wolf recolonization. Understanding deer behavior in the presence of wolves is vital for game management. While past predator-prey research focused on wolves as predators, there's a gap in understanding deer responses as prey. Examining this dynamic is key for predicting wolf damage, implementing preventive measures, and using wolves for deer population control.The study focuses on constructing a behavioral model for red deer and its implications, utilizing data from experimental farm. DailyDiary sensors with highly sensitive accelerometers were attached to deer, complemented by video recordings for model training and with the use of DDMT software were identified seven types of behaviour. The study aims to use a behavioral model for European deer, define seasonal behavior changes, and explore the impact of wolf reintroduction, contributing valuable insights to wildlife management and conservation. This research enhances our understanding of deer behavioral responses to wolf reintroduction and their influence on the ecosystem.

keywords: Methods for studying behaviour; Collective animal behaviour; Predator-prey interactions

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Detailed insights on parental behaviour of wild jackdaws using continuous recording and computer-vision techniques

Marçal Pou-Rossell, Daniel Sol, Jolle W Jolles

CREAF

Parents are known to behave differently at different times of the day, across the breeding season and under different weather conditions. However, due to logistic and technological limitations, traditional methods often fail to collect temporally detailed data, preventing to account for environmental and temporal factors influencing behaviour. Despite holding profound implications for our understanding of how parental care influences offspring fitness, we still know relatively little about temporal dynamics of multiple dimensions of parental behaviour, as there is little highly detailed quantitative data available. Here, we introduce a novel automated camera-based monitoring system designed to record fine-scale behavioural patterns from parental care across the entire reproductive cycle. Using this system, we continuously captured image data of 14 wild jackdaw nests (Corvus monedula) for five months at a 1-second resolution. By integrating cutting-edge computer-vision AI with deep-learning, we could effectively quantify key aspects of parental behaviour from nest construction until fledging. For the first time, we will present results on detailed temporal changes in parental behaviour throughout the complete reproductive cycle.

keywords: Parental care; Methods for studying behaviour; Reproductive behaviour

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Multidimensional plasticity of phenology: Effects of density on plastic responses of breeding time to temperature

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Phenotypic plasticity is crucial for annual adjustment of breeding time in response to temperature fluctuations. Organisms encounter multiple fluctuating environmental factors such as conspecific density, which significantly affects fitness. We examined interactive effects of temperature and conspecific density at different spatial scales (territory and patch level) on breeding time and success, using long-term data from a great tit (Parus major) population. Birds bred earlier with warmer spring temperatures and at low local density, be it average lifetime density or during years of low density. There was no significant effect of density at patch level. Earlier breeding reduced brood failure risks and increased fledgling success, lower territory densities increased fledgling success and high patch densities increased the risk of brood failure. Density-related responses are likely mediated by food competition rather than by an increased proportion of low-quality birds or higher occupation of poorer territories at higher densities. This study highlights the importance of analysing factors across spatial scales and individual responses to multivariate cues for a comprehensive understanding of variations in phenological plasticity.
keywords: Behavioural plasticity; Contests and competition; Long-term studies; Multidimensional plasticity

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Effects of birth timing within the breeding season on personality in a small mammal

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For short-lived seasonal breeders, offspring experience different ecological conditions due to the time of birth within the breeding season: later-borns may face more intense resource competition for survival because of higher population density. We conducted behavioral tests on a wild population of the bush Karoo rat (Otomys unisulcatus), a small rodent that constructs stick lodges for shelter, which provide essential protection from the harsh environment throughout its life. The lodges are long-lasting structures, their availability is affected by population density: it may be more difficult for individuals to find unoccupied lodges at the end of the breeding season when population density peaks. We investigated the association between the date of birth within breeding season and individual personality types. 98 individuals underwent repeated tests for activity, boldness, and exploration-like behavior as young adults and fully matured adults. We found behavioral phenotypes along a proactive-reactive gradient. Individuals born later showed a more proactive personality. Our results provide evidence that birth timing has a long-lasting effect on personality, which may increase competitive ability for resources in the later-borns.
keywords: Animal personality; Life histories

Social competence – what are we measuring?

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Social competence refers to the ability of an animal to optimise the expression of its social behaviour based on the available social information. It is of particular importance in social species, where the behavioural response in each interaction has consequences for an individual's fitness. However, it is difficult to determine what the defining behavioural traits of social competence are. Moreover, these interactions require the individuals to accurately perceive the social information, generate a behavioural strategy, implement and evaluate the strategy and further decide on subsequent action. In cooperatively breeding cichlids, Neolamprologus pulcher, helpers appease the dominants by submission behaviour or by providing help. They also interact with other helpers within the group to maintain dominance hierarchies by aggressing to lower ranks and submitting to higher ranks. Many of these competencies are learnt from early-life environments and have links to cognitive flexibility. In this study, we will study several indices of social competence in the cichlids, at the individual level, repeatedly to distil the essential attributes of social competence and how the different indices relate to each other.

keywords: Group living / social behaviour; Behavioural plasticity; Methods for studying behaviour

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The influence of hunting ban areas on red deer behaviour

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The concept of the landscape of fear is applicable to both natural predators and humans. We tested whether a National Park free from hunting and smaller-scale hunting ban areas (both types together = HBAs) influenced diurnal and nocturnal habitat use in red deer (Cervus elaphus) compared to unprotected areas. Using integrated step selection functions, we analysed habitat selection of 243 GPS-collared individuals from six study areas across the Central Alps during day and night, over the course of the year, and especially during the autumn hunting season. During the day, red deer avoided habitats where encounters with humans were likely, and preferred HBAs from spring to autumn. At night, they showed the opposite selection. This daily pattern was absent in the study area centred on the National Park, where habitat selection was less specific overall. During the main hunting season, red deer preferred HBAs over areas without protection during both day and night. Thus, HBAs succeed in mitigating the influence of humans on the behaviour of red deer and allow the animals more freedom of movement and activity, i.e. to show "nocturnal" behaviour during the day as well.

keywords: Conservation and behaviour; Movement ecology

Coevolution of female fidelity and male help in populations with alternative reproductive tactics

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In socially monogamous species, pair-bonded males often continue to provide care to all offspring in their nests despite some degree of paternity loss due to female extra-pair copulation. Here we use an analytical population genetics model and an individual-based simulation model to explore the coevolution of female fidelity and male help in populations with two genetically determined alternative reproductive tactics (ARTs): sneakers that achieve paternity solely via extra-pair copulations and bourgeois that form a mating pair and spend some efforts in brood care. We show that when the efficiency of mate guarding is intermediate, the bourgeois males can evolve to 'specialize' in providing care by spending more than 90% of time in helping their females while guarding them as much as possible, despite frequent cuckoldry by the sneakers. We also show that when sneakers have tactic-specific adaptations and thus are more competitive than the bourgeois in gaining extra-pair fertilizations, the frequency of sneakers and the degrees of female fidelity and male help can fluctuate in evolutionary cycles. Our theoretical predictions highlight the need for further empirical tests in species with ARTs.
keywords: Reproductive tactics; Parental care; Cooperation; Theory

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Agricultural landscapes shape roe deer behavior and their response to global warming

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Agriculture and global warming are identified as major global threats to terrestrial biodiversity, yet few studies have considered the behavioral responses of synanthropic species to both threats simultaneously. We combined 11 years of GPS-tracking and activity data from European roe deer (Capreolus capreolus) with long-term field observations of local agricultural practices to understand how crop phenology, high temperatures and woodland availability simultaneously shaped the habitat use and activity patterns of roe deer year-round and during the summer mating season. We found that female roe deer adjusted their behavior depending on crop type, phenological stage and time of day, suggesting that tall crops provided substitute refuge when 'natural' cover was scarce. This behavior stopped under high temperatures in summer, likely reducing refuge availability for females with little access to woods. Woodland availability and sex mediated responses to heat suggesting that high temperatures exerted a stronger constraint on individuals with limited woodland and rutting males. Our work highlights how behavioral plasticity, life history and preserving forest areas may shape how roe deer mitigate human land-use and climate change effects
keywords: Anthropogenic effects; Climate (change) and behaviour; Behavioural plasticity

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Who let the frogs out? Insights from an experimental island population

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Animal populations in closed settings allow for unbiased estimates of fitness. In 2012, we established an experimental population of the dendrobatid frog Allobates femoralis on a river island to investigate a variety of questions ranging from space and resource use, orientation, animal personality, and communication. We took advantage of the colonization phase of the island, and used molecular parentage analysis to establish cross-generational pedigrees and reconstructed tadpole transport trajectories of frog parents. In the past years, we investigated how individual frogs differ in their levels of aggression, exploration, and boldness and how this impact on individual space use, mate choice, and parental care; and how these differences ultimately affect an individual's survival and reproductive performance. The combination of population monitoring, standardized behavioural testing, habitat manipulation experiments, and genetic parentage analysis revealed that poison frogs show strategic and flexible parental strategies, have elaborate navigation and communication skills, and exhibit consistent individual differences in behavioural profiles.
keywords: Long-term studies; Animal personality

The role of the sun in shaping wild western gorilla movements

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In the shade of the rainforest, it can be difficult for a frugivore to find fruiting trees, which are scattered, patchy and rare. When foraging, western gorillas (Gorilla gorilla) rely on their memory of food locations. As with most mammals, it is not yet known what tools they actually use for spatial orientation. By enhancing the visibility of landmarks and/or acting as a compass, the sun may support efficient spatial orientation. Using long-term GPS tracking (596 days) of one group of wild western gorillas, we investigated the role of the sun in shaping gorilla movement between resource patches. We found that gorillas moved straighter under sunlight conditions even under a dense vegetation cover. By contrast, movement straightness was not markedly different when the sun elevation was low (the sun azimuth being usable as a compass) or high (so providing no directional information) and the sky was clear or overcast. This suggests that gorillas navigate by relying on landmarks but do not use the sun azimuth as a compass. This study uncovers a neglected aspect of primate navigation. Spatial memory and vision may have played an important role in the evolutionary success of diurnal primate lineages.
keywords: Movement ecology; Foraging; Cognition

Infection dynamics predicted by host sex and early reproductive decisions: a longitudinal study in the European shag

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University of Glasgow

A common pattern observed in age-structured animal populations is age-related variation in both prevalence and intensity of parasite infection. Understanding the influence of within- and between-individual factors on age-specific levels of infection is a central challenge in ecology. We used endoscopy methods to examine dynamics of nematode infection in adult European shags (Gulosus aristotelis) using a data set spanning nine years from a longitudinal study of individually marked birds on the Isle of May, Scotland. We explored two non-mutually exclusive explanations for age-related variation in nematode infection: within-individual changes in parasite burden with age and selective disappearance. We investigated whether host sex and recruitment decisions modulate temporal infection dynamics. While female shags showed a consistent decline in nematode burdens with age both cross-sectionally and longitudinally, infection dynamics were associated with age at first reproduction in males. There was little evidence of selective disappearance driving cross-sectional patterns of infection. Age-specific levels of infection were driven by within-individual processes through interactions with host sex and early reproductive strategies.
keywords: Long-term studies; Host-parasite interactions; Reproductive tactics

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The interlink between socio-ecological factors and cognitive development on foraging competence in wild meerkats

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The ability to acquire food (i.e., foraging competence) is fundamental for survival, particularly during development. In meerkats (Suricata suricatta), adults sustain pups throughout ontogeny by provisioning food, and pups follow adults while foraging, favouring most helpful ones. However, pups that invest more time foraging independently reach better foraging competence later in life and experimental provisioning increases pup's foraging time (Thornton 2008). Pups may maximise their fitness through different developmental strategies (begging versus independent foraging) which in turn can impact future survival. Thus, both the pup's ability to identify and follow most helpful adults and personality traits may influence foraging strategy and future competence. We followed 19 pups from 8 litters throughout development. We conducted natural observations, personality and cognitive assessments at five time points from nutritional reliance on adults, to nutritional independence, into early adulthood. We disentangle the effect of socio-ecologicaly (e.g., group composition) from individual characteristics (cognitive skills and personality traits), in the development of foraging strategies and competence in meerkats.
keywords: Foraging; Cognition; Animal personality

You sound familiar! Leopards discriminate between familiar and unfamiliar long-distance calls.

Rosaria Santoro, Sue Anne Zollinger and Selvino de Kort

Manchester Metropolitan University, You sound familiar! Leopards discriminate between familiar and unfamiliar long-distance calls.

Recognition of conspecifics via long-distance vocalizations is crucial for sexual communication and territorial spacing in solitary species such as leopards (Panthera pardus). We conducted playback experiments with 17 captive leopards to determine whether they can discriminate between the long-distance calls of their enclosure mate and an unfamiliar individual. The loudspeaker broadcasting the stimuli was placed opposite to the enclosure mate's enclosure (EME), with the mates removed during the playback. We measured three behavioral responses to stimuli: Facing the EME, facing the loudspeaker, and response latency. Subjects faced the EME only when they heard the calls of their enclosure mates, even though the loudspeaker was in the opposite direction. The subjects also exhibited increased visual attention towards the loudspeaker with opposite-sex playback stimuli. Leopards faced the loudspeaker longer for unfamiliar than familiar stimuli. Results suggest that leopards extract individual identity information from vocalizations, discriminating between familiar and unfamiliar long-distance calls. Leopards showed higher response to opposite than same-sex callers, likely to play a role in attracting mates in the brief mating season.

keywords: Acoustic communication; Communication; Signalling; Playback experiment

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Sibling number matters: differential social interactions during early life affect social competence later in life

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The social environment to which animals are exposed during development can affect their later-life behavioural competences (ability to respond adequately to environmental challenges). An essential yet unexplored component of the social environment is the number of siblings individuals grow up with. Sibling numbers exhibit substantial natural variation and may thus be a key determinant of the early social environment for many vertebrates. Using the cooperatively breeding fish Neolamprologus pulcher, we investigate whether the number of siblings during early life affects the development of territory defence competence at the juvenile stage. We reared N. pulcher in large broods (LB), small broods (SB), or LBs with restricted social interactions. We predicted that growing up in LB would improve territory defence competence later in life. Moreover, we predicted that restricting social interactions will reduce the advantages of growing up in an LB. Growing up in an LB represents a complex environment that can enhance animals' cognitive development and help them develop better behavioural competences later in life. Therefore, we propose that growing up in a large brood can be a crucial factor contributing to individual fitness.

keywords: Behavioural plasticity; Cooperative breeding; Interspecific interactions

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Hierarchy of human-generated signals in free-ranging dogs' approach decision

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We investigated the hierarchy of human facial & auditory signals in interspecific individual recognition in free-ranging dogs (FRDs) through a choice test. FRDs have to navigate complex interactions with a multitude of humans daily & need to identify potential friends or foes quickly. FRDs can recognise & distinguish between familiar & unfamiliar humans on the basis of facial cues but an added auditory stimulus might be required if certain facial features are covered. To test if recognition system is holistic or cue-biased, we tested the response of 40 dogs through approach to two familiar humans. One experimenter provided a positive auditory cue but no facial cue (face covered) & the other with visible face but no auditory cue. Dogs chose the vocalizing human significantly higher even when their faces were covered. Vocalisation also seemed to bias their choices when selecting between a familiar versus unfamiliar person. Dogs are more likely to respond to auditory cues over facial cues as they can receive & respond to auditory signals from afar, decreasing chances of potential harm. Furthermore, positive vocalizations are generally followed by a positive gesture (petting or food) by friendly humans & may thus be more trusted.
keywords: Communication; Acoustic communication; Cognition; Urban ecology

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Genetic, Developmental and Environmental Drivers of Social Network Traits in Wild Great Tits

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Social animals exhibit complex group dynamics vital for processes like information sharing and predator vigilance. Understanding the evolution of sociality requires disentangling the causes of individual-level variation in social behaviours. Leveraging a multigenerational pedigree and extensive observational data from a long-term monitored great tit population, this study explores genetic and environmental variation in repeatable social network traits derived from foraging events. Animal models reveal minimal narrow-sense heritability (<3%) in group size choice, further reduced (<0.4%) when considering spatial location (30%). Moreover, despite natal dispersal, a substantial proportion of adults forage near their birth site, indicating scope for natal environment effects. Individual gregariousness (degree) has a small genetic component (<4%), centrality has estimates up to 10% in 1 of 3 years sampled, and betweenness shows virtually zero heritability overall. These findings suggest detectable, albeit small, genetic influences on individual sociability, with marked environmental effects. Future analyses will explore temperature effects during natal stages on adult behaviour, enhancing our understanding of factors shaping sociality.
keywords: Group living / social behaviour; Long-term studies; Behavioural plasticity

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Hibernation phenology shifts in opposite directions in two sympatric bat species in response to climate change

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Long-term studies are fundamental to understanding how animals adapt their phenology in reaction to environmental change. In temperate-zone bats, as in many other mammals, hibernation is a crucial adaptation to overcome unfavorable conditions, which must be carefully timed to match the environment. Here, we investigate the hibernation phenology of two sympatric bat species with different foraging ecologies, Daubenton's bat (n=938) and Natterer's bat (n=891), over the course of 13 years using RFID-readers placed at the entrance of their joint hibernaculum. We used linear mixed models to assess how entry, emergence and duration of each bat's longest period within the hibernaculum changed over time. We observed significant shifts in hibernation phenology, with contrasting patterns between the species. With a warming climate, Natterer's bats entered the hibernaculum later and emerged earlier, resulting in an overall decrease in hibernation length of 1.87 days/year. In contrast, Daubenton's bats advanced their entry into the hibernaculum, leading to a surprising increase in hibernation duration by 1.15 days/year. Our results highlight that the hibernation phenology of sympatric species may be oppositely affected by climate change.
keywords: Long-term studies; Climate (change) and behaviour

Fitness consequences of stochastic behavioral individuality in a clonal fish

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Genetic and environmental differences are by far the most studied drivers underlying phenotypic variation. However, a growing number of studies finds substantial among-individual variation that is unexplained by apparent genetic or environmental differences. Here, we ask whether such seemingly stochastic variation has fitness consequences by performing a long-term life-history experiment with a naturally clonal fish (Poecilia formosa). Maintaining highly standardized conditions for 280 days, we recorded individuals for 10 hours per day over the first 28 days of their lives, assessing early-life behavioral profiles. We then characterized reproductive profiles over 4 broods per individual, quantifying in total 2522 offspring and 152 broods. We find (i) consistent among-individual differences in the size of offspring and broods produced and (ii) early-life behavioural individuality in activity and feeding patterns, with among-individual differences in feeding being predictive of growth, and consequently offspring size. Our study provides experimental evidence that even when minimizing genetic and environmental differences, systematic individual differences in life-history measures and ultimately fitness can emerge.
keywords: Animal personality; Life histories; Long-term studies

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Cuddling pigs: brain response to being stroked after establishing a positive human-animal relationship

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Positive contacts with humans can induce pleasurable experiences for animals, but little is known about the underlying neurobiology of the human-animal relationship. This study looked at the brain response to being stroked by a human in 20 female pigs under general anaesthesia, of which 10 had been habituated to human contact over 9 weeks post-weaning. Functional Magnetic Resonance Imaging (fMRI) scans were analysed with SPM12 to compare the positive contact (POS) and control groups. We expected to observe differences in brain areas related to social processing (pre-frontal cortex) and in pleasure-related areas (anterior cingulate cortex, nucleus accumbens, caudate nucleus) in POS pigs, and greater activation of the amygdala in control pigs. As we predicted, greater activation in the pre-frontal cortex and the anterior cingulate cortex, and lower activation in the amygdala were observed in the POS pigs compared to control pigs. However, greater deactivation was observed in the caudate nucleus of POS pigs, and no difference was found in the nucleus accumbens. Long-term experience of positive human contacts therefore altered the pigs' brain response and suggest that stroking by a human is perceived as a social and pleasurable event.

keywords: Interspecific interactions; Cognition; Neuroendocrinology

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Cost of reproduction in the clonal ant Platythyrea punctata

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Eusocial insect colonies are characterized by division of labor (DOL) among reproductive and non-reproductive nestmates. Egg-layers are typically more long-lived than non-reproductives, contrasting the trade-off between fecundity and longevity reported for numerous non-social animals. In species with distinct caste diphenism between queens and workers, variations in morphology, developmental time, and larval food availability may explain this phenomenon. Yet, a similar positive link between fecundity and longevity exists in queenless ants, where reproductive and non-reproductive individuals share indistinguishable ontogeny and morphology. Reproductive DOL is present among morphologically and genetically identical clonal ant Platythyrea punctata. Can everyone overcome the costs of ovary activation irrespective of its social rank? We conducted egg-removal treatments to understand egg-laying behavior in detail, compared the lifespan and egg quantity and quality. Our preliminary results suggest that nearly 90% of the workers can activate their ovaries despite their social rank, and several subordinates even had the potential to outcompete dominants. Our findings aim to give insights into the cost of reproduction in totipotent ants.

keywords: Cost of reproduction; Group living / social behaviour; Life histories

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Investigating the link between sociality and female reproductive success in Assamese macaques

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Understanding the link between social environment and reproductive success is crucial to explore the benefits of sociality. While many studies find positive correlations between within-group variation in sociality and fitness in primates, others report more nuanced results. Using long-term data collected from 2007-2023 in a wild population of Assamese macaques (Macaca assamensis) at Phu Khieo Wildlife Sanctuary, Thailand, we test the effect of strength of the strong ties and dominance rank on two crucial components of female reproductive success: conception probability and infant survival. We constructed a directed acyclic graph and adjust for variables like group size, reproductive history, age, and food availability in our models. Our sample includes 572 reproductive cycles from 82 adult females and 336 births from six groups with 21–98 individuals. We hypothesize that females with stronger ties and higher ranking will have enhanced reproductive success, particularly in seasonal breeders, where spatial association with closely bonded partners can provide feeding benefits and reduce harassment. The findings of this study will shed light on mechanisms by which social interactions may influence reproductive outcomes in primates.
keywords: Long-term studies; Group living / social behaviour

Sexual selection in a sexually monogamous species

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Sexual selection has been studied and measured in many taxa, but most studies focused on polygamous or monogamous species with extra-pair paternity, while sexually monogamous species have been left aside. Additionally, the impact of external factors on sexual selection, like predation, has rarely been studied in wild populations. We use sociable weavers (Philetairus socius), a sexually monogamous facultative cooperative breeder, with a low divorce rate and a low extra-pair paternity rate. We used 8 years of breeding data on more than 1400 individuals living communal nests that were experimentally protected and not against snakes, the chicks' major predator. We measured the probability of mating once, the opportunity for selection (I) and sexual selection (Is), Bateman gradients (βss) and Jones index (s'max) in relation to sex and colony protection. Females have higher probability than males of mating once and Is was stronger for males in protected and unprotected colonies. βss was found positive only for females in protected colonies. Our results bring new information on how individuals undergo sexual selection in sexually monogamous species and how predation can influence the sexual selection measures in wild populations.
keywords: Sexual selection; Long-term studies

Social ageing reduces late-life disease risk in a group-living primate

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Ageing affects many phenotypic traits, but the declines in social behaviour that occur with age have only recently become apparent. Given the fitness benefits associated with social connectedness, understanding why 'social ageing' occurs is important for integrating sociality into our understanding of the ageing process. We explored within-individual age-based changes in sociality using 8-years of behavioural data from a population of free ranging rhesus macaques. Our results revealed that females actively reduced their social networks with age and focused on partners previously linked to fitness benefits including kin, strong and stable partners, providing the clearest evidence to-date for social selectivity in a non-human animal. By simulating pathogen spread through these social networks, we showed that social selectivity has the potential to be adaptive by protecting against disease risk in later-life. This benefit of social ageing was greatest when infection severity increased with age and pathogen transmissibility was high. Taken together, these results demonstrate the value of long-term data in disentangling the drivers of social ageing and therefore shedding light on the late-life consequences of these behavioural changes.
keywords: Group living / social behaviour; Behavioural plasticity; Life histories; Behaviour and disease ecology

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Facial displays are related to affective states in domestic fowl

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Some bird species have the capacity to move their head feathers and to rapidly change the colour of their facial skin due to variation in blood flow (i.e. blushing). In mammals, variation in facial expressions are used as a marker of affective states. The aim of our study was to investigate the relationship between facial displays and affective states in domestic hens. To this aim, skin redness of the bare areas of the face and the position of head feathers of 12 adult hens were measured during situations varying in emotional valence and/or arousal level: situations associated with fear or frustration (negative valence/high arousal), situations associated with pleasure or reward (positive valence/high arousal) and situations associated with calm and contentment (positive valence/low arousal). Our results show the highest facial skin redness in situations of fear and frustration, a lower but still high redness in situations of pleasure and reward, and the lowest in situations of calm and contentment. Head feathers were fluffed most frequently in situations of positive valence. In conclusion, hens showed facial displays associated with their affective states, opening new perspectives to study avian affective states.
keywords: Cognition; Physiology and behaviour

How to cope with thermal stochasticity? Foraging strategies and underlying energetic requirements of thermal stress.

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Despite being concomitant to climate change, the ecological, behavioural and physiological implications of thermal stochasticity on organisms remain largely unexplored. In particular, the sensitivity of foraging behavioural strategies to temperature could have large consequences across communities via trophic interactions. In this context, we investigated the effect of thermal unpredictability on an endangered freshwater fish, the Rhône apron (Zingel asper). Fish (n=92) were acclimated to constant temperatures (13°C, 18°C or 23°C) or experienced a stochastic profile centered on 18°C but randomly oscillating between 13°C and 23°C. We predicted a decline in foraging activity associated with increased energetic cost. We assessed this response by measuring functional response, spontaneous activity and standard metabolic rate (SMR). At ecosystems scale, the alteration of foraging behaviour suggests important consequences of stochasticity on trophic networks. At the organism's level, responses being not mirrored point out that stress might alter the commonly presumed mechanistic link between underlying physiological needs and resource acquisition, therefore questioning the persistence of species in the era of global change.
keywords: Climate (change) and behaviour; Foraging; Physiology and behaviour; Thermal stochasticity

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Personality matters - the interplay between consistent individual differences and mouse welfare

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Evolutionary and behavioural ecology place emphasis on the ecological importance of consistent individual differences in behaviour ('animal personality'). Animal welfare science, by contrast, focusses on mean population levels, largely neglecting individual differences. However, animal personality might be of relevance for animal welfare too. In laboratory praxis, animal housing conditions are typically standardised and often constrain exploration behaviour, an important personality trait. However, individuals with distinct exploration types might experience identical housing differently. Against this background, we hypothesise to observe personality-dependent welfare consequences in response to the housing condition. Female mice were characterised for their personality type in exploration and the most and the least explorative individuals were set up in standard housing. Half of the animals had additional access to super-enriched cages. We monitored individual welfare using a multi-domain approach (behaviour, physiology, immunology). Our results hint towards personality-dependent welfare consequences in response to the housing condition that allow for a shift of perspectives in the evaluation of animal welfare.
keywords: Animal personality; Physiology and behaviour; Animal welfare

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Facial Facts: A novel and non-invasive method to study pinniped foraging behaviour

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Studying foraging behaviour is key to understanding the ecology of species, populations and even individuals. On all levels a range of diverse foraging strategies can arise, as is the case for the Galápagos sea lion (Zalophus wolebaeki). As part of a long-term monitoring project the foraging behaviour of adult females was studied using biologging devices, discovering distinct foraging strategies, which are differently adapted to varying environmental conditions. However, the use of such devices is often associated with high costs and invasive attachment methods. We therefore established a novel, non-invasive and cost-effective method using vibrissae length as morphological proxy to visually determine foraging strategies. Specialized foraging behaviours result in distinct and temporally stable patterns of vibrissae abrasion. With this method we could significantly increase the sample size of animals with known foraging strategy as well as demonstrate a temporal stability of foraging strategies at a hitherto undescribed extent, both valuable aspects for further research. This provides a vivid example on how phenotypic traits can give an unexpected insight into an animal's behaviour.
keywords: Foraging; Methods for studying behaviour

Parents matter! Early social life effects on cognition in the Tokay gecko

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The environment experienced early in life can have major effects on individual development. One prominent influence, especially on behaviour, is the social environment. Interactions with group members increase with increasing group size, and individuals need tools to deal with the associated challenges, i.e. improved cognitive abilities (Social Intelligence Hypothesis). In this study, I utilise developmental plasticity to investigate the effects of group size experienced early in life on cognition in the Tokay gecko (Gekko gecko) a lizard species in which parents form short-term family groups with their offspring. I compared neophobia, habituation and associative learning across individuals that were either raised in a family group for six months or alone from the day of hatching. I find that lizards raised alone showed lower space neophobia compared to individuals raised in a family group, while I find no differences in object neophobia, habituation or associative learning. My findings do not match results from previous work and demonstrate that only by studying a wide range of species are we able to determine the broadness of prominent hypothesis such as the Social Intelligence Hypothesis.
keywords: Cognition; Learning; Group living / social behaviour; Developmental plasticity

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Division of labour in cooperatively breeding vertebrates

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Division of labour (DoL) among group members arguably reflects the pinnacle of social complexity. The synergistic effects created by task specialisation and the sharing of duties in a group raise the efficiency of the acquisition, use, management and defence of resources by a fundamental step above the potential of individual agents. A glance at the taxonomic distribution of DoL suggests a remarkable gap, however. DoL seems to be of little importance in vertebrates, which is surprising given that many vertebrate societies seem to meet the requirements for the emergence of DoL. Here I argue that despite the apparent rarity of permanent specialisation among members of vertebrate groups, temporal specialisation and spontaneous DoL are in fact widespread, which I will illustrate with data from cooperatively breeding African cichlids. Fish continue to grow throughout life, causing both morphological variance among group members and temporal dynamics concerning the performance of specific tasks. This affords an opportunity for efficiency enhancement through DoL in social fishes, where results show that behavioural decisions are affected by ecological circumstances, divergent life history trajectories and individual space use patterns.

keywords: Cooperation; Cooperative breeding; Group living / social behaviour; Division of labour

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Cichlid fish pass a cross-modal recognition task with unfamiliar conspecifics

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Cross-modal recognition experiments use expectancy violation theory to test whether an animal associates multiple cues from different sensory modalities as belonging to the same or different individuals. Most cross-modal recognition experiments tested this question with familiar individuals, interpreting positive evidence as indication for 'true' individual recognition. However, cross-modal recognition tests can only test for the association of multiple cues across sensory modalities. These may be learned individual signatures, but they may also be any other cues classifying properties of individuals. The critical control with unfamiliar individuals is usually lacking from these studies: Individual recognition of unfamiliar individuals should obviously not be possible. Here we show that the highly social cichlid fish Neolamprologus pulcher can distinguish congruent from incongruent multimodal cues in familiar and,also in unfamiliar individuals, indicating that cross-modal tasks can be solved without individual recognition. Instead, N. pulcher detected incongruence between olfactory and visual cues of unfamiliar individuals (i) based on social rank, but also (ii) based on the mismatch of subtle characteristics independent of rank.

keywords: Cognition; Group living / social behaviour; Recognition

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Behaviour: The Key to Successful Management of the Little Vermilion Flycatcher on the Galapagos Islands

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The Little Vermilion Flycatcher, Pyrocephalus nanus, endemic to the Galapagos Islands, has faced a notable decline due to parasitism by the invasive Avian Vampire Fly, Philornis downsi. The larvae of this parasite, feed on the blood of incubating females and nestlings, resulting in high nestling mortality. However, on Santa Cruz Island, females abandoned their nests even before larvae were present. Foraging observations revealed that invasive plants limit accessibility to arthropod prey near the ground, which is the preferred foraging niche of these birds. Since 2019, we have been experimentally restoring vegetation in 9 plots of 1 hectare each by removing invasive plants. As predicted, we found significantly lower foraging -and perch height, as well as longer incubation times in managed areas compared to unmanaged areas. Over the last 5 years, we have been able to significantly increase reproductive success in managed areas. To further enhance breeding success, we reduced the number of fly parasites in the nests using an insecticide. Behavioral observations of the fly and the nest-building birds guided us in the development of two innovative methods to apply the insecticide: self-fumigation and the "spritz technique".
keywords: Conservation and behaviour; Host-parasite interactions; Habitat change and behaviour

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Cuddling pigs: Disentangling wanting and liking in positive human-animal interactions

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Dopamine and opioids modulate the wanting and liking components of reward processes, yet their specific roles in social and human-animal interactions remain unclear. In this study, we aimed to disentangle the roles of dopamine and opioids during human-animal interactions, and to determine the optimal dosage for receptor antagonists for these neurotransmitters in pigs. We administered the dopamine D2 receptor antagonist Amisulpride orally and the mu-opioid receptor antagonist Naloxone intranasally, at three dosage levels, to 30 female pigs using a within-subject design. Each treatment (drug $\times$ dose level) was administered prior to 10 min interaction sessions with a familiar human. Amisulpride significantly increased pigs' latency to first contact with the human at all dose levels compared to baseline, which, as we predicted, suggests a decrease in dopamine-related motivation ('wanting') to interact. However, Naloxone had no effect on the time pigs spent in contact with the human, contrary to our prediction that blocking opioids would decrease this behaviour as an indicator of the pleasurability ('liking') of the interaction.
keywords: Interspecific interactions; Neuroendocrinology

Social mechanisms underlying group-level vocal signatures in captive cockatiels

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Vocal communication plays an important role in negotiating social interactions. However, untangling the factors that shape vocal patterns remains challenging. Our study aimed to investigate how social dynamics influence communication patterns in captive Cockatiels (Nymphicus hollandicus) with an emphasis on the impact of social affiliation, pair formation, and dominance hierarchies as primary causal agents of vocal change. We conducted a controlled experiment comprising 8 newly formed groups of 6 birds, housed in large outdoor aviaries over 3 months. We recorded vocalizations, social interactions, and dominance interactions using microphone backpacks and overhead cameras. Using these semi-automated techniques, we generated an extensive dataset consisting of 178000 calls and 135000 social calls. We then analyzed the key drivers of changes in vocal patterns. Our results revealed a relationship between sociality and vocal communication in parrots, with a significant role for pair formation in driving group-level changes. By elucidating the underlying dynamics of vocal change in a controlled setting, we improve understanding of the social mechanisms that govern group convergence and the drivers of the evolution of vocal communication.

keywords: Acoustic communication; Signalling; Group living / social behaviour

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Flirting with problems: The problem-solving skills of females affect how they choose their mates

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Sexual selection has been hypothesized to contribute to the evolution of cognitive traits, and it is commonly posited that females prefer males with good problem-solving skills. However, how a female's own skills affect her choices is often neglected. We performed controlled mate choice tests, where female house mice (Mus musculus domesticus) could choose between unfamiliar males with different cognitive performance records. All animals were previously tested in a battery of four problem-solving tests while living freely under semi-natural conditions. Preliminary results show that the problem-solving skills of the females affected how they chose their mate, with female nonsolvers developing a preference for one of the males within the 72 hours of the test. Within the same timeframe, female solvers did not develop a preference for either male. The cognitive skills of the females seem to influence their choice and their approach to choosing. Our findings highlight the need to consider the individual characteristics of the females during mate choice as a considerable factor affecting sexual selection on cognitive traits.

keywords: Mate choice; Cognition; Innovations

Consequences of divergent selection for sociability on vocal communication of emotions in sheep

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Emotions are encoded in vocalisations. Their perception by conspecifics can lead to emotional contagion, which plays a role in coordination and cooperation, and may explain their selection through evolution. Sheep are social, vocal and some social traits are heritable, which allows the genetic selection of animals based on their social behaviour. Two diverging sheep lines have been selected for high or low sociability, based on their reactivity to social isolation, providing a model to study the link between vocal communication of emotions and sociability. We hypothesize that more social animals would produce calls with more stress markers when socially isolated and would be more sensitive to hearing stress calls produced by conspecifics than less social animals. The spectro-temporal analyses of 1240 isolation bleats (131 sheep) showed that selection for sociability impacted their features (frequency and formants distribution). A playback experiment tested the ability of sheep from the two lines to perceive this difference. The behaviour and variation in facial temperature were monitored to quantify responses. This study highlights the consequences of genetic selection for social behaviour on perception and contagion of stress.
keywords: Acoustic communication; Long-term studies; Group living / social behaviour; Emotions

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Decision-making rules in food hoarding Paridae

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Several bird species in the Paridae family cache food to increase winter survival, when food availability is unreliable. Hoarding creates a dependable food source, enabling birds to accumulate fat reserves to survive long and cold nights. How birds decide whether to eat or hoard a food item whilst they are out foraging is not fully understood. We use agent-based models to investigate which variables influence these decision-making processes, such as the birds' stomach content and fat reserves. We present sets of agent-based models in which decision-making is based on either stomach content, fat reserve, changes in fat reserve, or combinations of these variables. We explore how agents with different decision rules perform in varying environments and how this is reflected in their physiology and behaviour. Results show that agents basing their decision-making on stomach content survive better than models based on fat reserve or fat change rates. This could be explained by a higher resting frequency and a lower body weight in the agents, resulting in lower metabolic costs. Moving forward, we will seek to compare our model predictions with field data to understand further the decision rules underlying hoarding behaviour in Paridae.
keywords: Foraging; Physiology and behaviour

Multi-generational effects of maternal androgen variation on vocal ontogeny in meerkats

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Vocalisations are key to negotiating conflicting intra-group interests. Variation in vocal behaviour is often linked to variable androgen exposure, suggesting susceptibility to hormone-mediated maternal effects. Despite significant inter-female variation in androgen concentrations in select mammals, the impact of perinatal androgen action on early offspring vocal behaviour remains understudied, particularly the effects on subsequent generations. We address this gap in the meerkat, Suricata suricatta—a cooperatively breeding mongoose with a diverse vocal repertoire and characterised by female hormonal 'masculinisation' that varies in degree by social status. Building upon our prior analysis of first-generation pups, we examined vocalisations across distinct developmental stages in second-generation pups, born to daughters of normative dominant and subordinate females as well as dominant females that experienced androgen-receptor blockade in late gestation. We present differences in vocal ontogeny among 'treatment' groups and by maternal social status, suggesting the potential for epigenetic inheritance of vocal traits across generations. We discuss possible implications and fitness consequences of vocal developmental plasticity.
keywords: Transgenerational effects; Communication; Physiology and behaviour

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Absence of Menzerath's Law in the submissive vocalisations of meerkats

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Diverse information encoding systems including human language, the vocal and gestural systems of non-human animals, and the structure of DNA and proteins, have been found to conform to 'Menzerath's law' – a negative relationship between the number of units comprising and a sequence, and the size of those units. Here, we present the first exploration of Menzerath's law in a non-primate mammal. Specifically, we test for the presence of Menzerath's law in the vocal bouts produced in a submissive context by meerkats (Suricata suricatta). Using a suite of Bayesian mixed effects models, we examined 1,676 vocal bouts produced by 89 wild meerkats, ranging from 1-590 calls in length, to determine whether the number of calls comprising each bout had a negative relationship with the duration of those calls. We found no evidence that calls produced by meerkats in a submissive context adhere to Menzerath's law, adding to the rare exceptions to this law in the vocal repertoires of non-human animals, which collectively shed light on the forces that shape variability in the production of signal-forms.
keywords: Acoustic communication; Communication; Signalling

Why Didn't The Chicken Cross The Road? Inhibitory Control and Learning are Influenced by Early-Life Social Stability

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Complex social environments present cognitive challenges - group-living animals must inhibit inappropriate responses and rapidly learn to change their behaviour, to avoid conflicts and maintain group cohesion. Individual variation in such cognition could be attributable to developmental plasticity in response to environmental differences. In this study, we investigated the effect of early-life social stability on inhibitory control (IC), learning and social behaviour. Chickens (n=72) were raised in either stable or unstable social groups, and their behaviour during raising was recorded. At five-weeks-old the chicks' IC and learning abilities were assessed. Finally, birds in combined groups were tracked whilst spatial resource predictability was manipulated, to assess how early-life experiences affect social networks in a changing environment, potentially mediated by individual variation in IC and learning. Contrary to initial predictions, preliminary results indicate that birds raised in stable social groups are better able to learn to inhibit than those raised in unstable groups. These findings further our understanding of the social causes and consequences of individual variation in cognition.
keywords: Cognition; Group living / social behaviour; Learning

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Can we resolve the financial struggle to run long-term field sites?

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Long-term field sites provide two crucial services: (i) supplying long-term social, demographic and ecological data crucial for answering questions in ecology and evolutionary biology, and (ii) offering vital protection of biodiversity, since they are linked to better habitat quality and law enforcement besides less poaching and forest cover loss. Despite their precious role for research and conservation, many field sites struggle to find long-term financial support. We will present results of a recent survey conducted amongst field site directors (N=60). Although field sites have relatively small budgets, almost 50% of their institutions provide less than 10% of the core funding. 78% of field sites only have funding secured for the next 2-3 years and responsibles express little confidence in securing money during the next funding period. Lack of funds results in temporary or permanent site closures, including canceling contracts of knowledgeable field staff, creating holes in the long-term data collection, or leaving animals and site biodiversity with reduced protection. We aim to discuss action for future stable strategies to support field sites e.g., long-term field site grants, fees to use data, or biodiversity offset schemes.
keywords: Long-term studies; Conservation and behaviour

Developing A Pose Estimation Model to Evaluate Positive Affect in Domestic Dogs during Human Interactions

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Dog behaviours associated with positive affect are not well studied. Collecting behaviour through manual recording is time consuming and resource intensive, limiting research. We aimed to refine a DeepLabCut (Mathis et al., 2018; Laurel et al., 2022) pose estimation model to automatically collect 20 dog body landmarks from video of dog-human interactions. The video used to develop and assess the model involved a range of breeds participating in a conditioned place preference test (n=24) and stranger approach test (n=17) designed to record behavioural responses related to preferred human interaction, as well as shelter dog-staff interaction video. We used transfer learning from DeepLabCut SuperAnimal-Quadruped to make a new, dog-specific model. Individual landmark accuracy was assessed through mean average precision and the model retrained to achieve acceptable precision. The developed model was then applied on unseen test data for analysis. We used B-SOiD algorithm (Hsu & Yttri, 2021) for dimension reduction and classification of the resulting behaviour groups. Accuracy considerations, model limitations, and future directions for development are discussed. This research aids in the development of a tool to assess dog behaviour.
keywords: Methods for studying behaviour; Group living / social behaviour; Physiology and behaviour; Human-Animal Interaction

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Social Context's Role in Shaping Empathy and Decision-Making in Non-Human Primates

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Non-human primates serve as important models for investigating social behaviors, including empathy and other basic behaviors. We aimed to examine the influence of social context on the basic behavior of long-tailed macaques and explore the presence of empathy in this species. We developed a cognitive testing system utilizing a transparent touchscreen display that allowed pairs of macaques to interact face-to-face and perform tasks in various social situations, including the audience, envy, competition, and altruism effect. We employed an eye-tracker to monitor gaze and pupil size signals while they performed different cognitive tasks and interacted with each other. Our results revealed that macaques performed better on the tasks in the presence of a conspecific. The eye-tracking results confirmed that monkeys gaze patterns were influenced by social relationships and task conditions. They exhibited increased looking time during co-perform tasks and increased pupil size among dominant individuals. We observed no clear evidence of empathic responses within this species. These findings highlight the variation in empathic behavior across different primate species and emphasize the importance of considering species-specific differences.
keywords: Methods for studying behaviour; Cognition; Cooperation

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Outdoor recreation and hunting modulate susceptibility to human disturbance in Alpine marmot Marmota marmota

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Humans are often perceived as predators, thus even non-consumptive activities like outdoor recreation may cause disturbance. Nonetheless, there is growing evidence that wildlife can also have remarkable behavioural tolerance towards humans, but the mechanisms behind different responses remain unclear. We investigated the effect of type of human activity – hunting and outdoor recreation – on susceptibility to human disturbance in Alpine marmot. Marmots were studied in areas with contrasting protection regimes and under different levels of outdoor recreation, in Northern Italy, over three seasons (2021-2023). Flight-initiation-distance was used as a proxy of susceptibility to human disturbance and tested against levels of outdoor-recreation and hunting using linear mixed modelling. We find that marmots seem to habituate to non-threatening human presence to some extent, whereas susceptibility to disturbance was higher in hunted than protected areas, both during and outside hunting season. By unravelling the role of human behaviour as a factor modulating wildlife response to humans, our work has potential implications for conservation and management strategies aimed at promoting coexistence in human-altered landscapes.

keywords: Conservation and behaviour; Behavioural plasticity

Individual responses to capture are not predicted by among-individual risk-taking in response to predation threat

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Individuals vary consistently in their behavioural responses when coping with risky situations including predation. The pace-of-life syndrome (POLS) hypothesis postulates that a trade-off between current and future reproduction underlies individual variation in behaviour. Individuals with a fast pace of life are hypothesised to show more risk-prone behaviour. This assumes that individuals vary along a single risk-taking axis. We investigated in breeding blue tits (Cyanistes caeruleus) whether individual variation in risk-taking is correlated across different risky situations. First, we simulated a predation threat by presenting taxidermic mounts of a common predator, the Eurasian sparrowhawk during brood provisioning. Thereafter, we captured one of the parents as a simulated predation event. By measuring individual latencies to resume brood provisioning after exposure to different threats, we found individuals' responses to exposure to a predation threat and actual capture were only weakly correlated. Taking these results together, our study provides a striking case example showing the existence of multiple, uncorrelated risk-prone—risk-averse axes along which individuals vary, which appears inconsistent with the POLS hypothesis.

keywords: Animal personality; Behavioural plasticity; Parental care

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The fractal and multilevel structure of zebra finch social networks

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Social network structure plays a key role in shaping processes in animal populations. While humans' egocentric networks exhibit a fractal structure, it remains unclear whether it's unique to large social mammals. Here, we tracked zebra finches in four large captive colonies to investigate the structure of egocentric contact networks and the resulting social networks. Zebra finches consistently showed 1-2 closest, 6-7 close, and 22-24 strong contacts. Contact identities remained stable across days, and the fractal structure of the egocentric networks is consistent in two contexts (single- and mixed-sex colonies). The pattern of relationship differentiation can also promote the efficiency of information transfer. The results remain robust across analytical approaches. Further, when viewed from a top-down 'community perspective', the fractal nature of zebra finch egocentric networks lead to a multilevel social structure in mixed-sex colonies but not in single-sex colonies. Our results demonstrate that zebra finches exhibit a fractal pattern of egocentric networks and a multilevel social structure, suggesting that fundamental principles could drive the structural properties of social networks in evolution.
keywords: Group living / social behaviour; Collective animal behaviour; Cognition

Poster Abstracts

Do fish rationalize the unpredictable?

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The capacity to mentally represent multiple, potentially mutually exclusive future scenarios, and to prepare accordingly, is essential for many complex future-oriented behaviors. Inspired by Redshaw and Suddendorf's study, we presented zebrafish with an inverted Y-tube which delivered food reward through either the left or right arm with equal probability on any given trial. At the start of each trial, zebrafish had to choose one of the arms of the Y-tube. Control trials were presented with a hinged tube exiting either left or right. Each trial was scored on choice latency, first arm choice, rewarding arm, consumption of the reward, and fish's movement after food delivery, regardless of whether it was at the rewarded arm. The data will reveal whether zebrafish can represent two mutually exclusive future scenarios: if so, we predict that fish will only move to check the other arm when first choosing the 'incorrect' one. Control trials will help determine whether fish can spontaneously adjust their behavior given a new constraint in the apparatus making one of the future scenarios impossible. The study will compare the results with data from other non-human animal species as part of a broader project on reasoning and rationality.
keywords: Cognition; Behavioural plasticity; Reasoning

Investigating interactions between blacktip reef sharks and their schooling prey

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The interactions between predators and prey are crucial for maintaining ecosystem stability and are a significant driver of collective behaviour in animals. Despite the ecological importance of sharks, research on them is limited, leaving gaps in our understanding of their behavior. Moreover, coral reefs have recently experienced significant declines in shark population. In our study, we combine drone technology and computer vision tools to analyze aggregations of fish and their interactions with predators in natural environments. We filmed blacktip reef sharks and other predatory species interacting with schools of silversides in different reef areas in the Maldives. We use a machine learning model (YOLO) to segment the outline of fish schools and track the posture of sharks and bait fish. With these measurements we analyze the behaviour of the fish in response to predation and quantify the physical properties of large swarms. Additionally, we can extract identity and kinematics of the sharks to probe whether the sharks are hunting collectively. Finally, we are developing local collaborations to monitor this phenomenon using drones, to better understand the longer time-scale nature of fish-shark co-occurrence in reef areas.
keywords: Collective animal behaviour; Methods for studying behaviour; Conservation and behaviour

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Offspring recognition in Camels

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Experiments were conducted to investigate how camel mothers recognize their offspring. Several experimental manipulations were carried out, in which mothers had their eyes, ears, noses, or combinations of such senses, blocked. The mother was enclosed in a fenced enclosure, and one of the manipulations was applied to her. Thereafter, the mother's own calf, or a stranger calf, was introduced to the enclosure, and the latency of suckling was measured. Each session lasted 30 mins, after which the other calf was introduced for another 30 mins, and latency to suckling was taken. The procedure was randomized between the mother's calf and the stranger calf. The results indicate that camel mothers can recognize their own calves by any of the three sensory modalities (vision, hearing, and smelling), or a combination of those. Mothers who had all their senses (eyes, ears, and noses) blocked were less inclined to allow calves to suckle, whether their own or a Stanger calf. We conclude that camels use multimodal sensory cues to tell their own offspring from stranger calves.
keywords: Parental care; Group living / social behaviour; Methods for studying behaviour

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Dynamics in Group Size and Fitness Consequences in a Population of Free-Ranging House Mice

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House mice (Mus musculus domesticus) exhibit social behaviors affecting their evolutionary fitness, defined by their reproductive success. Group living offers benefits like better resource access and predator protection but also poses challenges such as increased competition and parasite transmission. Optimal group size balances these factors. This study examines group size dynamics and reproductive success in free-ranging house mice, living in a barn in Zurich, Switzerland. Utilizing a long-term dataset of social contacts and reproductive outcomes, we apply network analysis to investigate how variations in group size affect individual and group-level fitness. Our approach includes constructing a temporal network to analyze social interactions and employing the flow stability method- a powerful dynamic community detection technique- to reveal hierarchical group structures. Subsequently, we investigate the relationship between group size, genetic relatedness, and reproductive competition through nonlinear mixed-effects models. Our findings aim to provide insights into the role of social structure in the evolutionary fitness of mammals and extend social network analysis to other species and ecological research.
keywords: Group living / social behaviour; Reproductive behaviour; Long-term studies

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Attendance to weight cues in Goffin's cockatoos

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The ability to consider weight related object cues through proprioceptive feedback can provide animals with information about object material, content or functionality. Such cues may be particularly relevant to flying animals such as birds. In a series of experiments, we studied attendance to weight cues in Goffin's cockatoos. While Goffins learned faster than chimpanzees to differentiate between identical objects based on weight alone, a follow up study suggests that the species difference may be caused by the use of different methodologies. We further show that Goffins learn to save effort in an object-transport-task switching back and forth between two identical, equally rewarded kettlebells of different weight and learning to transport the lighter one when walking or in flight. Nevertheless, they show no preference between transporting two identically looking, equally rewarded dumbbells of the same weight but one being balanced and one being unbalanced in their weight distribution. However, preliminary results show that individual Goffins do pay attention to weight balance during tool use, preferring to hold an unbalanced stick tool at its heavier end in a setup in which the tool needs to be stabilised entirely by the bird.
keywords: Cognition; Tool use; Learning; Weight

Evolution of puppy behavior around adoption period: Study on the cohort of 44 Golden Retriever puppies

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Adoption is a stressful period for puppies, leading to economic losses for breeders and owners and well-being impairment for animals. This study aimed to assess behavioral changes during the adoption period. Forty-four puppies were included from 9 litters (6 ± 3 puppy/litter). The day before adoption (59 ± 3days) and 7 days later, puppies were filmed in 2 different rooms at 3 different situations: free exploration, interactive toy and noise exposure (Riemer et al. 2013). A total of 43 behavioral parameters were evaluated and quantified using Boris Behavior (version 8.20.3). Rstudio (version 2023.06.0+421) was used for statistics. Paired t-test revealed significant increases in total movement time ($p<0.001$), toy interaction time ($p=0.002$) and the number of barks ($p=0.006$) 1 week after compared with before adoption. While, crying time ($p<0.001$), latency before the first movement ($p=0.025$), latency before interaction with the toy ($p=0.003$), proximity time ($p=0.03$) and evaluator observation time ($p<0.001$) were decreased after adoption versus before. Our findings suggest an increase in detachment of puppies from the reference person following adoption. Overall, adopting puppies at 8 weeks does not compromise their behavioral development.
keywords: Physiology and behaviour; Methods for studying behaviour; Habitat change and behaviour; behavioral development

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Who keeps the house after divorcing? Partner and nest (in)fidelity in the long-lived Alpine swift

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Despite the advantages of lasting pair bonds and the prevalence of monogamy (at least in avian species), some individuals switch mates (divorce). Divorce is generally considered to be adaptive though its causes and consequences often remain unclear, most notably regarding the genetic basis of this behaviour. We used 30+ years of data to study mate and nest site (in)fidelity in a Swiss population of Alpine swifts. Swifts are a long-lived bird with bi-parental care who remarkably reuse nesting structures from year to year, building upon them with materials gathered entirely in flight. We first described the overall patterns of mate and nest site fidelity, and report that 16.6% of Alpine swift pairings end in divorce, with males more often retaining the nest site than females. We then investigated the predictors of divorce and identified low reproductive success in the year X as a trigger. Divorce was only moderately repeatable in females, with very little additive genetic variance in either sex suggest little potential for microevolution. Finally, we assessed the fitness consequences of divorce and report that an active decision to modify the pair bond may be more beneficial for swifts than passive mate switching following widowing.
keywords: Mate choice; Behavioural genetics / genomics; Long-term studies

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Personality of free-ranging dogs in their natural environment: validation and implementation of a behavioural test

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Despite free-ranging dogs representing 80% of the world's dog population, research on canine personality has focused predominantly on pet dogs. However, human socialisation and training likely impact dogs' personality development, possibly shifting the personality spectrum of the species. Therefore, tests need to be adjusted and validated to incorporate free-ranging dogs. Our newly designed test battery, measuring human- and conspecific-directed sociability, neophobia, and tractability, provides a feasible way of testing the dogs in their natural environment. First, we showed that inter- and intra-rater reliability is satisfactory (0.84 and 0.93 respectively). In a second step, we showed that our test captures good temporal stability of certain behavioural traits over 6 weeks (N=36 free living dogs in Morocco; Capitain et. al. 2024). In the final step, we are testing cross-context validity, where human- and conspecific-directed sociability, and exploration during the test (N=90), is related to measures capturing the same trait taken from daily observations of the same individuals. By addressing these three steps, we assess whether long and complex behavioural tests can be reliably performed even in disturbance-prone environment.
keywords: Animal personality; Methods for studying behaviour

Coordination and communication of cooperative offspring care, babysitting behaviour, in meerkats

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In group-living animals, coordination is an essential element to maintain cooperation. Exploring the information propagation via communication within groups and its impact on their collective outcome will give insight into the social group dynamics of a species. In this study, I aim to understand the intricate communicative mechanisms underlying coordination of pup care behaviour in meerkats (Suricatta suricatta), a cooperative breeding mammal native to the arid parts of Southern Africa by looking into their vocal and visual communication network. I carried out full group collaring by deploying audio collars equipped with a GPS and accelerometer unit on all individuals of multiple meerkat groups. The data collected gives us the opportunity to access and comprehend all the vocalization produced by both babysitters and non-babysitters during a week of babysitting period. Additionally, I recorded potential visual communications and interactions at the babysitting burrow by deploying cameras around the burrow system. Understanding how these social animals effectively coordinate their actions and navigate in complex multimodal communication networks can provide insights into the mechanisms underlying cooperation and social evolution.
keywords: Collective animal behaviour; Communication; Cooperation; Coordination

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Maternal and early life influences on weaning responses in young Thoroughbred horses

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In altricial species early life conditions influence adult resilience, but this is under-researched in precocial species. We tested whether social environment in early life – perinatal maternal foal-directed licking (PML), pre-weaning (PW) social behaviour, weaning environment (social companionship) - and foal coping style, sex or age at weaning impacted foal resilience following artificial weaning (major stressor). We recorded behaviour over 2 seasons across 3 UK Thoroughbred studs using scan and focal continuous sampling, with video (PML [n=27]) and live observations (PW: mare-foal proximity [n=36], foal social play behaviour [n=40]; at weaning: restless locomotion (RL) and vocalisations [n=44]). Coping style [n=29] was determined during a routine farrier visit. Because RL time was positively associated with vocalisation rate (p=0.001) we took reduced RL as a proxy for increased resilience. Foals who received more PML and had more adult mare field companions tended to spend less time in RL (PML:p=0.075; companions:p=0.094); whereas foals engaging in more PW social play showed greater RL (p=0.008). Foal RL at weaning was not influenced by other factors. Manipulating the number of adult companions may increase foal resilience.
keywords: Long-term studies; Parental care; Group living / social behaviour; Early life

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Insular isolation erodes song recognition among coal tit populations of the Eastern Mediterranean

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Islands are characterized by high endemism, attributed to genetic drift following a founder event. Studies have demonstrated how insular populations have reduced genetic diversity and limited evidence of ongoing gene flow with continental populations, coupled with often dramatic divergence in morphological characters. By contrast, the effects of insular isolation on the songs of island birds are less understood. We investigated song divergence and its recognition among insular and continental populations of Coal Tit in the Eastern Mediterranean. We compared songs and responses to their playback between Coal Tits in Cyprus and in nearby Turkey and Lebanon. In addition to divergence in song frequency, we found that Coal Tits in Cyprus responded weakly to songs from both continental populations. Conversely, in Lebanon and Turkey, Coal Tits responded less to Cyprus song than to either local or distant continental song, suggesting song may act as a premating isolating barrier. Consistent with findings of genetic and ecological niche divergence, our behavioural experiments suggest Cyprus Coal Tit merits recognition as a distinct species.
keywords: Acoustic communication; Communication

Invasion prospects of a novel t haplotype variant

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House mice (Mus musculus) are invasive in several parts of the world. The t haplotype, a naturally occurring genetic element, possesses characteristics that make it a promising candidate for mouse population control: 1) increased transmission due to meiotic drive, where around 90% of offspring inherit the t when the father is a carrier and 2) its negative impact on the reproductive success of homozygous carriers. Previous work describes two different t variants – a sterile (ancestral) one, where homozygous males are sterile and a lethal one that causes death of homozygote carriers, regardless of sex, during embryonal development. We recently observed a mutation from a sterile to a lethal variant in our lab. This raises the question, if such novel lethal variant can successfully spread in a population, where a sterile t is already present. Previous models on t evolution rely on lethal fitness compensation or t-complementation, which are not well documented in mice, and cannot convincingly explain the t frequencies observed in nature. In this project, we explore competition between sterile and lethal t variants in the context of dispersal propensity and polyandry to make predictions on the invasive success of the novel t variant.
keywords: Contests and competition; Dispersal; Reproductive behaviour; Meiotic Drive

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Spatial learning, behavioural types, and space use in the Madagascar giant day gecko (Phelsuma grandis)

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Individuals may vary in their cognitive ability and behavioral type. This variation is hypothesized to be connected through a shared risk-reward framework. Bolder, more active, risk-prone individuals are assumed to learn faster. Research biases towards mammalian and avian species limit our understanding of this link's generality. Cognition and behavioral research on geckos have been overlooked due to the belief that they have limited cognitive capacities. Thus, this study aims to explore the relationship between cognition and behavioral type in a semi-free ranging population of the Madagascar giant day gecko, Phelsuma grandis, at the Zürich Zoo. Cognition is measured through a spatial acquisition and reversal learning experiment over roughly 10 weeks. Individuals choose between two boxes with a distinct spatial relationship. One box provides food, while in the other the food is blocked with a mesh for odor control. After the acquisition phase, the blocked and unblocked foods are reversed. Simultaneously, capture-mark-recapture data is collected –by using the uniquely identifiable pattern on the lizard's head and back– to study space use, the covariation of learning ability and behavioural type and estimate population size.
keywords: Cognition; Learning; Animal personality; Movement Ecology

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Effects of Domestication and Selection for Productivity on Numerical Cognition in Chicks

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Numerical cognition serves manifold roles in animals' interactions with their environment. However, for domesticated animals, which encounter fewer environmental challenges, numerical cognition has presumably become less essential to survival. Hence, domesticated breeds, especially those selected for high productivity, can be expected to allocate more resources to production traits (e.g., growth) than to numerical cognition. We will assess numerical discrimination and proto-arithmetic abilities in young chicks of (1) the Ross308 (RO), a domesticated, highly productive commercial hybrid, (2) the Gallina Padovana (GP), a domesticated breed selected for purposes other than productivity, and (3) the Red Junglefowl (RJF), domestic chickens' wild ancestor. Further, we will control for potential breed differences in chicks' reaction to humans, food and social motivation, working memory, and inhibitory control. We expect the RJF to show the highest accuracy in both numerical tasks and, within the domesticated breeds, we expect the GP to outperform the RO. Preliminary results presented at the conference will provide insights into the impact of domestication on numerical cognition and, more broadly, into the evolution of cognition.
keywords: Cognition; Anthropogenic effects

Pedigree-based analysis of livestock depredation behaviour in German wolves

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Livestock losses result in a demand for wildlife management actions. In Germany, in year 2000, circa 150 years without resident wolves, the first wolf pack was confirmed. Since 2005, the wolf population continuously increased and spread. Since wolves are social animals, strongly involved in parental care, this suggests that young wolves inherit, socially, hunting behaviour and prey selection from their parents. Currently, no reliable statements exist, in relevant literature, regarding the extent to which a possible tendency to prey on livestock can be passed on to subsequent generations via genetic predisposition or learning. However, the answer to this question is significant and play an important role in the public debate. Genetic analysis of thousands of suspected livestock depredation cases and monitoring samples withing the past 15 years allowed us to first, reconstruct large parts of the pedigree of German wolves; and, second investigate the linkage between kinship and livestock depredation behaviour, on guarded or large livestock. We identified no transmission of such behaviour from conspicuous packs to their offspring.
keywords: Behavioural genetics / genomics; Life histories; Dispersal

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Humans abilities to read internal attention and external attention from faces of humans and apes faces

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Humans can extract information from the faces and gazes of other humans. They can discriminate between external attention (on physical or social environment) and internal attention (recollection, mind wandering) by watching video recordings of faces (Benedek et al; 2018). Do these abilities extend to reading the type of attention (external or internal) on the faces of other species phylogenetically close to humans such as great apes? Our study aims to confirm the human ability to read the type of attention from human faces and gazes and explore whether this ability also applies to reading the type of attention from the faces and gazes of chimpanzees, gorillas, orangutans. The protocol is the following: videos (5 sec) of human, chimpanzee, gorilla, and orangutan faces are presented to participants. Participants must then choose between Internal attention or External attention for each stimulus, in a forced choice paradigm. Currently we are finalizing our study and the results will presented at the ECBB conference.
keywords: Cognition; Communication; Interspecific interactions; External and internal attention

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Hypersociability vs. Deferential hypothesis: differences between dogs and wolves in a human-animal conflict situation

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Whether a selection for hypersociability or submissive (deferential) behavior is the driver for dogs' distinct human-directed behavior remains unclear. However, this has not yet been explored by comparing dogs and wolves in an animal-human conflict situation. Hypersociability would be evident if dogs approach regardless of conflict and faster than wolves, while more avoidance behavior compared to wolves would indicate increased deference. We engaged similarly socialized dogs (n=11) and wolves (n=10) in a tug-of-war conflict over food with a bonded human. Non-conflict trials involved pulling food without contention, while conflict trials had both parties pull on the food simultaneously for 3s while the human argued, before either the human won the food or let the animal win (counterbalanced). We measured conflict engagement, affiliative, and submissive behavior. Preliminary results (11 dogs, 5 wolves) reveal that dogs behaved more affiliative towards the human than wolves. Previous conflict did not affect the latency to engage again in either species, but dogs gave up more often and wolves engaged more persistently. The findings support the hypersociability hypothesis, while evidence for the deferential hypothesis is ambiguous.
keywords: Interspecific interactions; Group living / social behaviour

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Know thy food: Cyrba algerina's (Araneae, Salticidae) response to prey cues requires previous experience

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Cyrba algerina (Salticidae) is known to exhibit geographic variation in its responsiveness to the odour cues of sympatric spider-prey. However, contrary to other jumping spiders, only field-collected individuals respond to these prey cues. Here we examined: i) whether response towards prey cues is strictly innate or, on the contrary, requires previous experience, and ii) whether this ability is restricted to sympatric spider-prey species or families. Response to sympatric and allopatric prey was evaluated using lab-reared individuals from two populations. Individuals were tested in vision- and odour-based choice tests after a feeding period with allopatric and sympatric oecobiids (Oecobiidae) and with allopatric nephilids (Nephilidae). Lab-reared individuals from both populations responded in a similar manner. Results indicate that previous experience with prey is necessary for C. algerina to respond to the cues of sympatric and allopatric oecobiid species used, but not to the cues of nephilids, suggesting C. algerina has an innate bias towards oecobiids as prey. C. algerina's sensitivity to these prey cues seems to be under the control of a developmental switch mechanism.
keywords: Behavioural plasticity; Predator-prey interactions

The Ontogeny of Object Manipulation in carrion and hooded Crows

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Corvids are well-known to manipulate non-edible objects in a variety of contexts ranging from play and prey-dropping to tool use. Early-life object manipulation, however, has received little attention, mainly due to technical issues: nestlings spend all day in the nest, rendering their observation challenging. Here, we hand-raised wild-caught carrion and hooded crows to investigate the development of fine motor skills through object manipulation. Focussing on the very early developmental period, we supplemented artificial nest boxes with natural objects commonly found in crow nests, such as twigs and feathers. Some individuals had ad libitum access to natural objects while others only had access to them during focal observations three times a week. We examined individual differences in motor development and how solitary and social object manipulation patterns changed as the nestlings aged. Analysing object manipulation frequency and complexity, we compare the development of motor skills between our non-tool using species with previously published data on tool-using crow species to highlight the similarities and differences in object manipulation early in life and their influence on later foraging strategies.
keywords: Cognition; Learning; Extractive foraging

Bros and brothers disperse together in spotted hyenas

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Why do some individuals coordinate their behaviour in space and time and settle in the same breeding group? Is it an active decision that is driven by the selective advantages of settling with kin and social allies? Or the mere consequence of similarities in needs, capacities and available destinations? We examined the likely drivers of the coordination in breeding-group choice among male spotted hyenas. We used 24 years of continuous demographic and social monitoring of the eight hyena social groups inhabiting the Ngorongoro Crater in Tanzania. We compared the choices of 148 pairs of same-cohort males that varied in similarity (i.e., maternal and socio-ecological background and genotype) and kinship. We found strong support for both active and passive processes! Twin brothers who share most cumulative similarity were most likely (70%) to settle in the same group, followed by distantly-related but familiar peers (36%), and of strangers originating from different groups (7%). Also, coordination among twins increased when population density and associated benefits of kin cooperation increased. I will also cover the implications that these patterns likely have for cooperation between males after clan settlement in their new group.
keywords: Collective animal behaviour; Dispersal; Cooperation; long-term studies

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The Love Hormone in Context : Oxytocin responses to social interactions in a small-scale human society

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Oxytocin (OT), often called the 'love hormone,' influences human social behaviour, though its mechanisms are not fully understood. Recent research links OT to both prosocial and antisocial behaviours, necessitating further study. This study examines OT's effect on social behaviour in Bolivia's Tsimane society, focusing on natural OT variations and their connection to cooperative and competitive behaviours in small-scale societies. We hypothesise that OT levels increase during competitive scenarios and with less familiar partners, offering insights into partner evaluations and risks in unfamiliar relationships. In spring 2023, we collected 434 urine samples and measured OT levels using RIA. Specifically, 67 samples were taken before and after inter-group competitions like football matches. Bayesian models, accounting for age, sex, and ID, revealed a significant OT increase in males during competitions, supporting our hypothesis on in-group cooperation and inter-group competition. Additionally, 91 samples were categorised by familiarity levels: alone, with close relatives, extended family, friends or neighbours, people from another cluster, or in community-level social settings, based on behavioural observations and interviews.
keywords: Human behavioural ecology; Contests and competition

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Sexual conflict over copulations in wild Assamese macaques

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Sexual conflict ensues where the outcomes of intrasexual competition and intersexual choice are not aligned, driving the evolution of strategies in one sex to manipulate the outcome of sexually selected strategies in the other. Recent research efforts shifted the focus away from immediate force to a temporally decoupled form of coercion, intimidation. Here we investigate which strategy better explains male aggression and mating success in a seasonally mating primate living in multimale-multifemale groups with moderate to low mating and reproductive skew. We use observational data collected over 10 years on a wild population of Assamese macaques living in their natural habitat in Phu Khieo Wildlife Sanctuary, Thailand. We assess whether male aggression towards females increases in the mating season, targets reproductively active females and increases their injury risk. We further test, whether mating success within a particular dyad is best predicted by the rate of aggression towards the female in the preceding three months, the rate of aggression towards any female in this period or aggression immediately prior to copulation. Finally, we integrate these findings with previously described affiliative strategies for this population.
keywords: Sexual selection; Reproductive tactics; Long-term studies

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Social preferences and shoaling dynamics in sexually immature green chromide (Etroplus suratensis), a freshwater cichlid

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Animals form groups by exercising choices based on cost-to-benefit ratio under a given set of ecological conditions. In this study, we studied social preferences and shoaling dynamics of sexually immature cichlid, green chromide, using con and hetero species (orange chromide, closely related, and tilapia, distantly related cichlid species) as stimuli. For social preferences, we used one- and two-choice setups and calculated preferences via occurrences of green chromide on the stimulus side. For shoaling interactions, we tested 3 categories: green chromide (GC), green with orange chromide (GC+OC), and with tilapia (GC+T), all with a group size of 8. Green chromides showed a significant ($P<0.05$) preference towards conspecifics when presented with either hetero species. However, when presented alone, there was also a significant ($P<0.05$) preference towards orange. Shoaling dynamics showed that GC and GC+OC mostly formed significantly larger shoals ($P<0.05$) than GC+T, which split into multiple shoals. Thus, green chromides did not prefer tilapia and showed fission in their groups with tilapia, possibly indicating a natural tendency of the species or a strategy that might be adaptive in nature.
keywords: Group living / social behaviour; Interspecific interactions; Cognition

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Long-term decrease in coloration: a consequence of climate change?

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Climate change has been shown to affect fitness-related traits in a wide range of taxa; for instance, warming leads to phenological advancements in many plant and animal species. The influence of climate change on social and secondary sexual traits, that are associated to fitness due to their role as quality signals, is however more unknown. Here, we use more than 5800 observations collected on two Mediterranean blue tit subspecies (Cyanistes caeruleus caeruleus and C. c. ogliastrae) to explore whether blue crown and yellow breast patch colourations have changed over the past 15 years. Our data suggests that colouration has become duller and less chromatic in both sexes. In addition, in the Corsican C.c.ogliastrae, but not in the mainland C.c.caeruleus, the decrease is associated with an increase in temperature at moult. Overall, this study suggests that ornamental colourations could become less conspicuous due to warming, revealing potential climate change effects on sexual and social ornaments and calling for further research on other signals and on the possible proximate mechanisms behind these effects.
keywords: Long-term studies; Signalling; Sexual selection; Bird coloration

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The Macaca Nigra Project, a long-term field project on crested macaques' biology, ecology and conservation

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Model species of long-term studies with well-identified individuals are few. Focusing on less known taxa is crucial to assess the validity of theories with regards to variation in ecology or behaviour. The macaques are a major lineage of Cercopithecidae. The few well-characterised species (rhesus macaques) are seasonal breeders, socially intolerant, with low sexual dimorphism and male reproductive skew, whereas less studied species (Sulawesi macaques) are non-seasonal breeders, socially tolerant, and more sexually dimorphic. The Macaca Nigra Project (MNP), founded in 2006 as an international scientific collaboration, endeavours to study one of the less known contrasting species, the crested macaques, Macaca nigra, highly endemic and Critically Endangered. This poster presents two studies using long-term data, highlighting difficulties in finding meaning in variation over time and scale but the importance of accounting for it. The first looks at the links between sociality and reproduction and the second at climate, phenology and home range patterns. Now, this project is important given the bleak outlook of the monkeys' survival, but their outstanding importance in primate radiation and evolution.
keywords: Long-term studies; Group living / social behaviour; Climate (change) and behaviour

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FAIR-BiRDS: advancing transparency in ecological and evolutionary data

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Transitioning towards FAIR data has been notoriously challenging in the long tail of science. This is mainly because the long tail consists of many independently assembled datasets different in structure and management, yet collected with a similar purpose. Based on the recently established SPI-Birds Network and Database on long-term population studies of birds, hosting and standardising individual-level data, FAIR-BiRDS' aim is to develop this network as a model for other (ecological) research domains, with particular emphasis on the currently under-addressed stages of data processing, data analysis, and data preservation. Shortly, the project will 1) develop a repository with citable datasets, 2) expand the user base to both data producers and data users, 3) will establish a peer-reviewed archive for data processing and analytical codes, promoting efficiency and replicability of large-scale data analyses. Our final goal is a fully transparent FAIR research landscape of datasets, analytical tools and publications that are connected by digital identifiers and rich metadata. I intend to present the details of this project to researchers working on long-term datasets, and encourage them to join our network.
keywords: Long-term studies; Life histories; Open Sciences

Human-oriented referential communication in family pigs and dogs- A citizen science study.

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Previous research suggests that pigs, contrary to dogs, might be incapable of communicating referentially with humans when facing an impossible-to-reach reward. If this is related to pigs' predispositions as a non-visual species, or to the task, which might have enhanced pigs' manipulative tendencies and persistence while suppressing their willingness to communicate with humans, needs further clarification. In a citizen science study, we compared the emergence of human-oriented referential communicative behaviours of family dogs and pigs when exposed to a reward placed on an elevated surface, inaccessible by physical manipulation. Our preliminary results show that pigs and dogs increased their orientation-alternation (referential behaviour) between the reward and the humans when the food was unreachable compared to a baseline ($P<0.001$). Still, dogs displayed this behaviour to a greater extent than pigs ($P<0.001$) revealing their predisposition for human-oriented visual communication. The set-up influenced the subjects' behaviour as dogs tried more than pigs to solve the task themselves ($P=0.024$). This is the first report showing that pigs may be able to referentially communicate with humans in a non-manipulative out-of-reach task.
keywords: Communication; Interspecific interactions

Daily activity patterns in agoutis (Dasyprocta spp) in response to relaxed predation

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Animals' fitness is determined by the balance in energetic requirements maintained during daily activities, in response to environmental factors. Predation is a major environmental factor and avoiding predation represents a significant cost to prey populations and communities. Islands without predators provide an excellent arena to study prey's responses in the absence of any cue related to predation risk. Here, we investigated whether natural absence of felids has influenced activity patterns of diurnal agoutis in Panama, by monitoring activity in sites with and without predators. We predicted that agoutis in predator-free sites can expand their temporal niche towards the night, which is a period of high predation risk, in sites with predators. Agoutis showed relative high activity at night in one of the predator-free sites, with no evidence of nocturnality for the predator sites. Another clear pattern across our predator-free sites was that agoutis started their daily activity earlier, before sunrise, which is also a period of significant predation risk. Our study highlights the role that felids play in regulating agoutis' daily activity patterns and we discuss the implications of our findings.
keywords: Behavioural plasticity; Foraging; Predator-prey interactions

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Of helpers and breeders: initial steps to understand whether helping increases breeding probability in sociable weavers

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Cooperative breeding, where individuals provide alloparental care, is puzzling since it is a costly behaviour, and individuals should maximize the benefits of their actions, while reducing the costs. Two main types of explanation have attempted to resolve this paradigm: indirect fitness benefits, acquired by helping close relatives, and direct benefits, where cooperators enhance their own fitness. A possible way of enhancing own fitness is through increasing future access to reproduction. Here, we used a 9-year dataset to describe the demographics of helping behaviour and how these relate to breeding in the sociable weaver (Philetairus socius), a highly cooperative African passerine. We found that colonies are composed of about 35% of breeders, 31% of helpers, 28% of individuals not seen helping nor breeding, and 7% both breed and help. Among the individuals that reproduced and helped, a large majority were males and (85%), and overall more males than females helped (33% vs. 23%). We will use these results to explore mating success among helpers vs non-helpers and to investigate whether there are sex-specific benefits of cooperation linked to mating strategies in this species.
keywords: Cooperative breeding; Mate choice; Long-term studies

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Multimodal signaling in manakins: lack of correlated evolution between acoustic, visual, and behavioral traits

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Sexual traits are frequently displayed in combination as multimodal signals. Some hypotheses propose that different signals trade-off with each other potentially due to resource limitations or that these develop simultaneously to enhance communication effectiveness. Alternatively, multiple cues may evolve independently to convey different information. We explored the interdependence between different signal modalities in manakins, which are known for great interspecific diversity in the degree of elaboration in courtship dance, song, and plumage coloration. We found that song, plumage coloration, and courtship dance evolved independently since there was no correlation between these traits. Our results show that song, color, and dance diversity are each related to different ecological factors which suggests that sexual signals in manakins convey different information and/or respond to different selection pressures. Larger species and those with lower dispersal capacity tend to exhibit higher color richness, which differed among lek categories, being higher in species with "classic" leks. This study supports the idea that correlation between signal modalities do not constitute a widespread pattern in songbirds.
keywords: Signalling; Acoustic communication; Sexual selection

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Long-term data to study life history strategies in a long-living bird, the Common Swift

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During lifetime, animals constantly face unfavorable, fitness-reducing conditions. In response they develop life history strategies to increase their fitness despite these challenging conditions. The Common Swift (Apus apus) is an ideal study organism for life history strategies as it is a long-living species with an exceptional lifestyle. It is a long-distance migratory bird, overwintering in Africa and breeding in Europe. Its reproductive success is limited by a small clutch size and a long developmental period of the young, only allowing one brood per year. It feeds exclusively on aeroplankton, making its reproductive success dependent on weather conditions during breeding season. We study the Common Swift in a breeding colony in Germany with unusually easy access to nests. High site fidelity of swifts enables us to produce long-term data and cover life histories of individuals. By using various methods during breeding season and overwintering season, we collect data about different aspects of life history strategies including migration, pair bonds and parental investment, thus covering a complete annual cycle. Here we give an overview of our project and present interesting findings on the life history of a fascinating bird.
keywords: Long-term studies; Life histories; Methods for studying behaviour

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Behavioural and hormonal profiles in juvenile guinea pig males living in distinct social environments

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The individualised social niche results from interactions of an individual with its social environment, which can change during lifetime. Thus, individuals need to be able to conform to different individualised social niches over lifetime. Our goal is therefore to elucidate when and how social niche conformance in guinea pigs can occur. To achieve this aim, behavioural and hormonal profiles of males living in different ontogenetic phases (juvenility, adolescence, adulthood) will be investigated. Until now, the juvenile phase was examined. For this approach, male guinea pigs live in two distinct social environments: males of one group are socially stimulated regularly, while males of the other group are not. This procedure increases the number of social interactions, which is a crucial factor constituting individualised social niches. Plasma samples to determine hormone concentrations as well as video material from the behaviour in the home enclosure were collected from ten juvenile males from each treatment group. We hypothesize that males realising different individualised social niches during juvenility differ in their behavioural profiles which are reflected by their endocrine phenotypes. The data is currently being analysed.
keywords: Behavioural plasticity; Physiology and behaviour

Behavioural predictors of emigration in house mice (Mus musculus)

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Dispersal propensity is a key life-history trait of socially organized animals. A broadly accepted hypothesis proposes a behavioural dispersal syndrome as a main proximate driver for individuals to emigrate. This hypothesis does not consider social relations and general dynamics of large socially organized groups. Here, we experimentally tested predictors of emigration behaviour utilising a naturally occurring selfish genetic element in house mice that had previously been shown to increase emigration propensity. To this end, we combined enclosure experiments where mice were given the opportunity to leave with behavioural tests of boldness and exploration to identify possible factors mediating emigration behaviour. In addition, we monitored social structure in the enclosures using an antenna system. We did not find any clear relationship between individual behaviour and emigration behaviour apart from a trend towards less explorative and less bold animals leaving earlier. In contrast, social network data suggested a change in social interactions shortly before the dispersal event. Our findings indicate that social interactions and social status may play a more important role for emigration than individual behavioural traits.
keywords: Dispersal; Group living / social behaviour

New diet new me? Are there any differences in behaviour and morphology in wild house mice on different diets?

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Island taxa exhibit distinct behavior and morphology compared to those on mainland. To adjust to new environments, animals must rapidly adjust behaviour, but also find a new solution in terms of morphology. In our study, we experimentally mimic the process of migration of animals to new environments with a new dietary regime to see how fast these adjustments can manifest. While our control mice kept receiving a standard laboratory food (pellets) as in previous generations, we created three experimental groups immigrating to "islands" as young adults each offering various natural foods differing in texture and components (soft, hard, and high-fibre). After 3 months, we run Open Field tests to test risk taking. Our results showed no difference between the groups. In addition, we also took morphological parameters and calculated anatomical cross-sectional area (ACSA) for masticatory muscles. Mice didn't show any differences in ACSA however we noticed a trend in which mice showed differences in body length depending on diet. These results show that adult individuals aren't adjusting flexibly, indicating that neither behavioural nor morphological changes may show themselves in the first generation after introduction of a new diet.
keywords: Habitat change and behaviour; Migration

Mystery of quiet songs: vocal amplitude vs complexity in the star finch

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Bird song has two main functions, mate attraction and territory defence, for both of which singing louder songs is advantageous. However, some songbird species are characterized by very quiet songs, suggesting possible constrains on the song amplitude, but within- and among-species variations in song amplitudes are not well understood due to the technical difficulties. We focused on the star finch (Bathilda ruficauda), known to have relatively low-amplitude songs. Given the extreme acoustic complexity of song syllables in the species, we predicted a trade-off between amplitude and acoustic complexity. Using calibrated recordings made under standardised conditions in the laboratory, we tested relationships between the amplitude range and phonetic properties of a song syllable (such as peak frequency, bandwidth, and entropy). In accordance with the prediction, our findings indicated that more complex syllables tend to be sung with lower amplitude. This result implies physical constraints associated with the production of acoustically complex sounds. Considering that the subject species is not territorial and always shows courtship in a close distance, probably selection has favored complex songs at the expense of amplitudes.
keywords: Acoustic communication; Communication

Reproductive success and characteristics of winter-breeding female wild house mice

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Reproduction can be very costly. Reproducing under optimal conditions can lower the costs, but also limit the opportunities. House mice (Mus musculus domesticus) are an interesting species to test costs and benefits of reproduction as many are seasonal breeders, but some breed year-round. Reproducing in winter increases energetic costs but appears to offer fitness benefits to offspring, as pups born in winter have been shown to have a shorter reproductive delay, a higher likelihood of reproduction and a longer life span. This study examines the characteristics that allow female house mice to reproduce in winter, whether parental investment varies by season and if reproducing in winter confers an advantage in number of grandoffspring. I will use data from the last 20 years from a long-term study on wild house mice in a barn in Switzerland. I hypothesize that females with greater experience, higher quality and better nest building skills are more likely to reproduce in winter, that parental investment is highest for winter-born offspring, and that being born in winter leads to a higher long-term reproductive success. Understanding non-seasonal reproduction helps predict how breeding decisions translate into fitness outcomes.
keywords: Cost of reproduction; Long-term studies; Parental care

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Neurobiology of pair bonding in blue-fronted Amazon parrot (Amazona aestiva)

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Amazona aestiva has social needs such as pair bonding. Facing separation anxiety leads to stereotyped behavior, depression-like behavior and even death. Treatments include the administration of dopamine inhibitors. However, descriptions of the distribution of neuropeptides associated with social and reward neural network are scarce. We mapped the expression of tyrosine hydroxylase (TH), a precursor of catecholamine synthesis, and the expression of vasopressin (VP), related to pair bonding in nine blue-fronted Amazon parrot. Histological sections of brains were processed by immunohistochemistry for TH (1:1000) and VP (1:5000). The TH-immunoreactivity was from rostral regions of the striatum to dorsal regions of the medulla. Higher neuronal densities were in the preoptic area and mesencephalic regions, especially in dopaminergic nuclei related to vocal learning pathways. The immunoreactivity to VP were located in hypothalamic areas, thalamic areas and below the anterior commissure. Interestingly, there was VP-immunoreactivity in dopaminergic nuclei exhibiting a different cell marking pattern from the neurons of hypothalamic areas. This information helps to develop safer and effective interventions in parrots.

keywords: Neuroendocrinology; Group living / social behaviour; Mate choice; Monogamy

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Studying Vocal networks in the Arabian babbler (Argya squamiceps) using acoustic cameras

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When studying bird intra and inter-specific interactions it is crucial to accurately track which individual emits which vocalization. However, locating sounds of free moving birds in nature can be challenging, especially in scenarios when many individuals call in spatial and temporal vicinity. We have recently introduced the use of a hand-held acoustic camera which allows solving this problem. We applied the system to localize and record vocalizations of Arabian babblers (Argya squamiceps) during snake mobbing behavior. As the recorded babblers are ringed and therefore identifiable, we could use the calling order to reconstruct a vocal social network depicting which individuals call after which individuals. Acoustic analysis revealed that Arabian babblers call in a periodic pattern and with age specific pause lengths between individuals of different identities. Also, network parameters showed that juvenile babbler call as much as adults but have less call alternations with other individuals.Our approach demonstrates how this novel technology can be applied to reveal new insight about vocal networks in group living wild animals.

keywords: Methods for studying behaviour; Acoustic communication; Group living / social behaviour

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Every day counts: Reproductive differentiation through mutilation is time bound in the ponerine ant Diacamma indicum

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Reproductive differentiation, a key feature in eusocial insects, is achieved by employing different strategies. In the Ponerine ant, Diacamma indicum, this differentiation occurs through a process called mutilation, where the mated worker (gamergate) removes a special thoracic structure (gemma) from newly eclosed callow ants. In the current study, we investigated if there is a critical time window for successful mutilation, and when it occurred, the dynamics of the process were observed. We followed callows of two age groups (n = 44) across 17 colonies and found that mutilation was 100% successful within 24 hours of callow's emergence (n = 24). However, the success rate diminished to only 15% for callows aged 24-48 hours. Network analysis revealed the central role played by the gamergate, callow and at least one worker. This study reveals time constraints faced by reproductive individuals to maintain their reproductive monopoly in the colony and discusses the evolutionary underpinnings of caste determination and conflict resolution.
keywords: Reproductive behaviour; Life histories; Reproductive tactics; Division of labour

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Bystanders affect allogrooming duration and interventions in feral cattle

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Dyadic interactions are key to sociality, with economic decision-making affecting partner choice and investment in affiliation. The presence of nearby individuals (bystanders) can affect an animal's defection temptation and motivation, with bystanders themselves intervening to increase access to social partners; however, the role of bystanders in affiliative ungulate interactions is unknown. We investigated the presence of bystanders on the likelihood of intervention and the duration of allogrooming in a mixed-sex feral cattle herd in Hong Kong. We recorded duration, bystanders and intervention attempts for 239 allogrooming bouts, from 56 animals. Approximately 20% of bouts were successfully terminated by a third party. Allogrooming duration increased with number of bystanders, with more bystanders resulting in longer allogrooming bouts. Dominance status affected the likelihood of intervention; allogrooming was more likely to be successfully interrupted when there was a large negative rank difference between the allogrooming performer and the highest-ranking bystander. Our results are key to how cattle can perceive social rank, and highlight the importance of social context and partner choice in cattle grooming decisions.
keywords: Group living / social behaviour; Cognition

Complexity and environmental variability modulate emotional reactivity in Japanese quail across generations

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Numerous studies highlight the effects of stressful or enriched living conditions of laying females on the behaviour of their offspring. Such studies are essential to understanding how negative or positive experiences influence the phenotype of individuals across generations. However, the interactions between an animal and its environment involve a complex association between negative and positive experiences. Here, we therefore wondered whether a complex and variable environment, combining positive and negative experiences, could influence the behaviour of Japanese quail females (F0) and their first-generation offspring (F1). We exposed laying females to stimuli encouraging the expression of comfort, foraging and anti-predator behaviour (CVE) and we characterised this treatment's impact on F0 females and F1 offspring's emotional reactivity. Compared with control (CE) females, F0_CVE females were less neophobic and compared with F1_CE offspring, F1_CVE offspring were less neophobic, more sensitive to social separation and more reactive to a simulated predator attack. Such effects could have major consequences for the animal's ability to adapt in the wild and would be interesting to study as part of conservation programmes.

keywords: Transgenerational effects; Conservation and behaviour; Maternal effects

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Mothering and experiences with predators increase antipredator abilities in red-legged partridges (Alectoris rufa).

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Given the current decline in gallinaceous populations, the release of captive populations into the wild appears to be a major tool for their conservation. However, the survival rates of these captive populations can be very low. Some factors can improve the survival rate in the wild: the rearing by parents induces better antipredator abilities in offspring, and early exposure to predator stimuli promotes better survival after release. However, these two factors are rarely applied simultaneously. So, this study evaluated the impact of early experiences on antipredator behaviors of adult red-legged partridges in a semi-natural environment. We compared the behaviors of trained birds (reared by their mother and exposed to simulated predator attack) (N=18) to control ones (only reared by their mother) (N=12). We found that trained partridges expressed higher level of antipredator behaviors, with a longer escape distance from human and a higher tonic immobility duration. Our results supported the fact that the mothering associated to predator experiences at an early stage can improve anti-predator behavior at adult age and could be an interesting factor increasing partridges' survival in the wild.

keywords: Animal personality; Parental care; Behavioural plasticity

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Oxytocin: A mediator of life history?

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Oxytocin (OT) is involved in female reproductive functions and social behavior. We tested the hypothesis that OT mediates life history, promoting female fecundity and proceptive behaviors. Specifically, we predicted that females with higher OT levels have earlier age of first reproduction (AFR) and higher total fertility (TF) as well as more open and extraverted personalities. We tested these predictions in a human subsistence society, the Tsimane of Bolivia, using 432 urine samples from 209 people aged 2-83. We used Bayesian multilevel models to test the associations between OT (measured using radioimmunoassay), AFR and age-standardized TF (obtained from demographic interviews), as well as openness and extraversion (measured with a culturally-adapted personality questionnaire). Basal OT levels showed moderate repeatability (R = 0.34), supporting the notion of individual differences in OT-mediated phenotypes. However, OT was unrelated to personality, and associated with later, not earlier AFR (posterior support = 94%) and lower, not higher TF (68%). Pending improved personality data and another 800+ OT samples, our results suggest that OT may mediate life history, but not in the previously predicted direction.
keywords: Human behavioural ecology; Physiology and behaviour; Life histories

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Testing the Waters: Comparing Weight Perception in Kea, Ravens and Crows

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Humans have a sophisticated understanding of weight as a property that is inherent to all objects, but it is not clear whether other species are able to reason about properties of their physical environment (e.g. weight) in an abstract fashion. Results from chimpanzees and kea parrots suggest nonhuman animals can only perceive weight through direct experience, but new caledonian crows have been able to infer weight based on an objects' movement in a breeze. Ecological differences between corvids and kea parrots imply the neophilic kea may rely heavily on tactile experience whereas the neophobic corvids may also use visual cues to gather information about their physical environment. To test this, I present two related corvid species (Corvus corax, Corvus cornix/corone) and kea parrots (Nestor notabilis) with four different weight discrimination tasks to tease apart differences in exploration strategies and get a comparative measure for weight discrimination. I also examine whether birds are able to infer the weight of objects based on environmental cues and cues inherent to objects themselves. Preliminary results may shed light on the importance of a species' ecology for the evolution of certain information gathering strategies.
keywords: Cognition; Learning; Exploration

Does litter sex-ratio affect social play in juveniles? A pilot study in the critically endangered European mink

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Conservation breeding is becoming more common as the number of endangered species increase. Due to the constraints of captive settings, behavioural development can be compromised. For the European mink, whose survival is reliant on conservation breeding, abnormal male mating behaviour jeopardises the success of the breeding program. Since early life conditions (such as enriched environment from birth and social play) are important in the development of adult behaviour, we hypothesised that sex-ratio of the litters and environmental enrichment will influence the levels of juvenile play. We run a pilot study with 10 litters in 3-year time period. Litters were observed via cameras and their social behaviour was observed to obtain average frequency and duration of play per litter. Litter size was added to the model as a covariate. Our results indicate while litter sex-ratios did not affect the frequency of play, litters with more females had longer bouts of social play (t=-5.3; p=0.002), with no independent or interactive effects of enrichment. Our future work will aim to replicate this result with a larger sample size, as well as test whether play and sex-ratio interact to affect courtship behaviour and mating success in adulthood.

keywords: Conservation and behaviour; Group living / social behaviour

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Long-term chimpanzee research in the Nimba Mountains of Guinea, West Africa

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University of Zurich

The long-term chimpanzee research site in the Nimba Mountains of Guinea was established in 2003. Today, the Nimba Chimpanzee Project studies and conserves two communities of western chimpanzees. Nimba is the only mountainous chimpanzee study site in West Africa. We study topics related to the behaviour and ecology of these chimpanzees, including tool use, feeding ecology, sociality, and communication. Our long-term research project has revealed a unique behavioural repertoire in the Nimba chimpanzees, including the consumption of freshwater crabs and the construction of sleeping nests on the ground. The Mount Nimba Strict Nature Reserve is a UNESCO World Heritage Site. Despite its protected status, the area is impacted by human encroachment and extractive industries. The Nimba Mountains is a biodiversity hotspot, and an exceptionally important priority area for chimpanzee conservation. We use our research findings to develop applied conservation strategies. The Nimba Chimpanzee Project takes a holistic approach to conservation based on scientific research, capacity building, and community engagement. Our initiatives include local researcher training, educational events, conservation outreach and sustainable development projects.

keywords: Long-term studies; Conservation and behaviour; Great apes

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Blue-headed macaws (Primolius couloni) act prosocially in an instrumental helping task

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Understanding the evolutionary origins of prosocial behaviour is a challenge for scientists. Recently, prosocial behaviour was demonstrated in African grey parrots (AGP) but not in blue-headed macaws (BHM). However, this lack of prosocial behaviour in BHM may be due to the methodology used, as previous studies have produced conflicting results and demonstrated an effect of cognitive demand on performance in prosocial behaviour experiments. Therefore, we re-examined prosocial behaviour in BHM using an alternative cognitively less demanding methodology. The birds were assessed in a task where they could help their partner by pulling plates out of a tube, causing a piece of food to fall onto the partner's side. We varied the presence of the partner and the accessibility of food to control whether the birds understood the contingencies of the task. We found that the birds helped significantly more often in the test condition compared to control conditions when the partner was absent and when no food reward was accessible to the partner. These findings show that BHM possess spontaneous prosocial behaviour and that the cognitive demand of a test requiring prosocial decisions may mask subjects' prosocial behaviour.
keywords: Cooperation; Cognition

Ape Research Index (ARI): Quantifying research experience on cognitive skills in captive chimpanzees

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Chimpanzees are primary models for multiple research fields studying human evolution. Results from experiments with captive chimpanzees are often generalized on a species level and used to create hypothesis on human evolution. Most research on captive chimpanzees is concentrated to a few institutions, resulting in some groups accumulating experience in research tasks during their lifetimes. Yet, the effect of this previous experience on chimpanzee cognitive performance is currently unaccounted for. This poses a potential bias for our understanding of chimpanzee cognition, influencing the robustness of comparative cognition studies. The ARI project evaluates this bias via a systematic data extraction from the literature encompassing all experimental studies from captive chimpanzees worldwide (zoos, sanctuaries, & research labs). The project examines individual chimpanzees' experience and performance in experiments both via a meta-analysis and targeted experiments across groups of chimpanzees with low to high levels of prior research participation. All extracted data will result in an open-access database so that researchers can identify suitable subjects for their specific questions and increase the validity of chimpanzee models.
keywords: Long-term studies; Cognition

Exploring Early Stage Domestication in North American Raccoons: A Long-term Study in a Natural Setting

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The Russian fur fox experiment is probably the most famous and inspiring experiment in domestication research. Each generation, only the friendliest and least aggressive, i.e. tame, individuals were bred to produce the next generation. Over a short period of time, the behavior, physiology, and morphology of the foxes changed drastically. These observed changes were the basis for the formulation of the Neural Crest Domestication Syndrome (NCDS) hypothesis. The NCDS describes a mild defect in the migration and proliferation of neural crest cells, a downstream effect of selection for tameness, as the underlying mechanism capable of explaining all traits ubiquitous in domesticates. While we now have this detailed framework with a testable hypothesis, we still lack a species and an experimental setup to accurately test the NCDS hypothesis in a natural setting. Crucially, all current domesticates introduce the problem of breed-specific changes and/or lack ancestral populations, making comparisons difficult if not impossible. I present here the beginning of a long-term study investigating the early stages of domestication in relation to the NCDS in a non-domesticated, in-situ, natural setting of a North American raccoon population.
keywords: Long-term studies; Urban ecology; Methods for studying behaviour; domestication

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Development of play behaviour in Japanese quail (Coturnix japonica)

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Play has been studied in mammals and birds, but no study has reported the existence of play behaviour in Japanese quail, a less social species during the adult life than the hen. Then we have performed a pilot study in order to observe the expression of play behaviour during the first weeks of life of young quail. For that, we have recorded whether the chicks, maintained in social groups, have expressed play behaviour from the age of 2 days to the age of 29 days. We have observed two types pf play: objects pay and locomotor play, with a peak of expression for this one at 19 days of age. We found also a complex difference between males and females because although males have expressed more play while females have expressed play more quickly. Moreover, we have performed personality tests on chicks. We have demonstrated no correlation between emotional reactivity and play expression, but a negative correlation between social motivation and expression of play behaviour. Thus, the more playful quail were, the lower the social motivation was. To sum up, we have evidenced expression of play in young quail with correlation with individual features, and we would like now establish hormonal correlations with play expression.
keywords: Behavioural plasticity; Animal personality; Cognition; Behavioural development

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Pattern of rhythm: exploring zebra finch temporal song preference

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Rhythm, how elements occur over time, is a key feature of communication for many animal species. Besides human music, we also find rhythmic patterns in fireflies flashing and in indris and zebra finches' songs. Despite different animal taxa and modalities, these patterns remain periodic and can be composed by a single element, as isochrony of a metronome, or by multiple elements, as heterochrony in human music, leaving it unclear whether these patterns are shaped by environmental or cognitive constrain or by species-specific preference. The songs of zebra finches (T. castanotis), made by males only, are of particular interest since they are made by repeated motifs with an isochrony distribution that resembles human finger-tapping rhythm, suggesting his key role in rhythmic processing. In this poster, we present our data on zebra finches' preference for different rhythmic patterns. Zebra finches are tested in an operant 4-way choice test, with four song renditions that match different rhythmic patterns. These results will give us insight into the rhythmic preference of zebra finches, clarifying if isochronous rhythms are selected by social and sexual selection in zebra finches or arise from factors like environment or cognition.
keywords: Acoustic communication; Cognition; Sexual selection

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Automatic analyses support the 'many-eyes' hypothesis and repeatability in vigilance behaviour in a cooperative bird

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Predation is a selective force with a major impact on preys' fitness, leading to various anti-predator strategies, such as predator detection through vigilance behaviour. However, studying this behaviour raises many challenges, particularly in social species where multiple individuals can simultaneously share the costs of this task. We used videos to develop a deep learning-based tool to automatically quantify vigilance behaviour of several individuals simultaneously at artificial feeding stations. Using these developments, we studied the vigilance behaviour of a colonial cooperatively breeding bird, the sociable weaver (Philetairus socius), that forages on the ground in the open savannahs of the Kalahari region. We found that the proportion of individual vigilance decreases with group size (supporting the many-eyes hypothesis) and vigilance was significantly repeatable among individuals. The developments of this work open the door to revisit some of the classical hypotheses on vigilance behaviour literature and address new hypotheses that require significantly larger, and individual-level datasets.
keywords: Cooperation; Group living / social behaviour; Methods for studying behaviour

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Setting up a new long-term study on the social structure of a Rüppell's vulture groups

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The social brain hypothesis (SBH) dictates that increasingly complex social life has fostered the evolution of increasingly complex cognition. Phylogenetic comparisons to test this prediction have, however, mainly focussed on social mammals, with some recent work on corvids and parrots too. To allow a more balanced phylogenetic comparison, however, extending the focus to other species, like Rüppell's vultures, is paramount. Rüppell's vultures are long-lived birds that live in large social groups, and have relatively large brains, i.e., an interesting candidate to test the SBH. Yet, little is known about the complexity of their social life. Here, we want to introduce our newly set up lab studying a total of $\pm$ 25 birds in two captive groups. Our analyses of the first behavioural data showed a linear dominance hierarchy, and that those birds that have a pair bond have significantly higher ranks than those that do not. Yet, adding to their social complexity, affiliative interactions were not restricted to those pair bonds, but also not indiscriminate. With more data coming in, we hope to also present some first results on the stability of these dominance hierarchies and social networks over the year(s) (including 1.5 breeding cycle).
keywords: Group living / social behaviour; Long-term studies; Contests and competition

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Mapping complexity: Technical skills in geographically separated populations of Tanimbar corellas

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Object combinations are of considerable scientific interest, serving as an observable indicator of technical intelligence and given their suggested role as potential precursors to the development of tool use. Tanimbar corellas (Cacatua goffiniana; Goffin's cockatoos) are an important model in comparative cognition research due to their advanced technical and social capabilities. They are endemic to the Tanimbar Islands, Indonesia, but were also introduced to Singapore, where they established a self-sustaining population. Here, we compare the complex object combinations observed in these two locations: tool sets for extracting embedded seed matter from a tropical fruit (Tanimbar Islands) and dynamic object-fruit combinations resembling tool use (Singapore). This comparison provides initial insights into the presence of advanced technical skills in two geographically separated populations of the same psittacine species. Similar to tool-using primates, such abilities may emerge from opportunism and extractive foraging, facilitated by persistence, sensorimotor control, and a strong inclination to combine objects. These observations contribute to mapping the distribution of sophisticated technical skills across geographical regions.
keywords: Foraging; Tool use; Cognition

Born to be social? Phenotype plasticity in social traits via prenatal maternal effects

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Animal life is inherently social. Yet, there is significant intraspecific variation: some individuals consistently are more social than others. There is ample evidence that mothers can modify the developmental trajectory of their offspring by transferring non-genetic material (e.g. hormones) to eggs. As mothers know about their offspring's postnatal social environment, they might alter the social phenotype of their offspring to match the social context they will experience after birth. However, it is still debated whether such trans-generational phenotypic plasticity is adaptive. To test this, we experimentally manipulated the social density perceived by blue tit females before egg laying. We found that mothers in the high-density treatment transferred less testosterone to their eggs than control mothers. Network degree (i.e., the number of social interactions of the brood) was not affected by treatment, but broods with lower yolk testosterone concentrations showed higher degree. Thus, lower yolk testosterone levels translated into a more interactive social phenotype, which could be adaptive.
keywords: Behavioural plasticity; Group living / social behaviour

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Feeding program and leaning behavior in captive benthic sharks

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Establishing a tailored feeding plan is crucial for the well-being of sharks in captivity, yet research gaps make it challenging for aquarists to determine the best diet. Target feeding, mimicking natural hunting behaviors, facilitates physical activity and allows individual monitoring of feeding habits. This training also provides enrichment, reducing stress and promoting psychological health, as well as the establishment of an essential medical training. Moreover, it enables close observation of behavior, aiding in early detection of health issues. Overall, feeding training fosters natural behaviors, mental stimulation, and overall health for zoo sharks, while also offering educational benefits. The Budapest Zoo Shark School, opened in 2019, exemplifies innovative feeding training practices, providing valuable insights into managing captive shark populations.
keywords: Learning; Behavioural plasticity; Physiology and behaviour; medical training and nutrition

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Potter wasps: the master engineers of the insect world

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Studying insects is important due to the insights they give on biological processes such as learning, communication, social organization coupled with their ecological roles in pollination, decomposition and pest control. Despite their ecological importance, very little is known about the biology, behaviour, and prey associations of solitary wasps. Potter wasps are characterized by their unique nesting choices which range from nesting in soil, in pre-existing cavities or in free-standing mud nests they build and provision with lepidopteran caterpillars. We report on the potter wasp species Delta pyriforme, Delta conoideum and Phimenes flavopictus in and around the campus of the Indian Institute of Science, Bengaluru, India, all of which build mud nests using water and soil. The sequence of events during construction of the mud nests was observed in the field and within a large enclosure. The study generated seasonal activity distribution and revealed some of the parasitoid threats encountered. By combining behavioral studies on the potter wasps with structural studies on their nests, we hope to uncover the intricate relationship between materials used in nest construction and the behaviour that drives nest-building.
keywords: Life histories; Parental care

Landscape transformation and conflict limit the genetic connectivity of free-roaming cheetah in South Africa

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Large carnivores require large ranges to meet their energy demands, making them vulnerable to habitat destruction and human-wildlife conflict. This isolation of populations disrupt natural processes, with profound implications for genetic structure. We investigate the free-roaming cheetah (Acinonyx jubatus) populations across South Africa's landscape, establishing a baseline for understanding the genetics of these individuals. Through the analysis of 240 Single Nucleotide Polymorphisms collected across the landscape, we identified three possible distinct genetic groups. The Kalahari and Waterberg populations exhibit closer genetic similarities compared to the Lowveld, highlighting the restrictive impact of landscape transformation in the Limpopo region on cheetah dispersal and gene flow. Our findings underscore the importance of genetic management in conservation strategies, contributing to the understanding of cheetah populations' genetic diversity and connectivity. This study emphasizes the value of free-roaming cheetahs as a genetic reservoir and the necessity for conservation efforts to mitigate habitat fragmentation and promote genetic connectivity, ensuring the long-term viability of this critically endangered species.
keywords: Behavioural genetics / genomics; Anthropogenic effects; Long-term studies

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Semi-transparency: A Camouflaging Practice in a Freshwater Prawn

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Camouflaging protocols in animals initially focuses on the efficient and effective quality to merge with the ecosystem surroundings. The colouration pattern or colour dispersion on the body surface in animals encompasses sophisticated pigment biology, which is undoubtedly implicated in several biological functions. This work uses a semi-transparent freshwater prawn species, Macrobrachium lamarrei, to highlight the mechanistic approach of camouflage in the underwater aquatic medium by effectively using the reflection-refraction of light. Macrobrachium lamarrei has certain array of pigment droplets on its exoskeleton. However, the uniqueness of camouflaging is demonstrated because of the transparency quotient of the body, which critically plays a role for keeping the organism 'invisible' in the aquatic habitat. The degree of transparency is regulated by the tissue structure of the body surface which uses the intensity of light effectively. This study is aimed to analyse the interplay of light and body transparency where semi-transparent aquatic organisms can be a good biophysical 'prototype' to analyse camouflagic adaptation.
keywords: Aposematism and mimicry; Physiology and behaviour; Predator-prey interactions

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(De)composing sociality: disentangling individual-specific from dyad-specific propensities to interact

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In many group-living animal species, relationships between group members are highly differentiated. Some dyads have strong relationships, while others have weak ties. Evidence indicates that the number and strength of such ties are related to reproductive success and survival. Yet, few studies have considered that frequent or prolonged affiliative interactions between two individuals can be driven by two different processes: first, gregariousness, i.e. the propensity of individuals to interact with anyone, and second, dyadic affinity, i.e., the preference of dyad members to interact specifically with one another. Here, we present a principled statistical framework to estimate the two underlying but unobservable sociality axes from observed dyadic interaction data. We demonstrate the application and some critical advantages of our framework, which allows checking model fit against observed data, assessment of uncertainty in sociality parameters, and the possibility to extend it to more complex models. Our work will help to understand how and why individuals interact and will let us address refined questions about the relationship between variation in sociality and other features of interest, both within and across species.
keywords: Group living / social behaviour; Methods for studying behaviour

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Knowledge attribution in pet dogs

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Dogs respond sensitively to human behaviour and understand our visual perspective, but whether they can attribute knowledge to humans remains debated. Dogs capable of knowledge attribution should discriminate between a knowledgeable person and an ignorant, which we tested with 86 pet dogs using an 'unsolvable puzzle' set-up. Dogs participated in at most two one-minute trials of facing an unsolvable puzzle, each with a different puzzle, and test conditions varied across dogs and trials. Dogs were expected to look for help at the 'Knower' who prepared the puzzle rather than at the 'Ignorant' bystander. Dogs' first look went predominantly to the Knower, especially when both experimenters ignored the dog. They also looked longer at the Knower than at the Ignorant. However, when the experimenters made eye contact with the dog or the Ignorant handled food as well, the help-seeking behaviour varied. Our dogs appeared to attribute knowledge to humans, but were susceptible to distractions during this set-up. Further investigation is warranted to establish whether dogs' successful task performances reflect true insight, or simple associative learning.
keywords: Cognition; Interspecific interactions

Food for thought - A platform to study behaviour and cognition of wild, free-ranging Tanimbar corellas

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Captive Goffin's cockatoos or Tanimbar corellas (Cacatua goffiniana) have exhibited impressive cognitive skills. Recent studies have provided first insights that their wild counterparts are on par regarding innovative capacities and tooling skills. Wild birds temporarily kept in a capture-release aviary even exhibited the ability to craft and use different types of tools to reach a single goal, hence constituting a tool set. This remarkable observation has prompted several significant questions. However, studying the behaviour and cognition of this species within its natural habitat, the dense semi-deciduous forests of the Tanimbar Islands, Indonesia, is notoriously difficult. Here, we present the first results of our latest approach towards overcoming these challenges. By establishing hoistable feeding platforms, we assessed temporal and environmental factors influencing foraging activity. Based on the collected data, we conclude that this setup reliably attracts Tanimbar corellas and thus allows fully voluntary testing in situ. Furthermore, we introduce and discuss future plans for an automated tracking and identification system, which will allow us to further delve into this species' social and technical skills.
keywords: Methods for studying behaviour; Foraging; Cognition

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Are hunters hunks? Meat sharing's in the nested multi-level society of Guinea baboons

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Hunting animals and sharing meat is a male quality signal in human hunter-gathers, and is linked to greater reproductive success for the most successful hunters. Like human hunter-gatherers, Guinea baboons (Papio papio) live in nested multi-level societies, can transfer meat tolerantly, and acquire meat primarily through males. Guinea baboons thus offer an ideal system for examining how meat moves through another multi-level society, and to explore the origins of meat sharing as a quality signal. The base of Guinea baboon society are "units" composed of a primary male and his associated females. We tested whether males who acquired and shared meat more often had more females (unit size) for more time (unit tenure). We also examined how the tolerance of meat exchanges were affected by the possessor and recipient's sex and the societal level of the exchange. We used video records of 109 meat-eating event (324 exchanges) across 8 years at our Senegal field site. We find the frequency of male meat acquisition and sharing does not affect unit size or tenure, but that males transfer meat more tolerantly than females, and meat is transferred more tolerantly at the more basal levels of the multi-level society.
keywords: Mate choice; Group living / social behaviour; Foraging

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Spatial plasticity of wild boar during drive hunts

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Phenotypic plasticity, the ability of animals to adapt to changing environments, is evident in the wild boar population, contributing to its expantion. However, research on their spatial responses to human pressures is lacking. We collected GPS data from 55 wild boars during drive hunts over three seasons (2019 – 2022) in the Czech Republic and Sweden. Our analysis focused on movement, ranging behavior, and flight responses to hunts. Surprisingly, hunting intensity and bag size did not significantly influence spatial respons. However, the frequency of hunting events experienced by an individual correlated with increased daily travel distance and home range size. We identified two behavioral responses, "remain" and "leave." Initially, boars with limited hunting experience tended to "remain" more frequently. With more hunts, they shifted towards a "leave" strategy, indicating a dynamic adjustment to hunting pressures. Flight behavior lasted around 26 hours before boars returned to their original area, highlighting the temporary nature of their avoidance response. In summary, our study reveals the remarkable behavioral plasticity of wild boars during drive hunts, emphasizing their strategic adaptation to human-induced pressures.
keywords: Behavioural plasticity; Anthropogenic effects; Movement ecology

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Monitoring sleep in a highly social terrestrial bird

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Sleep is a fundamental part of every animal's life and is influenced by ecological and social variables. For example, in socially tolerant species, communal roosting may mitigate increased predation risk, but comes at the cost of sleep quality. Such complex tradeoffs cannot be simulated in laboratory settings that have come to dominate sleep studies, and instead demand new methods to study sleep in its natural context. We study sleep in wild groups of vulturine guineafowl, a terrestrial bird that lives in multilevel societies where groups preferentially merge with other groups at night to roost on trees. To study individual sleep in a relevant socio-ecological context, we use inertial data collected overnight from triaxial accelerometers. To extend methods developed for larger-bodied primates to smaller-bodied animals like vulturine guineafowl, we first account for differences in environmental noise using accelerometer data from wild guineafowl and dummy models equipped with accelerometer tags and wind speed data. Once calibrated, we aim to investigate how roost-site quality and preferential group association influence sleep, expanding the scope of sleep-related questions that can be asked in ecologically relevant settings.
keywords: Group living / social behaviour; Methods for studying behaviour; Collective animal behaviour; Sleep

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Flying through the waves: Does electrosmog affect migration of free-flying songbirds?

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Each year, millions of na66ve songbirds migrate thousands of kilometers using their magnetic compass. Many migratory species suffer from population declines and one potential driver is "electrosmog", which is emitted by electronic devices. Cage experiments showed disorientation of migratory birds when exposed to electrosmog. In order to identify the ecological relevance of electrosmog effects on bird migration, it is essential to test the findings from the laboratory with free-flying birds. For this purpose, night-migratory Northern wheatears (Oenanthe oenanthe) were exposed to artificially generated electrosmog during a stopover on the German island of Heligoland. Under a starry sky, no effects of electrosmog were found on their departure decisions. However, to exclude the use of a star compass, we recently tested birds under overcast skies. First results indicate again no effect of electrosmog, suggesting that birds do not use magnetic compass information for making the decision to leave an electrosmog-polluted area. Our findings do not generally exclude the impact of electrosmog on bird migration, but it currently seems unlikely that electrosmog acts as a main driver for population declines in migratory songbirds.
keywords: Anthropogenic effects; Migration

Effects of collars on behaviour of captive male fishing cats (Prionailurus viverrinus) at Khao Kheow Open Zoo, Thailand

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This study aimed to investigate the behaviour of the captive male fishing cats before, with and after wearing mock collars and study the behaviour patterns of each individual. The behaviour of three male fishing cats before, with and after wearing the mock collars was observed both days and nights with focal animal sampling technique for at least 15 days. The results revealed that there was difference in the behaviour of the fishing cats when wearing the mock collars, and when comparing without wearing them during the study period. While the male fishing cats were wearing the mock collars, it was observed that the most obvious behaviour was stereotypic. It implies that the mock collars affected on the behaviour of fishing cats. It also revealed that the fishing cats were nocturnal: the male fishing cats spent most of the time for locomotion at night time than day time. Although the male fishing cats showed feeding behaviour during the day time than the night time, these three captive male fishing cats might have been adapted to eat during the day at Khao Kheow Open Zoo. This finding could be used as basic information for developing and evaluating appropriate GPS collars of the fishing cats for in-situ conservation in the future.
keywords: Conservation and behaviour; Methods for studying behaviour

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MACHINE LEARNING AND MULTIMODALITY: ANALYSIS ON CO-OCCURRENCE OF Indri indri's FACIAL EXPRESSION AND VOCALISATIONS

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Multimodal information transmission occurs through multiple sensory channels, describing signals in their entirety. The face is crucial in social contexts, but current methods for describing facial movements are not universal and require extensive observation. This paper tests a new methodology for quantifying facial movements reproducibly across species and contexts using large datasets. Deeplabcut, a deep learning tool, studied facial movement without markers, using Indri indri, the only singing lemur, as the model species. Data collection in Madagascar's Maromizaha Nature Reserve over four months yielded 58 selected videos. Clips were edited and labelled with BORIS software. After training Deeplabcut on 13 facial points, coordinates were converted into distance matrices. Machine learning techniques, specifically the Random Forest Classifier, achieved a 93% $\pm$ 2% correct classification rate for phonation presence. K-means clustering identified 13 groups, validated with a Support Vector Machine at 95% $\pm$ 5%. This study lays the foundation for a universal model to analyze primate facial movements across contexts.
keywords: Communication; Signalling; Machine Learning

Weighting the Kea mind: Kea reasoning of weight as an unobservable entity

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Studying how animals reason about non-observable entities can reveal a lot about their understanding of the physical world. This is the case for the concept of weight. To date, this has been explored primarily in primates, with mixed results. Some studies show how chimpanzees understand weight just in terms of phenomenological perceptions, and others, for example, show Tufted Capuchins able to associate properties like sound to the weight of objects. More recent work with corvids and parrots suggests birds may be a particularly promising group for studies of weight understanding. In this research, we explore weight understanding in the highly explorative and neophilic Kea parrot (Nestor notabilis), a species that have shown similar performance in problem solving than apes and corvids. We present Kea with two experiments testing whether they determine the weight of objects: 1) by auditory cues produced when objects are dropped onto a hard surface; and 2) visual cues such as volume or size. Results from these studies provide insight into the kea's understanding of its physical environment and contribute to a wider picture on the phylogenetic distribution and evolution of abstract thinking in the animal kingdom.
keywords: Cognition; Learning

Sex modulation of social trade-offs in a wild bird social network

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Social relationships come with costs and benefits, which individuals aim to trade off optimally. In wild populations, these trade-offs are manifested as individuals associating with conspecifics to varying extents. However, how trade-offs within social networks occur, and the factors affecting how individuals manage social trade-offs remain largely untested in wild populations. Here, we used a wild population of Great Tits (Parus major) as a model system for examining social trade-offs within social networks: specifically, how individuals trade off associating with their future breeding partner versus with other birds. Throughout the non-breeding season, male and female birds increasingly associate with their future breeding partner. In newly-pairing birds, sex and age shape social decision making. Juvenile male birds initially associate relatively less with their partner. Additionally, juvenile male birds undergo lower social group member change whilst accommodating pair bonding. We discuss how these findings demonstrate how demographic characteristics shape fine-scale social behaviour and suggest future work considering how social trade-offs may affect individuals' future fitness.
keywords: Group living / social behaviour; Reproductive behaviour; Mate choice

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Socially responsive crickets: insights into the evolutionary consequences of behavioural interactions

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Social interactions in animals play a pivotal role in evolution by affecting the phenotype and fitness of individuals within a population. However, social interaction can in principle alter the rate and direction of evolution via another route: when the average behaviour and plastic responses to social partners (i.e. social responsiveness) are interconnected, an evolutionary change in one could simultaneously impact the other. We investigated this idea using agonistic interactions in field crickets as a study system. Taking a reaction norm perspective, we repeatedly monitored individual responses in the social context and quantified the extent to which aggressiveness and social responsiveness covary. Our findings reveal evidence of an individual-by-social environment interaction, as crickets not only differed in their average aggressiveness but also in their plastic response to variation in the phenotype of rivals. Importantly, there was a negative aggressiveness–responsiveness correlation, suggesting the existence of a potential evolutionary constraint on both aggression and social plasticity. Our study provides the first insights into an additional mechanism through which social interactions may alter evolutionary responses.
keywords: Group living / social behaviour; Behavioural plasticity

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Exposure to pesticide mixtures does/does not affect carabid beetles locomotory behaviors

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Pesticide use is known to have deleterious effects on non-target organisms' physiology and behavior even at sublethal doses. Despite progress in the integration of behavioral indicators in ecotoxicological assays, tests are often conducted using a substance-by-substance approach. However, field-contamination is rarely due to a unique substance, but to mixtures of fungicides, herbicides and insecticides, each with potentially different modes of actions. We tested the locomotory activity of 180 carabid beetles over a gradient of pesticide mixture exposure in agricultural soils. We sampled 10 soils representative of low, medium and high pesticide contamination levels. An additional 18 beetles were exposed to a standardized soil without pesticides. Carabids were housed in groups of 6 individuals over 6 weeks before measuring the outcomes of pesticide exposure on locomotory behaviors. We did not find evidence of behavioral alterations in exposed individuals compared to controls, nor with the number of pesticide molecules detected. Our results suggest that contact exposure has little influence on carabid behaviors. Exposure through the consumption of contaminated food item as the primary exposure route is currently under investigation.
keywords: Pollution and behaviour; Animal personality; Behavioural plasticity

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The yellow mongoose call repertoire and vocal ontogeny

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The social complexity hypothesis predicts for vocal communication to be more complex in group living species with more opportunities for social interactions. Facultatively social species provide the unique opportunity to identify how specific social aspects may influence the complexity of a call repertoire. Investigating vocal ontogeny, focusing on the changes at different life history stages, can reveal much about the development and complexity of the adult vocal repertoire, giving insight into which social factors in particular may enhance vocal variation. Preliminary data collected on the yellow mongoose (Cynictis penicillata), who can live solitary but also in groups, showed a larger call repertoire than so far described with pup-specific call types which appear to stop being produced once individuals mature. Results within this study further propose a certain degree of vocal flexibility with at least one discrete call type used across multiple contexts, shifts in fundamental frequency related acoustic parameters across age categories and the use of call combinations. Despite a small sample size, the findings suggest similar vocal developments throughout age stages as in the social obligate mongoose species.
keywords: Acoustic communication; Communication

Deep Learning solutions for long-term projects: efficient data processing for behavioural analysis

Liliana R. Silva, André C Ferreira, Marta Marmelo, Claire Doutreland, Rita Covas
CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Campus de Vairão, Universidade do Porto, 4485-661 Vairão, Portugal , BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Campus de Vairão, 4485-661 Vairão, Portugal

Behavioural traits are variable by nature, requiring the collection of large volumes of data to study their evolution. Collecting different behaviours from a large number of individually identifiable animals can be challenging. Behavioural classification through AI can be a solution but requires an extensive dataset to be trained. In long-term projects, standardized data collection systems are employed routinely over time, being ideally positioned to overcome the frequent imbalance between data collection and processing. The sociable weaver (Philetarius socius) long-term research project studies the evolution of cooperation, relying on >40000hs of behavioural video data for >2000 individuals over 10 years. Here we show how we take advantage of this repertoire and Deep Learning to automate: i) individual identification through colour-ring combinations and ii) the collection of several behaviours (nestlings feeding, nest building, aggression, roosting, vigilance). The rapid data processing and robust sampling of the automated pipeline developed led to a significant increase in the efficiency of data analyses in terms quantity and individual detail, while maintaining its generalization capacity between years and to other systems.
keywords: Methods for studying behaviour; Long-term studies; Cooperative breeding

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Physiology of personality: prenatal exposure, offspring personality, and stress reactivity in the banded mongoose

Erika Sininärhi, Aura Palonen, Hazel Nichols, Michael Cant, Emma Vitikainen
University of Helsinki, University of Oulu

Consistent behavior, aka personality, is related to fitness and may be beneficial in rapidly changing environments. However, little is known about physiology of personality in wild mammals, hindering our understanding of evolvability and behavioral adaptability of populations. I study whether prenatal stress and androgen exposure predict personality traits and stress reactivity of offspring later in life in the banded mongoose (Mungos mungo). Mothers may affect offspring competitiveness and I hypothesize pups with higher prenatal androgen exposure to be bolder, and those with higher prenatal stress exposure in turn to be less bold and have higher reactivity of the sympathetic nervous system (SNS) themselves. Hair samples are collected at trapping events from pregnant females and their offspring, and cortisol and dehydroepiandrosterone (DHEA) incorporated into the hair shaft as prox of prenatal stress exposure and SNS reactivity, respectively. Pup anogenital distance and digit ratio are measured as proxies of androgen exposure and the measures combined with behavioural data from a long-term field study of banded mongooses in Uganda, to analyse whether prenatal exposure is connected to boldness and stress reactivity of offspring.
keywords: Animal personality; Long-term studies

The effect of formation swimming on tailbeat and breathing frequencies in Southern Resident killer whales (Orcinus orca)

Federica Spina, Michael N. Weiss, Darren P. Croft, Paolo Luschi, Alessandro Massolo, Paolo Domenici
Ethology Unit, Department of Biology, University of Pisa, Pisa 56126, Italy

Traveling in formation can reduce the locomotion costs in many aquatic taxa. However, little is known about formation swimming energetics in cetaceans. We recorded drone-based videos of Southern Resident killer whales (Orcinus orca) traveling groups in the Salish Sea (WA, USA) and tested the effect of swimming speed, relative positioning within the group, sex, and size on individual tailbeat and breathing frequencies as proxies of the relative swimming costs. Energetic benefits of formation swimming were revealed when considering multiple factors at play: intervals between surfacing events lasted longer in large trailing individuals, but the overall breathing frequency was similar in all formation members regardless of their position. Tailbeat frequency was mainly associated with size, sex, and swimming speed, but showed a decreasing trend as the number of individuals in formation increased. Our results suggest that in Southern Resident killer whales, energetic saving may not be the main driver for swimming in the wake of conspecifics. Given their tight social structure, both kinships and intra-population hierarchies could be crucial factors in determining the spacing pattern of killer whales in formation.
keywords: Collective animal behaviour; Group living / social behaviour; Physiology and behaviour; Formation swimming

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Between Authenticity and Imitation: Untangling Parakeet's Call Recognition

Karina Stampe, Thorsten J. S. Balsby, Élodie F Briefer
University of Copenhagen

Eupsittula parakeets live in fission-fusion flock dynamics. Vocally interacting with both individuals that they are more or less familiar with is crucial for them to find resources and obtain a position in their flock. They produce individually distinctive baseline calls (loud contact calls), however when interacting vocally during fission and fusion events, they can alter the structure of their contact call to imitate others. Previous research compared how acoustic parameters change between spontaneous baseline calls and contact calls emitted as response to a playback stimulus (imitations) and showed that the acoustic parameters remained individually distinctive despite imitation. To better understand the systems in fission-fusion living species, we here investigated if Eupsittula parakeets can actually distinguish between baseline calls and imitations of these, using captive peach fronted parakeets E. aurea as a model. This was done through a playback experiment using a habituation-dishabituation paradigm. These results reveal the complexity of these species and their communication systems.
keywords: Acoustic communication; Group living / social behaviour

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When size matters: body-size perception in wolves and dogs

Dario Starić, Lea Arnauer, Gabrielle Bonfils, Sarah Marshall-Pescini, Friederike Range
Domestication Lab, KLIVV, University of Veterinary Medicine Vienna

When navigating their surroundings, animals require a basic understanding of objects' physical properties and some level of self-awareness. Self-awareness may be achieved through several cognitive processes that serve as "building blocks", for example, understanding of the properties of the body as an object and putting these properties in relation to the properties of other objects. Both evolutionary and ontogenetic processes may affect a species'/animal's body awareness. . To date, two studies showed that dogs are capable of understanding their own body size, but other properties (e.g. shape or solidity) have never been tested. Here, we advance our knowledge further by investigating ontogeny and evolution of body size perception. In the first study, we focus on the influence of experience (agility vs. no agility training) on dogs' body-size and -shape perception, and the solidity principle using a two-choice paradigm. In the second study, using a similar paradigm, we investigate whether the domestication and consequent change in ecological niche (scavenging vs. hunting) affected body self-awareness by comparing similarly raised dogs and wolves. The data collection should be completed by end of June 2024.
keywords: Cognition; Movement ecology

Asian elephant (Elephas maximus) sensory responses to food novelty

Hannah B. Tilley, Kaja Wierucka, Estelle Meaux, Joshua M. Plotnik, Ellen S. Dierenfeld, Timothy C. Bonebrake, Caroline Dingle , Hannah S. Mumby

The University of Hong Kong, School of Biological Sciences, The University of Hong Kong, Pok Fu Lam, Hong Kong SAR

Neophobia or adverse behavioural responses to novelty may be adaptive, protecting animals from harm. Elephants show disparate behaviours to novelty, engaging in more exploratory behaviours with novel objects in some studies and with increased caution in others. We investigated captive Asian elephant responses to food novelty in Nepal. Eight food items (fruits, vegetables & pulses)—4 novel and 4 familiar to elephants— were presented on a table in grid formation, allowing elephants to use vision, olfaction and touch to make choices. To investigate responses, we recorded the time of approach and the order in which elephants interacted with and consumed food items. We found that elephants consumed familiar foods before novel (Tukey, r2=4.18, p<0.0001) and touched novel items more in early trials (Tukey, r2=0.93, p<0.0001). However, with continued experimental exposure novel food items were eaten with increasing frequency but were not chosen for consumption first as often as familiar items in later trials (Tukey, r2=3.86, p<0.0001). These results provide insight into behavioural responses to novel foods, information for the welfare of captive animals, and provides evidence that this species may exhibit neophobia in foraging contexts.

keywords: Methods for studying behaviour; Foraging; Sensory ecology

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Investigating the development of the social niche in meerkats, using social network analyses

Zoe Turner, Tommaso Saccà, Sofia Forss

Department of Evolutionary Biology and Environmental Sciences, University of Zürich , Kalahari Research Centre

Across animal species, social systems vary in their extent of interactions, competition, cooperation, and cohesion. Though there has been considerable research on the overall social structures, the dynamics of how an individual's social niche is determined, sustained, and altered within these systems have received less attention. In this study, we aim to identify the role of early development on social relationships in a cooperative social mammal using the long-term study system of the Kalahari meerkats (Suricata suricatta). We honed into the critical developmental phase and measured sociality across five early life stages, during which meerkat pups transition from nutritional dependency to independent foraging, and toward sexual maturity as sub-adults. We combine group-wide spatial proximity scans (N=609) and detailed social interactions collected during focal follows (N=170) for 11 pups from three groups to generate social networks and present how they change across early development. Our findings will shed light on the critical impacts of early life on evolutionary adaptations, such as cooperation, and uncover the impact of social niche development on individual and group fitness and survival in a cooperative social mammal.

keywords: Group living / social behaviour; Life histories; Cooperation; Social Networks

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Can life expectancy explain variation in helpfulness in ants?

Filip Turza, Daniel Stec, Diego Fontaneto, Krzysztof Miler

Doctoral School of Exact and Natural Sciences, Jagiellonian University, prof. S. Łojasiewicza 11, 30-348 Kraków, Poland, Institute of Environmental Sciences, Faculty of Biology, Jagiellonian University, Gronostajowa 7, 30-387 Kraków, Poland

The ecological and evolutionary success of ants can be attributed to their altruistic tendencies. These tendencies include rescue behaviour occurring between nestmates when one of them is in danger (e.g. trapped). However, despite numerous studies, sources of variation in helpfulness in ants remain unclear. In our study, we tested whether the differences in the lifespan of workers between species explain rescue proneness. We aimed to find out whether species with relatively lower life expectancies are less likely to engage in rescue actions than species with relatively higher life expectancies. We measured the survivorship and helpfulness of several ant species representing diverse phylogenetic affiliations. We found that the expression of rescue behaviour is less frequent when ant species have lower than higher life expectancy. These results show that life expectancy constitutes a significant determinant of helpfulness in ants. Moreover, by illuminating the impact of life expectancy on behavioural patterns among ants, we aim to encourage broader consideration of this parameter in other social animals.
keywords: Group living / social behaviour; Physiology and behaviour

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Copying of song rhythm and rhythmic parameters in zebra finches

Judith Varkevisser (shared first author), Lara Burchardt (shared first author), Michelle Spierings

Leiden university

Rhythm plays an important role in different aspects of animal communication. Recent studies have highlighted the rhythmic patterns in the vocalizations produced by several animal species, both mammals and birds. For instance, intervals in zebra finch song have been shown to fit a metronome-like beat that is individually distinct. Many studies have demonstrated that zebra finch tutees copy the spectral content of their tutor's song, but less is known about possible copying of their tutor's rhythmic parameters. In this study we use a temporal interval analysis to find out whether tutees copy their tutor's rhythm, and we investigate whether copying accuracy in the temporal and spectral
keywords: Learning; Acoustic communication

Domestic pigs taking sides: rank and friendship effects in a two-choice test

Ariane Veit, Isabelle Fuxjäger, Marianne Wondrak, Ludwig Huber
Messerli Research Institute, University of Veterinary Medicine Vienna

This study aimed to investigate whether adult free-range pigs of a stable social group can be socially influenced to select a certain food location, and whether this bias may be due to rank or relationship quality differences between pigs. Per observer (N=20) six demonstrator pairs were selected, differing in rank and relationship quality to the respective observer. During the test, two demonstrators were eating on the observer's left and right side for two minutes. Subsequently, the observer pig was allowed to enter a test room and given the choice between two food bowls, which were again positioned on the left and right side. In addition to location, olfactory cues linked the respective demonstrators to the food bowls. Results show that observers preferred to attend to the relatively lower-ranking demonstrator during presentation. Additionally, more sociable observers preferred to attend the more affiliative demonstrators. We found no effect of rank or friendship on the food bowl choice. However, a left bias in more sociable observers might indicate a priming effect during exposure, which may be explained by hemispheric lateralization.
keywords: Group living / social behaviour; Foraging; Learning

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Competitive Bidding Affects the Provision of Cooperative Behaviour in Dwarf Mongooses

Yoonjung Yi, Josh J. Arbon, Amy Morris-Drake, Julie M. Kern, Andrew D. Higginson, Andrew N. Radford
School of Biological Sciences, University of Bristol, Life Sciences Building, 24 Tyndall Avenue, Bristol BS8 1TQ, UK, School of Environmental and Rural Science, University of New England, Armidale 2351, New South Wales, Australia / Centre for Research in Animal Behaviour, College of Life and Environmental Sciences, University of Exeter, Exeter EX4 4QG, UK

Whilst kin selection explains why relatives often cooperate with one another, siblings may still compete for limited resources. In cooperative-breeding species, where reproductive opportunities are limited, philopatric same-age siblings might bid for groupmate support by investing in cooperative acts. We used 12 years of field data to investigate whether having more competitors (i.e., siblings) leads to higher production of public goods in dwarf mongooses (Helogale parvula). Sentinel behaviour, where an individual scans for danger from a raised position, is a cooperative act of public good as social information about threats is shared with all groupmates. We found that the total number of siblings did not affect dwarf mongooses sentinel bout duration. However, individuals performed longer sentinel bouts when their same-sex siblings contributed more to sentinel behaviour that day. By contrast, the cooperative contributions of opposite-sex siblings did not influence individuals' sentinel behaviour. Our results highlight that dwarf mongooses can keep track of the cooperative contributions of groupmates and adjust their public goods provision accordingly in a competitive market.
keywords: Cooperation; Group living / social behaviour; Long-term studies

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Cockatoos' kitchen: Two types of innovative food preparation and their long-term transmission in Goffin's cockatoos

Jeroen Zewald, Alice Auersperg
Messerli Institute, University of Veterinary Medicine, Vienna

Foraging innovations reflect an animal's ability to exploit new food types or apply new foraging techniques. One type of foraging innovation is food preparation, in which an animal improves the quality of a food that is already edible in its current state, for example by dunking food in liquid before consumption. These reports are often anecdotal which hinders the inference of its function. We quantified two dunking innovations in a group of Goffin's cockatoos. First, we observed 7/18 cockatoos dunked dry rusk (rarely other food types) in water long enough to let it absorb water, thereby soaking it. Second, we also observed 9/18 cockatoos dunking cooked food in yoghurt. Using different experimental setups, the cockatoos showed a preference to dunk in blueberry yoghurt over a neutral one or water, seemingly to flavour the food. Since the birds show little overlap in the types of dunking used and since the behaviours have not been observed in the wild, we believe these to be two different innovations. To follow the potential spread of dunking throughout the group, we recoded it in regular intervals over two years, showing more individuals started to dunk which might reflect social transmission throughout the group.
keywords: Innovations; Foraging; Long-term studies

Attendees list

Abdu	Salamatu	Talk	Wednesday 17th	11h45 – 12h00	Cockatoo
Adriaense	Jessie E.C.	Talk	Wednesday 17th	09h00 – 09h15	Cockatoo
Aellen	Mélisande	Poster	Poster 27		
Alaman	Alejandro	Talk	Wednesday 17th	12h15 – 12h30	Cockatoo
Albi	Angela	Poster	Poster 32		
Alyan	Sofyan	Poster	Poster 79		
Anderwald	Pia	Talk	Thursday 18th	14h00 – 14h15	Guineafowl
Andres	Laura				
Ardoin	Théo				
Arndt	Saskia				
Asgari	Yasaman	Poster	Poster 55		
Aspillaga	Antonia	Talk	Thursday 18th	15h00 – 15h15	Cockatoo
Auersperg	Alice	Poster	Poster 24		
Azad	Kamrun Naher	Talk	Thursday 18th	14h30 – 14h45	House mouse
Badriyah	Siti Nur				
Balasubramaniam	Krishna	Talk	Wednesday 17th	09h15 – 09h30	Cockatoo
Bandyopadhyay	Srinwanti	Talk	Thursday 18th	10h00 – 10h15	House mouse
Banerjee	Avik	Talk	Wednesday 17th	12h30 – 12h45	House mouse
Barnes	Paige	Talk	Wednesday 17th	11h15 – 11h30	Guineafowl
Barrett	Brendan	Talk	Friday 19th	09h30 – 09h45	Meerkat
Basch	Andreas				
Baumgartner	Chérine D.	Talk	Thursday 18th	14h30 – 14h45	Guineafowl
Bendahmane	Ilyas	Poster	Poster 80		
Berghänel	Andreas	Talk	Wednesday 17th	15h00 – 15h15	Meerkat
Birch	Graham	Talk	Wednesday 17th	16h45 – 17h00	Meerkat
Bize	Pierre	Poster	Poster 72		
Blenkuš	Urša	Poster	Poster 6		
Borah	Doli	Poster	Poster 31		
Borsier	Emma	Talk	Wednesday 17th	09h30 – 09h45	House mouse
Bose	Mihieka	Talk	Wednesday 17th	11h45 – 12h00	House mouse
Bouquet	Aline	Poster	Poster 67		
Boutros	Nathalie	Poster	Poster 4		
Bouvet	Julien	Talk	Friday 19th	10h00 – 10h15	Guineafowl
Brack	Darwin C.	Talk	Wednesday 17th	11h15 – 11h30	House mouse
Brandl	Hanja	Talk	Thursday 18th	09h15 – 09h30	House mouse
Brenninger	Franziska A.	Poster	Poster 37		
Briefer	Elodie F.	Talk	Wednesday 17th	16h30 – 16h45	Cockatoo
Britschgi	Laetitia	Poster	Poster 22		
Brosche	Kimberly	Poster	Poster 28		
Brumm	Henrik				
Bshary	Redouan				
Bugnyar	Thomas	Talk	Wednesday 17th	10h00 – 10h15	Cockatoo
Burkart	Judith				
Büttner	Caroline Sophie	Poster	Poster 11		
Calderoni	Gregorio				
Calmon	Marie	Poster	Poster 23		
Camargo dos Santos	Bruno	Talk	Thursday 18th	11h15 – 11h30	Guineafowl
Capitain	Svenja	Poster	Poster 60		
Carlitz	Esther H.D.	Talk	Thursday 18th	15h15 – 15h30	Meerkat
Caro	Shana M.	Talk	Thursday 18th	12h00 – 12h15	House mouse
Carrilho	Maílis	Talk	Wednesday 17th	12h15 – 12h30	House mouse
Catitti	Benedetta	Talk	Thursday 18th	14h15 – 14h30	Meerkat
Cerveira	Ana Mota	Poster	Poster 16		
Chan	Alex H H	Talk	Friday 19th	10h00 – 10h15	Meerkat
Chatterjee	Arnab	Talk	Wednesday 17th	10h15 – 10h30	Guineafowl
Chimento	Michael	Talk	Wednesday 17th	09h45 – 10h00	House mouse
Christensen	Charlotte	Talk	Wednesday 17th	09h30 – 09h45	Cockatoo
Clutton-Brock	Tim	Plenary			
Cocchiara	Amélie	Talk	Thursday 18th	10h15 – 10h30	Cockatoo
Colbourne	Jennifer	Talk	Wednesday 17th	16h15 – 16h30	House mouse
Colominas-Ciuró	Roger				
Comin	Valentine	Poster	Poster 21		
Covas	Rita	Talk	Thursday 18th	14h00 – 14h15	Meerkat
Csak	Annegret				
Cuchot	Paul	Talk	Wednesday 17th	11h15 – 11h30	Cockatoo
Dall	Sasha				

Daoudi-Simison	Sophia				
Darmis	Fragkiskos	Talk	Thursday 18th	12h15 – 12h30	Meerkat
Davidian	Eve	Poster	Poster 29		
Davis	Grace H.	Talk	Wednesday 17th	11h30 – 11h45	Meerkat
Davis	Leyla				
de Groot	Corné	Talk	Thursday 18th	09h45 – 10h00	Cockatoo
de Guinea	Miguel	Talk	Thursday 18th	15h15 – 15h30	Guineafowl
Debras	Charlotte	Poster	Poster 58		
Dechaume-Moncharmont	François-Xavier				
Deichelbohrer	Alisha	Poster	Poster 83		
Delacoux	Mathilde	Talk	Friday 19th	09h30 – 09h45	House mouse
Delaunay	Axelle	Talk	Thursday 18th	14h15 – 14h30	House mouse
Desai	Chena	Poster	Poster 45		
Diez Leon	Maria				
Doutrelant	Claire	Poster	Poster 64		
Driscoll	Isabel	Talk	Thursday 18th	09h30 – 09h45	House mouse
Duboscq	Julie	Poster	Poster 69		
Dunn	Jacob	Talk	Wednesday 17th	17h00 – 17h15	Cockatoo
Ebensperger	Luis	Talk	Wednesday 17th	10h15 – 10h30	Meerkat
Ellis	Sam	Talk	Thursday 18th	09h15 – 09h30	Cockatoo
Engelhardt	Sacha C.	Talk	Thursday 18th	11h30 – 11h45	Guineafowl
F. Antunes	Diogo	Talk	Wednesday 17th	10h15 – 10h30	House mouse
Faiß	Marius				
Falk	Nikola	Talk	Wednesday 17th	17h15 – 17h30	Cockatoo
Fargevieille	Amélie	Poster	Poster 68		
Farine	Damien				
Felsch	Joey	Talk	Thursday 18th	12h30 – 12h45	House mouse
Ferreira	André C.	Talk	Thursday 18th	14h30 – 14h45	Meerkat
Ferreira	Océane	Talk	Thursday 18th	10h00 – 10h15	Cockatoo
Fichtel	Claudia	Talk	Thursday 18th	10h15 – 10h30	Guineafowl
Figueiredo	Alexandre	Talk	Wednesday 17th	11h30 – 11h45	House mouse
Fischer	Julia	Talk	Thursday 18th	11h30 – 11h45	Meerkat
Fišer	Ondřej	Talk	Wednesday 17th	12h00 – 12h15	Guineafowl
Fisher	David N.	Talk	Wednesday 17th	12h30 – 12h45	Meerkat
Flack	Andrea	Talk	Wednesday 17th	15h00 – 15h15	Cockatoo
Forss	Sofia				
Fourie	Babette	Talk	Thursday 18th	12h30 – 12h45	Guineafowl
Freudiger	Annika	Talk	Wednesday 17th	09h00 – 09h15	Meerkat
Friry	Salomé	Talk	Thursday 18th	12h00 – 12h15	Cockatoo
Früh	Christina				
Fusté	Roger	Talk	Thursday 18th	14h00 – 14h15	House mouse
Gallego Rubalcaba	Juan Vicente				
Galvez	Dumas	Poster	Poster 15		
García-Campa	Jorge	Poster	Poster 41		
García-Navas	Vicente	Poster	Poster 84		
García-Ruiz	Irene	Talk	Thursday 18th	12h15 – 12h30	Guineafowl
Garrido-Priego	Marina	Talk	Wednesday 17th	10h00 – 10h15	House mouse
Gerfen	Jasmin Laura	Poster	Poster 65		
Gil	Diego				
Gladow	Kai-Philipp	Talk	Wednesday 17th	11h30 – 11h45	Cockatoo
Gleske	Melanie	Poster	Poster 13		
Goedecker	Caspar	Poster	Poster 43		
Gonzalez Rossi	Ellen				
Gorshkova	Ekaterina	Poster	Poster 56		
Goto	Hana	Poster	Poster 1		
Goymann	Wolfgang	Talk	Thursday 18th	15h00 – 15h15	House mouse
Granell-Ruiz	Maria	Talk	Wednesday 17th	12h00 – 12h15	House mouse
Grotloh	Sophie	Poster	Poster 42		
Grout	Emily	Talk	Friday 19th	10h00 – 10h15	House mouse
Guenther	Anja	Talk	Wednesday 17th	09h00 – 09h15	Guineafowl
Guggenberger	Marie	Poster	Poster 75		
Güldenpfennig	Justine	Talk	Wednesday 17th	12h00 – 12h15	Cockatoo
Gutzwiller	Anne-Cathérine				
Hahn	Luca	Talk	Thursday 18th	14h00 – 14h15	Cockatoo
Halder	Subhashis	Poster	Poster 82		
Hämäläinen	Liisa	Talk	Wednesday 17th	16h45 – 17h00	Guineafowl
Hammer	Roy	Talk	Wednesday 17th	10h00 – 10h15	Meerkat

Hegedic	Matjaz				
Hillemann	Friederike	Talk	Thursday 18th	09h45 – 10h00	Meerkat
Hodgson	George	Poster	Poster 48		
Houdelier	Cécilia	Poster	Poster 8		
Huh	Kyu Min	Talk	Wednesday 17th	17h00 – 17h15	Guineafowl
Hürlimann	Antonia	Talk	Thursday 18th	14h45 – 15h00	Guineafowl
Hurme	Edward	Talk	Wednesday 17th	15h15 – 15h30	Cockatoo
Ilany	Amiyaal	Talk	Wednesday 17th	09h15 – 09h30	Meerkat
Inforzato Guermandi	Isabela	Poster	Poster 78		
Jacobson	Odd	Talk	Wednesday 17th	17h00 – 17h15	Meerkat
Jaeggi	Adrian	Poster	Poster 57		
Jakob	Katharina				
Jimeno	Blanca	Talk	Thursday 18th	09h15 – 09h30	Meerkat
Jorgewich Cohen	Gabriel	Talk	Friday 19th	10h15 – 10h30	Cockatoo
Kalbitzer	Urs	Talk	Thursday 18th	11h45 – 12h00	Meerkat
Kano	Fumihiro				
Kappeler	Peter	Talk	Wednesday 17th	12h00 – 12h15	Meerkat
Kempf	Anna	Poster	Poster 26		
Kessler	Rolf	Talk	Thursday 18th	09h00 – 09h15	Cockatoo
Keynan	Oded				
Kiik	Kairi	Poster	Poster 36		
Kirschel	Alexander	Talk	Friday 19th	09h30 – 09h45	Cockatoo
Koenig	Barbara	Plenary			
Koops	Kathelijne	Poster	Poster 71		
Koren	Lee	Talk	Wednesday 17th	17h30 – 17h45	Meerkat
Krackow	Sven				
Krasheninnikova	Anastasia	Poster	Poster 40		
Kudrenko	Svitlana	Talk	Wednesday 17th	09h15 – 09h30	Guineafowl
Kukofka	Paulina	Talk	Thursday 18th	11h15 – 11h30	Meerkat
Kulkarni	Manasa	Talk	Thursday 18th	09h30 – 09h45	Cockatoo
Kumar	Nishant	Talk	Thursday 18th	12h15 – 12h30	Cockatoo
Kunz	Julia A.	Talk	Wednesday 17th	16h30 – 16h45	Meerkat
Lagakos	Maria	Poster	Poster 70		
Lee	Saein	Talk	Wednesday 17th	11h45 – 12h00	Meerkat
Leedale	Amy				
Lesch	Raffaela	Poster	Poster 66		
Lessells	Kate				
Licht	Max	Talk	Wednesday 17th	16h30 – 16h45	Guineafowl
Lindholm	Anna				
Lokuciejewski	Emma	Talk	Wednesday 17th	12h15 – 12h30	Meerkat
López Caicoya	Alvaro	Talk	Thursday 18th	14h30 – 14h45	Cockatoo
Lorenzi	Maria Cristina	Talk	Thursday 18th	14h45 – 15h00	House mouse
Lumineau	Sophie	Poster	Poster 17		
Ma	Xueqian				
Madden	Joah				
Mahr	Katharina	Talk	Wednesday 17th	10h00 – 10h15	Guineafowl
Maiolini	Marco	Poster	Poster 5		
Makuya	Lindelani	Talk	Thursday 18th	14h15 – 14h30	Guineafowl
Manser	Marta				
Marmelo	Marta	Poster	Poster 38		
Martin	Mathilde	Talk	Friday 19th	10h15 – 10h30	Guineafowl
Massen	Jorg J.M.	Poster	Poster 47		
McPherson	Josie	Talk	Thursday 18th	09h00 – 09h15	Guineafowl
Meltzer	Andrea	Talk	Thursday 18th	11h45 – 12h00	Guineafowl
Mioduszewska	Berenika	Poster	Poster 44		
Morales	Judith	Poster	Poster 18		
Morel	Margot	Poster	Poster 61		
Morinay	Jennifer	Talk	Thursday 18th	09h00 – 09h15	Meerkat
Morris-Drake	Amy	Talk	Wednesday 17th	16h15 – 16h30	Meerkat
Morrison	Robin	Talk	Wednesday 17th	11h15 – 11h30	Meerkat
Moscovice	Liza R.	Talk	Wednesday 17th	15h15 – 15h30	House mouse
Mosna	Marta				
Mouchet	Alexia	Talk	Thursday 18th	12h00 – 12h15	Meerkat
Mukhopadhyay	Snigdha	Talk	Wednesday 17th	17h00 – 17h15	House mouse
Mukundan	Shweta	Poster	Poster 63		
Muller	Allison	Poster	Poster 12		
Müller-Klein	Nadine	Talk	Thursday 18th	15h00 – 15h15	Meerkat

Munshi	Chayan	Poster	Poster 10		
Mylne	Helen K	Talk	Wednesday 17th	09h30 – 09h45	Meerkat
Naguib	Marc	Talk	Friday 19th	09h45 – 10h00	Cockatoo
Nakano	Michel				
Natucci	Luca				
Netz	Christoph	Talk	Wednesday 17th	09h45 – 10h00	Cockatoo
Neumann	Christof	Poster	Poster 53		
Nishiumi	Nozomi	Talk	Wednesday 17th	17h30 – 17h45	Guineafowl
Noguer Pérez	Laura	Talk	Thursday 18th	10h15 – 10h30	Meerkat
Noordenbos	Jori	Poster	Poster 20		
O'Hara	Sean				
O'Hara	Mark	Poster	Poster 77		
O'Hearn	William	Poster	Poster 73		
Ogino	Mina	Talk	Friday 19th	10h15 – 10h30	House mouse
Olejarz	Astrid	Poster	Poster 14		
Oliveira	Teresa	Talk	Thursday 18th	11h45 – 12h00	House mouse
Orgeret	Florian	Talk	Wednesday 17th	09h15 – 09h30	House mouse
Pacher	Korbinian	Talk	Wednesday 17th	16h15 – 16h30	Guineafowl
Pallagatti	Ruthvik	Poster	Poster 52		
Pashchevskaya	Sonya				
Paul	Tithi	Talk	Wednesday 17th	12h30 – 12h45	Cockatoo
PC	Zakhiya	Talk	Thursday 18th	15h15 – 15h30	Cockatoo
Pérez Fraga	Paula	Poster	Poster 33		
Perrier	Léo	Talk	Wednesday 17th	16h15 – 16h30	Cockatoo
Perroulaz	Leïla	Talk	Friday 19th	09h45 – 10h00	Guineafowl
Peter	Annika	Poster	Poster 9		
Petroni	Luca	Talk	Wednesday 17th	17h15 – 17h30	Guineafowl
Phalke	Sagarika	Talk	Wednesday 17th	11h45 – 12h00	Guineafowl
Pilská	Anna	Talk	Wednesday 17th	09h00 – 09h15	House mouse
Piyapong	Chantima	Poster	Poster 35		
Pou-Rossell	Marçal	Talk	Friday 19th	09h30 – 09h45	Guineafowl
Protopapa	Elisa	Poster	Poster 34		
Purushotham	Vaishnavi	Talk	Thursday 18th	12h30 – 12h45	Cockatoo
Qiu	Jingyu	Talk	Thursday 18th	09h15 – 09h30	Guineafowl
Quinche-Giraldo	David	Poster	Poster 25		
Rabin	George	Poster	Poster 50		
Ramesh	Aparajitha	Talk	Thursday 18th	14h15 – 14h30	Cockatoo
Ratz	Tom	Poster	Poster 54		
Rempfler	Thomas	Talk	Thursday 18th	11h15 – 11h30	Cockatoo
Richter	Xiang-Yi Li	Talk	Wednesday 17th	17h15 – 17h30	House mouse
Riehl	Christina	Plenary			
Rigoudy	Noa	Talk	Wednesday 17th	09h30 – 09h45	Guineafowl
Ringler	Eva	Talk	Wednesday 17th	17h15 – 17h30	Meerkat
Robira	Benjamin	Talk	Thursday 18th	15h00 – 15h15	Guineafowl
Royauté	Raphaël	Poster	Poster 81		
Rüegg	Vanessa	Poster	Poster 3		
Ruf	Juliette				
Ruiz-Raya	Francisco	Talk	Thursday 18th	14h45 – 15h00	Meerkat
Saccà	Tommaso	Talk	Thursday 18th	11h15 – 11h30	House mouse
Sachser	Norbert				
Santoro	Rosaria	Talk	Wednesday 17th	16h45 – 17h00	Cockatoo
Sarkar	Rohan	Talk	Wednesday 17th	17h30 – 17h45	Cockatoo
Satarkar	Devi	Talk	Thursday 18th	10h00 – 10h15	Meerkat
Scherer	Ulrike	Talk	Thursday 18th	10h00 – 10h15	Guineafowl
Scherler	Patrick				
Schmitt	Océane	Talk	Wednesday 17th	15h15 – 15h30	Guineafowl
Schneider	Santana				
Shit	Piuli	Talk	Wednesday 17th	17h30 – 17h45	House mouse
Shivani	Shivani	Talk	Wednesday 17th	09h45 – 10h00	Meerkat
Silva	Liliana R.	Poster	Poster 76		
Silva	Nicolas J.	Talk	Thursday 18th	09h30 – 09h45	Meerkat
Sininärhi	Erika	Poster	Poster 7		
Siracusa	Erin R.	Talk	Wednesday 17th	10h15 – 10h30	Cockatoo
Soulet	Delphine	Talk	Thursday 18th	09h45 – 10h00	House mouse
Souques	Chloé	Talk	Thursday 18th	12h15 – 12h30	House mouse
Spina	Federica	Poster	Poster 30		
Sroka	Marlene	Talk	Thursday 18th	09h30 – 09h45	Guineafowl

Stampe	Karina	Poster	Poster 2		
Starić	Dario	Poster	Poster 19		
Stoehr	Svenja	Talk	Thursday 18th	11h30 – 11h45	House mouse
Strandburg-Peshkin	Ariana				
Szabo	Birgit	Talk	Wednesday 17th	11h30 – 11h45	Guineafowl
Taborsky	Michael	Talk	Thursday 18th	12h00 – 12h15	Guineafowl
Taborsky	Barbara	Talk	Wednesday 17th	12h15 – 12h30	Guineafowl
Tebbich	Sabine	Talk	Thursday 18th	11h30 – 11h45	Cockatoo
Tilley	Hannah B.	Poster	Poster 74		
Trapp	Christin				
Triki	Zegni	Plenary			
Truong	Suzanne	Talk	Wednesday 17th	15h00 – 15h15	Guineafowl
Turner	Zoe	Poster	Poster 46		
Turza	Filip	Poster	Poster 51		
Tyndel	Stephen A.	Talk	Friday 19th	10h00 – 10h15	Cockatoo
van Schaik	Jaap	Talk	Thursday 18th	12h30 – 12h45	Meerkat
Varkevisser	Judith	Poster	Poster 62		
Veit	Ariane	Poster	Poster 49		
Vezyrakis	Alexandros	Talk	Wednesday 17th	16h30 – 16h45	House mouse
Villain	Avelyne S.	Talk	Wednesday 17th	15h15 – 15h30	Meerkat
Vinken	Vera	Talk	Thursday 18th	09h00 – 09h15	House mouse
von Merten	Sophie	Talk	Wednesday 17th	09h45 – 10h00	Guineafowl
Walkenhorst	Britta	Talk	Thursday 18th	10h15 – 10h30	House mouse
Wang	Daiping				
Watson	Stuart K	Talk	Wednesday 17th	15h00 – 15h15	House mouse
Wilkinson	Anna				
Willcox	Kathryn	Talk	Wednesday 17th	12h30 – 12h45	Guineafowl
Wittig	Roman	Talk	Friday 19th	09h45 – 10h00	Meerkat
Wood	Kelsey	Talk	Friday 19th	10h15 – 10h30	Meerkat
Wyman	Megan				
Yi	Yoonjung	Poster	Poster 39		
Yousry	Lina				
Zarei	Shahaboddin	Talk	Wednesday 17th	16h45 – 17h00	House mouse
Zenth	Friederike	Talk	Thursday 18th	11h45 – 12h00	Cockatoo
Zewald	Jeroen	Poster	Poster 59		
Zhan	Xia	Talk	Thursday 18th	09h45 – 10h00	Guineafowl
Zhang	Yixuan	Talk	Thursday 18th	14h45 – 15h00	Cockatoo
Zöttl	Markus				